DISSIMILATION, CONSONANT HARMONY, AND SURFACE CORRESPONDENCE

by

WILLIAM G. BENNETT

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ABSTRACT OF THE DISSERTATION

Dissimilation, Consonant Harmony, and Surface Correspondence

By WILLIAM G. BENNETT

Dissertation Director:

Alan Prince

In this dissertation, I argue for a theory of long-distance consonant dissimilation based on Surface Correspondence, correspondence that holds over the different consonants contained in the same output form. Surface Correspondence is posited in previous work on Agreement By Correspondence, which explains long-distance consonant assimilation as agreement driven by similarity (Rose & Walker 2004, Hansson 2001/2010). I demonstrate that dissimilation is a natural outcome of this theory of correspondence, and develop a novel and more formally explicit characterization of the Surface Correspondence relation and the constraints sensitive to it. The consequences of this theory are explored in analyses of dissimilation and agreement patterns in Kinyarwanda, Sundanese, Cuzco Quechua, Obolo, Chol, Ponapean, Zulu, Yidiny, Latin, and Georgian.

The Surface Correspondence Theory of Dissimilation (SCTD) posits only constraints that demand surface correspondence, and constraints that limit it. Dissimilation falls out from the interaction of these constraints. Correspondence is only required between consonants that are similar in a specified respect; if they are not

similar in the output, they need not correspond. Constraints that disfavor Surface Correspondence therefore favor dissimilation, because dissimilating is a way to avoid penalized surface correspondence structures. This interaction derives long-distance consonant dissimilation without any special mechanism like the OCP or anti-similarity constraints; it also explains certain dissimilation patterns that aren't accounted for by previous OCP-based theories.

The SCTD unites long-distance consonant dissimilation and consonant harmony under the same theory, but does not predict that they are formally identical. Agreement is based on correspondence; dissimilation, on the other hand, is based on non-correspondence – consonants dissimilate instead of corresponding. Surface Correspondence constraints therefore affect dissimilation in different ways than harmony: limiting correspondence limits agreement, but *favors* dissimilation. The resulting prediction is that harmony and dissimilation are related in a consistently mismatched way, and not in the matching way predicted by previous theories that link them together (MacEachern 1999, Nevins 2004, Mackenzie 2009, Gallagher 2010, a.o.). This outcome of the SCTD is empirically supported: a survey of over 130 languages shows that the typology of long-distance consonant dissimilation indeed does not match the typology of consonant harmony.

DEDICATION

To my parents, Fred and Nancy Bennett,

whose guidance and support made all of this possible.

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Finally, to you, the noble reader: thanks for sampling this work, and I hope you find it interesting, useful, or maybe both. Also, please don't try to read the whole dissertation straight through.

It’s not intended for that, and also it turned out *way* longer than anticipated. I recommend that you start with chapter 1, but after that you can skip around as you wish. If you're not into formalism, feel free to treat chapter 2 as a reference. If you’re not into nitty-gritty data, then skim past the data sections in chapters like 5, 6 and 7. I will take neither notice nor offense. But definitely don’t read it all cover to cover. I mean, not unless you really want to know all the details about how the theory works, and what all the consequences are, and how they’re related to the empirical landscape. Even then, you probably won’t find answers to everything in here. But, I hope it’s a start that spurs great new ideas. Please enjoy.

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Introduction

1.1. Introduction

1.1.1. The core idea: dissimilation from surface correspondence

The ***Agreement-By-Correspondence*** framework is a theory of agreement developed in work by Walker (2000a, 2000b, 2001), Hansson (2001/2010, 2007), and especially Rose & Walker (2004). The initial aim of this work was to explain long-distance ***consonant harmony***: agreement between non-adjacent consonants, which isn't mediated other phonological material that intervenes between them. In the Agreement By Correspondence theory, the basis for this agreement is ***Surface Correspondence***: correspondence between the different surface consonants of a single output form. The arrangement and structure of these correspondences affects the input-output mapping because there are constraints that take them into consideration when assessing violations.

The central point of this dissertation is that surface correspondence also gives rise to dissimilation. The term 'dissimilation' is used here to refer to situations where surface consonants obligatorily disagree in some respect. This encompasses a range of dissimilatory effects, as Suzuki (1998) notes. Dissimilation can manifest as processes that change similar input segments such that they are less similar in the output. It can also manifest as a choice between segments or allomorphs based on disagreement on the surface, or it can emerge in the form of static co-occurrence restrictions that prohibit similar segments without giving rise to alternations. Any of these could be the result of a principle of disagreement in the output, so I will consider all these types of dissimilatory effects.

The Agreement By Correspondence theory leads to dissimilation because Surface Correspondence is based on phonological similarity. Constraints of the Corr-[αF] family evaluate every pair of output consonants; they require that pairs of consonants which share a specified feature be in correspondence with each other. These constraints are therefore satisfied in two essential ways.

(1) Two structural types of CORR constraint satisfaction
  a. Similar consonants that correspond
  b. Dissimilar consonants, whether they correspond or not

Agreement By Correspondence builds on the former (1a). Harmonizing consonants are required to correspond, because they are similar in some respect. Because they correspond, they are compelled to agree in another respect, by CC·IDENT-[F] constraints that require correspondents to agree with each other. This need for agreement is the basis for assimilation. Consonant harmony represents agreement rooted in similarity rather than proximity, thus deriving its long-distance occurrence.

Dissimilation builds on the other type of correspondence requirement satisfaction (1b): dissimilating consonants satisfy CORR constraints without corresponding, by being dissimilar. Consonants may be required to correspond only because they are similar in some respect – because they share some feature. If they do not share that feature, correspondence between them is not necessary. Dissimilation removes the similarity between consonants, which renders them outside the scope of the correspondence requirement. This satisfies CORR constraints, because consonants that aren't similar aren't obliged to correspond.

Since correspondence demands are satisfied by dissimilar consonants that don't correspond, the theory of surface correspondence is by its very nature a theory of dissimilation as well as harmony – whether intended as such or not. In this dissertation, I further develop the theory of surface correspondence, and study its consequences for dissimilation, and the relationship between dissimilation and consonant harmony. I propose that long-distance dissimilation and long-distance consonant harmony are two phenomena generated by the same surface correspondence relation: they arise from different rankings of the same set of constraints. The surface correspondence theory of dissimilation is applied in detail to analyses of harmony and/or dissimilation patterns in Chol, Georgian, Kinyarwanda, Latin, Obolo, Ponapean, Quechua, Sundanese, Yidiny, and Zulu. I also examine its typological predictions, evaluated against a survey of 148 dissimilation patterns, from 133 languages.

1.1.2. How it works

To see a simple example of the sort of interactions that are possible results of the surface correspondence theory, consider a hypothetical input /bap/. This input has two consonants that share the feature [Labial]. Based on this shared feature, correspondence can be required between these consonants, by a constraint CORR·[Labial]: 'if consonants are labial, they are in surface correspondence'. The consonants /b/ and /p/ also differ in the feature [±voice]. Correspondent consonants may be required to agree in voicing, by a constraint CC·IDENT-[voice], so this disparity sets up the potential for an interaction between these consonants – either harmony or dissimilation.

(2) CORR·[Labial]: 'if consonants are labial, they are in surface correspondence'
(3) CC·IDENT-[voice]: 'if consonants correspond, they agree in voicing'

The space of possible optima can be broken down into classes, based on these two features and the possibility of correspondence between the two consonants. These possibilities are illustrated in the table in (4). Matching indices in the outputs mark correspondences, shown in partition notation in the second column. The third column indicates whether the candidates are faithful, or involve an unfaithful mapping. (The shaded rows represent other candidates that can never win – they are harmonically bounded by (a)-(d).)

(4) Simple example: correspondence-related mapping possibilities
Input: /bap/

	Output	SCorr classes	I-O Faithful?	Type of mapping
a.	b_1 a p_1	{b p}	F-lab, F-voi	Faithful with correspondence
b.	b_1 a p_2	{b}{p}	F-lab, F-voi	Faithful with non-correspondence
c.	b_1 a b_1	{b b}	F-lab, UnF-voi	Harmony & correspondence
d.	b_1 a k_2	{b}{k}	UnF-lab, F-voi	Dissimilation & non-correspondence
e.	b_1 a b_2	{b}{b}	UnF-lab, UnF-voi	Harmony with non-correspondence
f.	b_1 a k_1	{b k}	UnF-lab, UnF-voi	Dissimilation with correspondence

One possibility (4a) is that the two consonants are faithful, and are in correspondence with each other. This correspondence is favored by a CORR constraint, because these [b] & [p] are similar with respect to place of articulation – they share the feature [Labial]. However, having correspondence between [b] & [p] also means that we have two corresponding consonants that disagree in voicing – a situation that would be problematic in a language with voicing harmony, where correspondence is attached to a requirement for voicing agreement.

Another possibility (4b) is that the two consonants in /bap/ surface intact, but don't correspond with one another. Since both consonants are labials, this presents a problem: correspondence is based on similarity between consonants, and here we have two labials that don't correspond. But, this lack of correspondence circumvents the agreement problem of (a): if the two labials don't correspond, then it doesn't matter whether they agree or not.

In order for surface correspondence to drive alternations, the fully faithful candidates (4a) & (4b) must both get ruled out. The faithful non-correspondent candidate (4b) can be ruled out by a constraint that demands correspondence – a *Corr constraint* - such as Corr·[Labial]: "if two consonants are both labial, they must correspond with each other". The faithful candidate with correspondence (4a) needs to be ruled out by a constraint that imposes some requirement on correspondent consonants – a *CC·Limiter constraint* – like CC·Ident-[voice]: "if two consonants are in surface correspondence, then they must agree in voicing".

If both faithful candidates are ruled out, then /bap/ may be mapped to an *un*faithful candidate – one with better surface correspondence opportunities. These candidates split into two general types: one class, represented in (4c), are harmonizing candidates; the other, shown in (4d), are dissimilating candidates.

The harmonizing candidate in (4c), [b_1ab_1], is like the faithful correspondent candidate in (4a) in that it has correspondence between the two labials. It differs from (4a) in the voicing of one consonant: /p/ surfaces as [b], which matches the voicing of the other [b] – this candidate does voicing assimilation. This assimilating candidate [b_1ab_1] (4c) doesn't incur the same disagreement violations as the faithful correspondent candidate [b_1ap_1] in (4a): here, the two labials correspond, and this correspondence is permissible because they agree in voicing on the surface.

Agreement in this way satisfies the CORR constraint by having correspondence, and it satisfies the CC·Limiter constraint (a CC·IDENT constraint, in this case) by changing the consonants to make them an acceptable pair of correspondents. This is the Agreement by Correspondence interaction, developed in detail in previous work by Rose & Walker (2004), and Hansson (2001/2010).

The fourth possible outcome is the unfaithful *non*-correspondent candidate in (4d), [b_1ak_2], which exhibits labial dissimilation. This candidate is like the faithful non-correspondent one, [b_1ap_2], in (4b) in that it has two output consonants that don't correspond. Where [b_1ak_2] differs from [b_1ap_2] is the similarity of these two non-corresponding consonants. In [b_1ap_2] (4b), the two consonants are labials; a constraint like that says "if two consonants are labial, they must correspond" will penalize this candidate. But, in [b_1ak_2], one labial changes to a non-labial: /p/ surfaces as [k]. This dissimilation satisfies the CORR constraint through non-correspondence between *dissimilar* consonants. The constraint that says 'labials must correspond' doesn't require [k] to correspond with [b], because [k] isn't a labial consonant. And, if they don't correspond, the constraints that require agreement under correspondence don't care that they differ in voicing – agreement isn't demanded among consonants that don't correspond.

Finally, the shaded candidates in (1) are harmonically bounded: they are possible candidates, but not possible optima. In (4e), [b_1ab_2], /p/ labial assimilates to match the voicing of the other labial /b/, even though they don't correspond. This is spurious harmony: agreement is enforced between non-correspondents, which aren't required to agree. It incurs the same faithfulness violations as the harmonizing candidate (c), plus the same Corr constraint violations as the faithful non-correspondent one (b). The candidate in (4f), [b_1ak_1], shows spurious dissimilation: labial /p/ dissimilates to a non-labial [k] that isn't required to correspond with [b], but they still correspond anyway. This has the same unfaithfulness as the regular dissimilating candidate (d), as well as the voicing disagreement problem as the faithful and correspondent candidate (a). The fact that these candidates are harmonically bounded illustrates an important point: differentiating candidates based on their surface correspondence profiles leads to a large increase in the number of possible candidates, but the space of possible optima increases very little.

So, the interaction of constraints that require correspondence and constraints that limit correspondence can spur unfaithful mappings for inputs with similar consonants. If correspondence is both required and prohibited, then it can be optimal to adjust the consonants in order to improve their surface correspondence. When such adjustments occur, they fall into two conceivable classes: harmony, and dissimilation. These two kinds of unfaithful mappings go hand-in-hand with different types of surface correspondence structures. Harmony alternations are familiar from previous work on Agreement By Correspondence: consonants that are similar in one respect end up assimilating in another – they agree in order to be better correspondents. Dissimilation is less intuitively obvious, but just as possible from the standpoint of the theory. Correspondence is demanded on the basis of similarity: only *similar* consonants are required to correspond. This means that restricting or penalizing correspondence favors dissimilation. Instead of corresponding, consonants can dissimilate so that correspondence between them is no longer demanded.

The dissimilating candidates, and the dissimilatory type of mapping, is the focus of the theory proposed here. The idea is that dissimilation occurs to avoid penalized correspondence: similar consonants dissimilate because they are required to correspond on the one hand, and also prohibited from corresponding on the other. This approach links dissimilation to harmony in a way that leads to specific and testable predictions. Since dissimilation and harmony are based on the same surface correspondence mechanism, the constraints that operate on that correspondence are active in both phenomena. This means that constraints that require or prohibit correspondence can be assessed based on consonant harmony as well as dissimilation – the theory makes predictions that can be tested outside of dissimilation. It also follows that dissimilation can happen over distance, like harmony. Both patterns are driven by surface correspondence, and correspondence is required on the basis of similarity, rather than linear adjacency.

1.2. Correspondence-driven dissimilation in action

To see how the dissimilation from correspondence interaction extends to analyses of actual dissimilation cases, let's consider one. Cuzco Quechua exhibits a form of glottalization dissimilation, in which a glottal stop dissimilates to [h] in the presence of a glottalized consonant (Parker & Weber 1996, Parker 1997; see also chapter 5 for full analysis). One manifestation of this dissimilation is an alternation between epenthetic glottal stops and epenthetic [h], based on disagreement with an ejective – a dissimilatory ban on the co-occurrence of two glottalized consonants. This alternation is schematized in (5) and exemplified in (6).

(5) Cuzco Quechua glottalization dissimilation, schematized:
   a. V … T → ʔV … T (epenthesis of initial ʔ when no an ejectives present)
   b. V… K' → hV … K' (dissimilatory use of [h] instead of [ʔ] before ejectives)

(6) Cuzco Quechua: [ʔ]~[h] glottalization dissimilation (Parker & Weber 1996):
   a. /asikuj/ → [ʔasikuj] 'to laugh' cf. *[asikuj]; [ʔ] epenthesized
   b. /ajk'a/ → [hajk'a] 'how many?' cf. *[ʔajk'a]; [h] instead of [ʔ]

The analysis of this dissimilation pattern is based on two surface correspondence constraints. These are defined informally in (7) & (8) below, and defined in more formal precision in chapter 2. The first constraint, CORR·[+c.g.], imposes a correspondence requirement. It demands that ejectives and glottal stops in the output are surface correspondence with each other.

(7) CORR·[+c.g.]: "if two consonants are [+constricted glottis], then they are in surface correspondence with each other"

The other constraint, CC·EDGE-(σ), is a constraint that imposes limits on correspondence relationships. It demands that groups of correspondents never span across the edge of a syllable; that is, it forbids correspondence between consonants that are in different syllables.

(8) CC·EDGE-(σ): "if two consonants correspond with each other, then they are not separated by the edge of a syllable"

When both of these surface correspondence constraints dominate faithfulness for constricted glottis, the result is that dissimilation is favored over faithful co-occurrence of two glottal consonants. The tableau in (9) illustrates this. The input here is the word /ajk'a/ 'how many?' from (6b); since this root starts with a vowel, it would normally surface with an epenthetic glottal stop at the beginning, on par with words like (6a) /asikuj/ → [ʔasikuj] 'to laugh'. But, because the root /ajk'a/ contains the ejective /k'/ – another constricted glottis consonant – inserting a glottal stop necessarily leads to a violation of one of the surface correspondence constraints. If the glottal stop is inserted, then it is required to correspond with the ejective; having the two [+c.g.] consonants without correspondence between them is a violation of Corr·[+c.g.] (9c). However, if these two glottalized consonants *do* correspond, they breech the limit on correspondence imposed by CC·Edge-(σ): having correspondence between consonants in different syllables violates this constraint (9b). Thus, if a glottal stop occurs in a root that already has another constricted glottis consonant in another syllable, there is no way to satisfy both of the surface correspondence constraints. In concert, these two constraints therefore disfavor the co-occurrence of glottal stops and other glottalized consonants, and favor dissimilation for constricted glottis.

(9) Cuzco Quechua glottal dissimilation: Corr·[+c.g.], CC·Edge-(σ) » *h[1]

Input: /ajk'a/ Output: [haj.k'a], *[ʔaj.k'a]		Corr·[+c.g.]	CC·Edge-(σ)	*h	Remarks
☞ a.	h_1 aj. k'_2 a, SCorr $\mathcal{R}$: {h}{k'}	(0)	(0)	(1)	No h~k' corr.
~ b.	$ʔ_1$ aj. k'_1 a, SCorr $\mathcal{R}$: {ʔ k'}		W (0~1)	L (1~0)	Corr. btw [+c.g.] Cs
~ c.	$ʔ_1$ aj. k'_2 a, SCorr $\mathcal{R}$: {ʔ}{k'}	W (0~1)		L (1~0)	No corr. btw [+c.g.] Cs
~ d.	h_1 aj. k'_1 a, SCorr $\mathcal{R}$: {h k'}		W (0~1)	e (1~1)	Corr. btw h~k' (HB'd)

[1] Candidates are shown with their output form and surface correspondence structure, which is given in set notation and redundantly indicated by numeral subscripts on the output consonants. Tableauxs are in hybrid comparative format. Winning candidates are always given in row (a), and other rows represent comparisons between the winner and an alternative, losing, candidate. Integers in parentheses show constraint violations; Ws & Ls indicate a constraint's preference for the Winner or the Loser (Prince 2002). For simplicity, cells with 0~0 violation comparisons are left blank by default.

The dissimilating candidate in (9a) offers a way to satisfy both surface correspondence constraints at once, by having consonants that aren't required to correspond. Instead of a glottal stop, this candidate inserts [h]. Because [h] isn't [+c.g.], it doesn't need to correspond with ejectives to satisfy CORR·[+c.g.]: [h] & [k'] don't share the feature [+constricted glottis], so no correspondence between them is required. This also satisfies CC·EDGE-(σ): no consonant corresponds with one in another syllable. So, the optimal candidate is the one that trades off a violation of some lower-ranked constraint(s) that favor [ʔ] as the epenthetic consonant – represented here in simplified form as *h – in order to satisfy both of the higher-ranked SCorr constraints by non-correspondence.

The dissimilating consonants in the candidate (9a) do not correspond with each other. This satisfies the CORR constraint because they aren't similar in the specified respect – they don't share the feature [+constricted glottis]. Dissimilation represents an improvement that capitalizes on non-correspondence between two consonants. By making the surface form have consonants that don't have to correspond, it leads to an improvement on CORR constraints relative to the faithful *non*-correspondent candidate (9c). Having correspondence between the dissimilating consonants is harmonically bounded: it loses no matter how the constraints are ranked. The dissimilating candidate with correspondence in (9d) incurs the same faithfulness violation as the dissimilating candidate with no correspondence (9a), but offers no corresponding improvement on markedness constraint.

1.3. Correspondence, dissimilation, and harmony

1.3.1. Using the same constraints to explain both

Under the surface correspondence theory of dissimilation advanced here, the constraints that give rise to dissimilation are the same ones responsible for consonant harmony – both are the set of constraints on surface correspondence structures. The unifying characteristic of these 'Limiter' constraints is that they all assign violations based on the properties of correspondent consonants. Dissimilation is favored by constraints that limit correspondence, which also play a crucial role in limiting the extent of harmony.

The set of CC·Limiter constraints consists of several different constraint families; a consequence of this is that languages can differ for when and where dissimilation occurs. We can see this clearly by comparing dissimilation patterns in Kinyarwanda and Zulu, two cases of dissimilation analyzed in later chapters. Both are Bantu languages, and have similar morphological structures – they have the same domain boundaries in the same places (10).

(10) Morphological structure of Zulu & Kinyarwanda (Schadeberg 2003, a.o.[2])
Word = Prefixes + $\langle_{\text{STEM}}$ Root + Suffixes $\rangle$

Both languages have dissimilation that occurs only across the edge of a domain, but they differ in which domain it is. Zulu has labial dissimilation, which occurs only across the edge of the morphological root - the boundary between roots & suffixes (11a), but not across the edge of the stem (11b). Kinyarwanda has a pattern of voiceless

[2] See also Walker et al. (2008) for Kinyarwanda, and Buell (2005) for Zulu, among others. This is the same definition of the stem generally used in Bantuist literature, though some work posits more elaborate structure within the word. See chapter 3 for more detailed discussion.

dissimilation known as Dahl's Law, common among east African Bantu languages). This dissimilation occurs systematically across the edge of the stem (12a), but generally does not occur across the edge of the root (12b).

(11) Zulu: dissimilation across the root edge, but not the stem edge

a. Labial dissimilation within stem, across edge of root. ⟨ɓ…–w⟩ → ⟨tʃ…–w⟩

⟨seɓenz-a⟩	'work'	
⟨setʃenz-w-a⟩	'work (pass.)'	*⟨seɓenz-w-a⟩

b. No dissimilation across the edge of the stem. ɓ⟨…w⟩ → ɓ⟨…w⟩

ɓa⟨lw-is-a⟩	'they cause to fight'	*tʃa⟨lwisa⟩

(12) Kinyarwanda: dissimilation across the stem edge, but not the root edge

a. Voiceless dissim. in adjacent syllables, across stem edge. kV⟨s…⟩ → gV⟨s…⟩

ku⟨βon-a⟩	'to see (inf.)'	
gu⟨som-a⟩	'to read (inf.)'	*ku⟨som-a⟩

b. No dissim. within stem, across root edge. ⟨…k–Vs…⟩ → ⟨…k–Vs…⟩

βa⟨sandik-iiʂ-a⟩	'they write with'	*βa⟨sandig-iiʂ-a⟩

In both Zulu & Kinyarwanda, as in the Cuzco Quechua example above, dissimilation is favored by a CC·EDGE constraint that prohibits correspondence across some sort of edge. But these three cases differ in what kind of edge that is. Different limits on correspondence lead to dissimilation in different contexts. In Cuzco Quechua, the relevant constraint is CC·EDGE-(σ); in Zulu, it's CC·EDGE-(Root); Kinyarwanda, it's CC·EDGE-(Stem).

Dissimilation is favored by constraints that penalize correspondence; because harmony is agreement under correspondence, these constraints also have the effect of penalizing harmony. A consequence of this is that the limits on correspondence are predicted to be the same in harmony and in dissimilation. For instance, the CC·EDGE constraints give rise to dissimilation across domain edges; they also produce systems where consonant harmony is bounded by those same edges. So, if there are constraints CC·EDGE-(σ), CC·EDGE-(Root), and CC·EDGE-(Stem), the theory predicts that there can be strictly syllable-internal harmony, strictly root-internal harmony, and strictly stem-internal harmony. As example cases in chapter 2 show, all of these are attested: the CC·EDGE constraints are evident not just from their role in triggering dissimilation, but also from limits on harmony.

CC·EDGE constraints are only one class of CC·Limiter constraints; other CC·Limiter constraints impose limits on surface correspondence based on other factors. CC·SYLLADJ limits correspondence based on locality: it prohibits correspondence between non-adjacent syllables. CC·SROLE limits correspondence based on structural position: it penalizes correspondence between consonants with different syllable roles, e.g. between onsets & codas. CC·IDENT-[F] constraints limit correspondence based on featural agreement: constraints in this family assign violation when correspondents disagree on a specified feature. These other types of CC·Limiter constraints are also supported by evidence from both dissimilation and harmony.

1.3.2. Using one correspondence relation for both

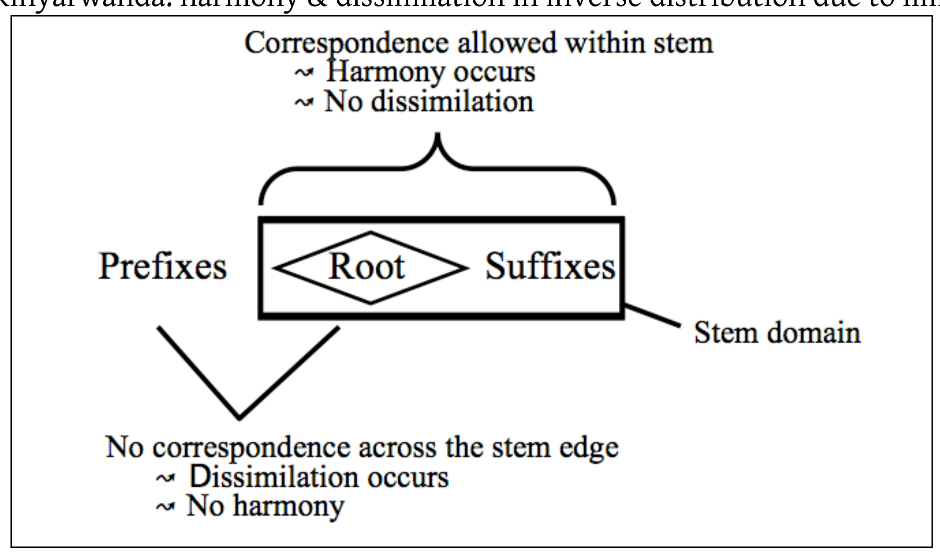
The theory of surface correspondence proposed in chapter 2 treats surface correspondence as a single correspondence relation, which partitions all of the consonants of surface forms into classes of correspondents. Each surface form therefore has one surface correspondence structure: segments either correspond, or they don't – the theory involves no notion of correspondence 'for' some feature. This one surface correspondence relation is the basis for both harmony and dissimilation.

A consequence of having just one correspondence relation is that constraints that limit correspondence can affect both dissimilation & harmony patterns, albeit in different ways. Limits on correspondence have a two-pronged effect: on the one hand, they favor dissimilation, and on the other hand they impede harmony. Dissimilar consonants satisfy correspondence constraints even when they aren't in correspondence, because correspondence is only mandated between similar consonants. In this sense, dissimilation can be said to optimize the non-correspondence of two consonants. Harmony, by contrast, can be said to optimize the correspondence between consonants. Harmonizing consonants are required to correspond because they are similar; they assimilate to avoid violating CC·IDENT constraints that require agreement only among correspondent consonants. Constraints that penalize correspondence therefore disfavor harmony, and also favor dissimilation.

This duality in the effects of the CC·Limiter constraints comes with a substantive implication for languages that have both harmony *and* dissimilation. Limits on correspondence can emerge in both processes, even if they don't involve the same segments. Different CORR constraints may impose different correspondence requirements, based on different features; as such, the segments that harmonize may not be the same set as the ones that dissimilate. But, even when this is the case, limits on correspondence can cut across the different correspondence requirements. CC·Limiter constraints assign violations for correspondence, period; it doesn't matter what feature(s) are the basis for that the correspondence requirement. Since harmony & dissimilation are both driven by correspondence, limits on correspondence itself can impact both. The prediction is that where correspondence is completely prohibited in a language, we should find that harmony does *not* occur, and that dissimilation *does* occur.

The cross-cutting of limits on correspondence is borne out in Kinyarwanda, as the analysis in chapter 3 will show. In Kinyarwanda, surface correspondence is prohibited across the edge of the stem domain, but allowed within the stem – the effect of the constraint CC·EDGE-(Stem). This limit on correspondence emerges in harmony as a bounding effect, and in dissimilation as a necessary condition. Kinyarwanda has sibilant retroflexion harmony, a type of agreement based on correspondence among sibilants. This harmony occurs within the stem domain, but never across the stem edge. Kinyarwanda also has a pattern of voiceless dissimilation known as Dahl's Law; in the surface correspondence theory of dissimilation, this arises because voiceless consonants are required to correspond. Dissimilation happens only across the stem, and not within it - it happens only where correspondence is prohibited. This inverse distribution is schematized in (13).

(13) Kinyarwanda: harmony & dissimilation in inverse distribution due to limits on corr.



So, where correspondence is allowed, we find harmony, but not dissimilation; where correspondence is forbidden, harmony doesn't occur, and dissimilation does. We also find the same inverse pattern in Sundanese, where harmony and dissimilation both involve the exact same segments. This pairing of effects is what follows from harmony & dissimilation being driven by the exact same correspondence relation: limiting correspondence itself both favors dissimilation *and* disfavors harmony.

1.4. Cross-linguistic implications & predictions

The surface correspondence theory of dissimilation (abbrv.'d 'SCTD') makes identifiable and investigable predictions about what kinds of dissimilation can and cannot occur. This follows from the set of CORR constraints that impose correspondence requirements. Under this theory, dissimilation is a reaction to a demand for correspondence. A pair of consonants can dissimilate only if they are required to correspond – that is, only if there is some CORR constraint that demands correspondence based on the feature(s) they share. Therefore, the theory predicts that the possible types of dissimilation are the same as the set of features that CORR constraints refer to.

The SCTD links dissimilation to another phenomenon, consonant harmony: the set of CORR constraints determines which features can dissimilate, and it also determines which classes of segments can engage in harmony. This property of the theory is beneficial: it means the SCTD makes predictions about the typology of dissimilation, that can be evaluated by looking at the typology of consonant harmony. This makes SCTD generate testable predictions that go beyond previous theories of dissimilation based on the Obligatory Contour Principle or comparable anti-similarity constraints.

Under the surface correspondence theory advanced here, the prediction is that the types of dissimilation that can occur should correlate with the types of consonants that harmonize. This is because the set of CORR constraints determines both of these typologies in tandem. We can therefore compare dissimilation & harmony, with the expectation[3] that the same set of CORR constraints will be evident in both. For example, if there is dissimilation for the feature [Labial], the SCTD predicts that there can also be consonant harmony that holds only among [Labial] consonants (producing agreement for some other feature) – both are effects of a CORR constraint that demands correspondence among labials. Chapter 9 takes up this test, using a survey of 148 dissimilation patterns – a sample much larger than those considered in previous work (cf. Bye 2011, Alderete & Frisch 2007, Suzuki 1998) – and comparing it to established typological findings on consonant harmony (Rose & Walker 2004, Hansson 2001/2010).

The SCTD also predicts parallels between harmony and dissimilation in terms of features, and structural factors: the CC·Limiter constraints that impose restrictions on correspondence should be evident in both harmony and dissimilation, just like the CORR constraints. The surface correspondence theory's predictions can also be compared to the obvious alternative – the ostensibly null hypothesis that if there a relationship between harmony and dissimilation, then it should be one of parallelism: the features which dissimilate and the features which harmonize should be the same. The surface

[3] I say 'expectation' because the space of observed linguistic patterns is not complete. All things being equal, all the CORR constraints should be evident from both harmony & dissimilation. However, we know that all things *aren't* equal: the set of languages we can look at isn't the set that actually exist, much less the set of languages that could exist.

correspondence theory predicts that they should *not* be the same: the features that dissimilate are parallel to the features that establish harmonizing classes, which are not the same as the features that agreement can be required on. So, if there is agreement for nasality, the SCTD does *not* predict that nasality should be a feature that dissimilates; instead, it predicts that the typologies of harmony and dissimilation are not related in this way. The same prediction holds for non-featural factors: if harmony can be domain-bounded, i.e. limited to hold only within a domain, then the SCTD predicts that dissimilation can hold only *across* the edge of that domain. These predictions appear to be reasonably accurate, as chapter 9 will show.

1.5. Structure & Scope of the dissertation

1.5.1. Structure

The first part of the dissertation, chapters 1-2, builds on earlier work by Walker (2000a, 2000b, 2001), Rose & Walker (2004), and Hansson (2001/2010, 2007) to develop the theory of surface correspondence, proposing novel formal definitions of this correspondence relation and the constraints that operate based on it. The Surface Correspondence theory advanced here makes specific cross-linguistic predictions not just about dissimilation, but also about the relationship between dissimilation and harmony.

In the second of the dissertation, chapters 3-6, I pursue the theory in the context of dissimilation and/or harmony systems in Kinyarwanda, Sundanese, Quechua, Obolo, Chol, and Ponapean. Examination of these cases show that some predictions of the surface correspondence theory are borne out. For example, in languages that exhibit both dissimilation and harmony, we find them intertwined as predicted, in languages like Kinyarwanda and Sundanese. These cases also provide evidence for a variety of CC·Limiter constraints, including CC·EDGE, CC·SYLLADJ, and CC·SROLE. The predictions of the fourth type of CC·Limiter constraint, CC·IDENT constraints, are not obviously borne out. These constraints produce dissimilation unless consonants agree; chapter 6 shows that patterns of this sort are attested in Chol & Ponapean, though such cases also submit to alternative analyses.

The third part of the dissertation, chapters 7-9, considers the surface correspondence theory in comparison with other theories of dissimilation based on the Obligatory Contour Principle (OCP) or other constraints that penalize similar consonants directly. The SCTD and the OCP have different consequences for the interpretation of dissimilation, for blocking effects, and for the empirical typology of the phenomenon. I show that in all of these areas, the surface correspondence theory actually seems more promising than the OCP. There are attested dissimilation patterns that are explained by the surface correspondence theory, and are not explained by OCP-based accounts: where the theories differ in their predictions, the OCP doesn't appear to be the better choice. I also show how the surface correspondence theory can be applied not just to dissimilation, but also to segmental blocking effects – where it also brings new insights to cases not explained by the OCP. Finally, chapter 9 considers the typology of dissimilation. Since dissimilation arises from the same surface correspondence relation as harmony, the theory developed here predicts that the typologies of consonant harmony & dissimilation are related in systematic ways. This parallelism seems to be a good prediction, based on data obtained from a new cross-linguistic survey of dissimilation patterns in over 140 languages.

1.5.2. Scope

The focus of this dissertation is long-distance dissimilatory interactions between consonants, and their relation to long-distance consonant agreement. The surface correspondence theory is founded on a correspondence relation between the *consonants* in a single surface form; it is therefore a theory of similarity-driven, consonant-to-consonant interactions. Vowel-to-vowel and vowel-to-consonant interactions are outside the scope of this work; previous work that observes numerous asymmetries that differentiate consonant harmony from vowel harmony, and vowel-consonant harmony.[4] Whether a related notion of surface correspondence could or should be extended to vowels, or to supra-segmental elements like tones, is not obvious; I leave this question for future research to pursue.

I will also limit the scope of the investigation to consonant dissimilation patterns that (i) operate over distance, not just between adjacent segments, and that (ii) are not gradient in nature. Adjacent segments are affected by a myriad of factors that don't apply to non-adjacent consonants; these include phonetic pressures like co-articulation with adjacent segments, as well as phonological factors like sonority sequencing in clusters. As such, long-distance dissimilation is a clearer picture of what's relevant for the theory of surface correspondence. Similarly, gradient similarity avoidance is a murky issue: gradient generalizations don't lead to a clear indication of

[4] For differences between consonant harmony and other kinds of agreement, see Rose & Walker (2004, 2011), Rose (2011a), and Hansson (2001/2010). The existence of true long-distance vowel dissimilation is questionable; see Suzuki (1998:204-206).

what the grammar of a language is doing. The co-occurrence of certain consonants may be statistically under-represented but still *attested*; in cases like these, it's not clear whether there's any actual dissimilation happening in the input-output mapping. Since it's not clear whether they're actually cases of dissimilation, it's not clear if these patterns are things that a theory of dissimilation must – or even should – explain, so I will not analyze them here. See chapter 9 for further discussion of these issues.

The rubric of dissimilation encompasses two kinds of patterns: 'active' dissimilation and static co-occurrence restrictions. In active dissimilation, similar consonants observably surface as less similar ones – there are visible alternations that show the dissimilation happening. In static dissimilation patterns, a dissimilatory mapping is inferred based on a gap: dissimilation is posited because (some) similar consonants do not co-occur, but there are no visible alternations that show the dissimilation in action. It is difficult to make a principled separation between these, as previous work has noted (Suzuki 1998, Bye 2011, among others; see also Shaw 1991, as well as Rose & Walker 2004, Hansson 2001/2010 on the same issue in harmony). A grammar that actively enforces dissimilation may or may not exhibit alternations; this depends largely on other factors, like whether the lexicon makes available combinable morphemes with the relevant segments. See chapter 9 for more detailed discussion.

Chapter 2
The Surface Correspondence Theory

2.1. Introduction

This chapter lays out the formal definition of the surface correspondence theory, and gives an overview of its consequences.

2.1.1. Surface Correspondence

The Surface Correspondence Theory of Dissimilation (SCTD) is based on the idea of *Surface Correspondence*. The basic notion is that a correspondence relation holds over the consonants in an output form, and it is the foundation of previous work on Agreement By Correspondence ('ABC') (Walker 2000a, 2000b, 2001; Rose & Walker 2004; Hansson 2001/2010, 2007).

The *Surface Correspondence Relation* is formalized here as an equivalence relation over the consonants in the output form of each candidate. Thus, Surface Correspondences are established in GEN. As part of each candidate –on par with its input-output correspondence relation, etc. – GEN supplies a *structure* of the surface correspondence relation: this structure indicates which of the output segments are 'in surface correspondence with' which other ones. The Surface Correspondence relation – as a mathematical equivalence relation – is transitive, symmetric, and reflexive. The structuring of the surface correspondence relation exhaustively partitions the set of output consonants into some number of *correspondence classes*. Each consonant is in correspondence with all of the consonants in the correspondence class that contains it.

The structure of the surface correspondence relation is significant because of CON. CON includes markedness constraints that assign violations based on the surface correspondence profile of a candidate. These constraints are of two types: CORR constraints, and CC·Limiter constraints. The CORR constraints assign violations for non-correspondence; they do the job of requiring correspondence, and they do so by penalizing non-correspondence between consonants which share some particular feature(s). The CC·Limiter constraints are 'correspondence-antagonists': they assign violations when there is correspondence between consonants that do not meet some further condition specified by the definition of the constraint. The CC·Limiter constraints counter-balance the CORR constraints, by imposing additional requirements on the surface correspondence structure of an output – requirements that may be incompatible with the correspondences demanded by the CORR constraints. This opposition is what makes the surface correspondence relation affect the input-output mapping: where surface correspondence is both required (by a CORR constraint) and prohibited (by a CC·Limiter constraint), the optimal solution may be to change the output consonants in order to achieve a better surface correspondence structure.

Different CC·Limiter constraints impose different requirements, and can therefore lead to different kinds of input-output disparities. Unlike the CORR constraints, the set of CC·Limiter constraints is heterogeneous: they are not a single family of constraints that share a common schema. For example, CC·IDENT constraints are Limiters that demand featural agreement between correspondents; these can lead to agreement (Walker 2000a, 2000b, 2001; Hansson 2001/2010; Rose & Walker 2004). CC·EDGE constraints are Limiters that forbid correspondence across the edge of some domain; they can have the effect of stopping an agreement by correspondence pattern, but not causing agreement to happen.

2.1.2. Limiting + Correspondence → Dissimilation

The most essential idea of the dissertation is that dissimilation arises from the theory of Surface Correspondence *because of constraints that penalize correspondence* - referred to collectively as 'CC·Limiter constraints'.

The CC·Limiter constraints produce dissimilation because Surface Correspondence is rooted in similarity. The only reason for having correspondence between two consonants is to avoid violating CORR constraints, and the CORR constraints assign violations only for non-correspondence between consonants that share some phonological feature(s). So, constraints that penalize correspondence can, by working in combination with the CORR constraints, penalize the co-occurrence of similar consonants. When a language both *requires correspondence* between consonants that share some feature (because of a CORR constraint), and also, *forbids correspondence* between those consonants (because of a CC·Limiter constraint), the combined result is a prohibition against the co-occurrence of consonants that share the feature in question. This is because having two of those consonants leads to a choice between two surface correspondence structures that are both unacceptable in the language.

One key aspect of why dissimilation falls out from this theory is that satisfying the CORR constraints does not entail correspondence between consonants. One of the foundational insights of the Agreement by Correspondence program is that correspondence is required among consonants that are similar in some respect – and that consonants which aren't similar in that respect aren't required to correspond.

Previous work (Walker 2000a, 2000b, 20001; Hansson 2001/2010; Rose & Walker 2004) uses this to explain the inertness of non-participating segments in consonant harmony: consonants that don't share the relevant feature(s) aren't subject to the relevant correspondence requirement, so they don't need to agree.

The theory advanced in this dissertation builds on this property of the CORR constraints to develop a theory of dissimilation. By dissimilating, a consonant escapes from a correspondence requirement; effectively, it becomes inert. A CORR constraint requires consonants to correspond only because they share some similar feature. If the consonants dissimilate – if they stop sharing that feature – then they are no longer required to correspond. And, if they are not in correspondence with each other, they do not incur violations of any CC·Limiter constraints. Thus, constraints that disfavor correspondence also favor dissimilation between them. Dissimilated consonants can satisfy CORR constraints in the same way that inert consonants do - they don't need to correspond because they aren't similar in the crucial respect.

2.1.3. Structure of this chapter

The chapter is organized in the following way. Section 2 presents the formal definition of the surface correspondence relation. Section 3 delimits the types of constraints that operate on this relation, and identifies the roles they play in a dissimilation system. Section 4 addresses how dissimilation emerges from the interaction of constraints that limit correspondence and those that require it, and considers some typological predictions (to be investigated in more depth in the context of the typological survey in chapter 9).

2.2. The Surface Correspondence Relation

2.2.1. Formal Definition of the SCorr Relation

As stated above, the Surface Correspondence relation is, formally, a mathematical equivalence relation: a relation which is *transitive*, *symmetric*, and *reflexive*. The SCorr relation holds over all of the consonants in the output portion of a candidate. What it does is partition the set of output consonants into some number of equivalence classes: non-overlapping, non-empty, subsets of the set of output consonants. Two consonants are in correspondence with each other if, and only if, the SCorr relation partitions them into the same equivalence class. In intuitive terms, then, the Surface Correspondence relation divides the surface consonants into groups, and 'establishes' correspondence among all the members of each group. These groups will be referred to as 'Correspondence Classes'.

2.2.2. The Space of Possible Correspondence Structures

When an output string contains multiple consonants, there are multiple possibilities for its surface correspondence structure. The number of possibilities depends on how many consonants there are in the output: there are as many possible structures of the surface correspondence relation as there are ways to partition the set of output consonants. The cardinality of this space of possibilities is finite and known: it is expressed by the Bell Numbers[1].

The table in (1) lists all possible correspondence structures for an illustratory output string [sampela]. The column on the left lists the output form. The middle

[1] I thank Bruce Tesar for pointing this out to me

[2] Even in this case, it is often possible to determine the correspondence structure by comparing sets of

column shows the structure of the Surface Correspondence Relation, i.e. the correspondence classes arising from each partition of the output consonants. Each correspondence class is shown as a set of consonants, and the classes are numbered according to the order of their leftmost member, and are arranged in that order. Correspondence classes are also redundantly marked by subscript indices on the output consonants, and groups of arrows on the same tier are added for visual emphasis of classes that contain multiple correspondents. The column on the right includes remarks about the characteristics or significance of each possibility.

The output string [sampela] has four consonants, and thus yields 15 possible partitions. They range from partitioning each consonant into its own correspondence class (a) (thereby having no correspondence among any consonants), to having all of the consonants in a single correspondence class, i.e. having correspondence among all of them (o). Between these two extremes are various other options. These include: having correspondence between two consonants but no correspondence between others (b-f); having two distinct and non-overlapping groups of correspondents (h-j); as well as having correspondence among more than two consonants (l-n). Each of these possibilities is a distinct candidate: all of them compete with each other, and the choice of which correspondence structure is optimal depends on the constraints in CON and their ranking.

(1) All possible surface correspondence structures for the output string [sampela]:

	Output portion of candidate	Correspondence Classes	Remarks
a.	s_1 a m_2 p_3 e l_4 a	{s}{m}{p}{l}	No corr. between any consonants; violates various Corr constraints; satisfies all CC·Limiter constraints
b.	↓ ↓ – – s_1 a m_1 p_2 e l_3 a	{s m}{p}{l}	Corr. between [s] & [m]; no corr. between other consonants; likely sub-optimal
c.	↓ – ↓ – s_1 a m_2 p_1 e l_3 a	{s p}{m}{l}	Corr. among the obstruents; no corr. among sonorants; satisfies Corr·[–sonorant], but not Corr·[+sonorant]
d.	↓ – – ↓ s_1 a m_2 p_3 e l_1 a	{s l}{m}{p}	Corr. among the coronals; no corr. among other consonants; satisfies Corr·[Coronal]
e.	– ↓ ↓ – s_1 a m_2 p_2 e l_3 a	{s}{m p}{l}	Corr. among the labials; satisfies Corr·[Labial]; violates CC·Ident-[nasal], CC·SRole (among others)
f.	– ↓ – ↓ s_1 a m_2 p_3 e l_2 a	{s}{m l}{p}	Corr. among the sonorants, but no corr. among obstruents; reverse of (c)
g.	– – ↓ ↓ s_1 a m_2 p_3 e l_3 a	{s}{m}{p l}	Corr. between [p] & [l]; no corr. between [s] & [m]; likely sub-optimal
h.	↓ ↓ – – s_1 a m_1 p_2 e l_2 a – – ↑ ↑	{s m}{p l}	Corr. between [s] & [m], and also between [p] & [l]; likely sub-optimal
i.	↓ – ↓ – s_1 a m_2 p_1 e l_2 a – ↑ – ↑	{s p}{m l}	Corr. among the obstruents, and among the sonorants; satisfies Corr·[+sonorant] and Corr·[–sonorant]
j.	↓ – – ↓ s_1 a m_2 p_2 e l_1 a – ↑ ↑ –	{s l}{m p}	Corr. among the labials, and among the coronals; satisfies both Corr·[Coronal] and Corr·[Labial]
k.	↓ ↓ ↓ – s_1 a m_1 p_1 e l_2 a	{s m p}{l}	Corr. among [s], [m], [p]; no corr. between [l] and other Cs; satisfies Corr·[–sonorant], Corr·[Labial]
l.	↓ ↓ – ↓ s_1 a m_1 p_2 e l_1 a	{s m l}{p}	Corr. among [s], [m], and [l]; no corr. between [p] and other consonants
m.	↓ – ↓ ↓ s_1 a m_2 p_1 e l_1 a	{s p l}{m}	Corr. among [s], [p], and [l]; no corr. between [m] and other consonants
n.	– ↓ ↓ ↓ s_1 a m_2 p_2 e l_2 a	{s}{m p l}	Corr. among [m], [p], and [l]; no corr. between [s] and other consonants
o.	↓ ↓ ↓ ↓ s_1 a m_1 p_1 e l_1 a	{s m p l}	All consonants correspond; violates no Corr constraints; violates many CC·Limiter constraints

These are all of the possible surface correspondence structures for the output form [sampela]. This is a complete list representing all candidates that have this output form; GEN produces all 15 of these possibilities, and no others. There is no structure for the Surface Correspondence relation that yields a pattern of correspondence other than those listed above.

Note that correspondence doesn't entail anything about phonological similarity; the connection between surface correspondence & similarity comes from the constraints, not the relation itself. This list of candidate exhausts the space of possibilities for partitioning the set of output consonants {s m p l}. This includes candidates like (g) & (h), where only the least similar consonants correspond – consonants don't have to share a feature to be partitioned into the same correspondence class. These are possible structures of the surface correspondence relation, and they reflect possible candidates. However, not all of these possible candidates are possible optima.

The table in (2) below lists some other conceivable patterns of surface correspondence that are impossible because they are not well-formed structures of the surface correspondence relation.

(2) Some *impossible* candidates, with ill-formed surface correspondences:

	Output	SCorr profile	Remarks
a.	↓ ↓ ↓ ↓ * s_1 a $\mathbf{m}_{1,2}$ $\mathbf{p}_{1,2}$ e $\mathbf{l}_1$ a – ↑ ↑ –	{s m p l}{m p}	Intent: All consonants in correspondence, but {m p} also in a second correspondence relationship. Impossible because SCorr is a single correspondence relation.
b.	↓ – ↓ * s_1 a $\mathbf{m}_2$ $\mathbf{p}_1$ e $\mathbf{l}_{ø}$ a – ↑ –	{s p}{m}	Intent: a three-way distinction: {s p} are in surface correspondence, [m] is 'in surface *non*-correspondence', and [l] is not represented in the correspondence structure at all. Impossible because SCorr is a relation over *all* of the output consonants.
c.	↓ – ↓ – * $\mathbf{s}_1$ a $\mathbf{m}_2$ $\mathbf{p}_{1,2}$ e $\mathbf{l}_3$ a – ↑ ↑ –	{s p}{m p}{l}	Intent: correspondence between [s] & [p] (the obstruents), and between [m] & [p] (the labials), but without correspondence between [s] & [m]. Impossible because SCorr is a transitive relation.
d.	↓ – ↓ – * $\mathbf{s}_{1,2}$ a $\mathbf{m}_3$ $\mathbf{p}_2$ e $\mathbf{l}_4$ a ↑ – – –	{s p}{s}{m}{l}	Intent: asymmetric correspondence, such that [p] is a correspondent of [s], but [s] is not a correspondent of [p]. Impossible because SCorr is a symmetric relation.
e.	↓ – ↓ – * $\mathbf{s}_{1,2}$ a $\mathbf{m}_3$ $\mathbf{p}_1$ e $\mathbf{l}_2$ a ↑ – – ↑	{s p}{s l}{m}	Intent: [s] corresponds with the other obstruent, [p]; and [s] also corresponds ,separately, with the other coronal, [l]. Impossible because SCorr is not relativized to specific features.

The structure in (2a) is invalid because there is only one surface correspondence relation. There is no way for this single relation to establish a second correspondence within a bigger correspondence class: this kind of nested correspondence structure is not a valid partition, since it entails that some consonants are in two distinct classes. Accordingly, the theory involves no notion of 'stronger correspondence' between some segments than others: consonants either correspond, or they don't.

The structure in (2b) is ill-formed because it is an invalid partition of the output consonants. The idea here is a three-way distinction: some consonants are in correspondence with each other, some are 'in correspondence with' themselves, and others are not 'in correspondence' at all. This is not possible because the surface correspondence relation inherently holds over all of the output consonants. It is possible to put a consonant in its own surface correspondence class, but not to leave it out of the correspondence structure entirely.

The structure in (2c) represents non-transitive correspondence: the obstruents [s] & [p] correspond with each other, and the labials [p] & [m] also correspond, but there is no correspondence between [s] & [m]. This is not possible because the surface correspondence relation is transitive. Accordingly, surface correspondence is not relativized to specific features. Consonants either correspond, or they don't. It is not possible to have 'obstruent correspondence' and 'labial correspondence'; the correspondence relation does not permit the notion of correspondence *for* some feature. The linkage between features and correspondence emerges because of how the CORR constraints are defined; no feature-sensitivity is built into the correspondence relation itself.

The structure in (2d) represents an asymmetric correspondence structure, something impossible to produce because the correspondence relation is transitive. The intent in this structure is that [p] is a correspondent of [s], but [s] is *not* a correspondent of [p]. This effect is impossible to obtain from an equivalence relation. If [s] & [p] are in the same correspondence class, then they correspond with each other; if they are in different classes, then they do not correspond – there is no third possibility in between these.

2.2.3. Space of relevant candidates, and possible optima

Surface Correspondences are not directly observed in the data; they are determined by applying the theory to it. When we observe any segmental output form with multiple consonants, there are multiple different correspondence structures it could possible have: various combinations surface consonants may correspond with each other, or they may not. But even though there are candidates that represent all possible partitions of the output consonants in a form, not all of them are possible optima. Large swaths of the candidate space are harmonically bounded; this is especially true of unfaithful candidates. Consequently, the correspondence structures of surface forms can usually be deduced from the correspondence-driven alternations they exhibit.

Let us consider, as an example, the interaction of just two consonants, based on one CORR constraint and one CC·Limiter constraint. This is shown in (3): the input here is /bap/ – a pair of labials that disagree in voicing; the two correspondence constraints are CORR·[Labial] and CC·IDENT-[voice], and the other two constraints are faithfulness for those same features. In this situation, there are at most four types of candidates that are relevant: faithfulness with correspondence (a), faithfulness with non-correspondence (b), unfaithfulness with correspondence – i.e. harmony (c), or unfaithfulness with non-correspondence – i.e. dissimilation (d). These four types of candidates are the only ones that can be optimal over the set of CORR, CC·Limiter, and faithfulness (IO·IDENT) constraints.

(3) Classification of the relevant types of candidates

	Input: /bap/	CC·IDENT -[voice]	CORR· [Labial]	IDENT- [voice]	IDENT- [Labial]	Candidate Remarks
✓ a.	b_1 a p_1, $\mathcal{R}$: {b p}	*				faith, corr.
✓ b.	b_1 a p_2 $\mathcal{R}$: {b}{p}		*			faith, non-corr.
✓ c.	b_1 a b_1 $\mathcal{R}$: {b b}			*		assim, corr.
✓ d.	b_1 a k_2 $\mathcal{R}$: {b}{k}				*	dissim, non-corr
☠ e.	b_1 a b_2 $\mathcal{R}$: {b}{b}		*	*		assim, non-corr
☠ f.	b_1 a k_1 $\mathcal{R}$: {b k}	*			*	dissim, corr

Other types of candidates do exist, but are not possible optima. This is because they combine one kind of correspondence structure with the type of unfaithful mapping to improve upon it. For instance, the candidate in (e) has assimilation between non-correspondents: this incurs the same faithfulness violation as harmony, as well as the same CORR violation as faithful non-correspondence. The spurious dissimilation candidate (f) is similarly doomed: it has the same disagreement problem as the faithful and correspondent candidate (a), plus the faithfulness violation of the dissimilating one (d). Any ranking of these four constraints will produce one of the candidates in (a)–(d) as optimal. No constraint favors dissimilation between correspondents, or agreement between non-correspondents, so these types of unfaithful candidates can never win. So, while there are many candidates that differ only in their surface correspondence structure, the majority of these are irrelevant for any given interaction.

This finding generalizes to longer forms as well. When more than two consonants are involved, the candidate set increases in size, but retains the same structure. The irrelevant types of candidates, like (3e) & (3f), remain harmonically bounded, regardless of how many of them there are. Unfaithful mappings are possible only when they offer some improvement of correspondence structure relative to the faithful candidates.

Because unfaithful candidates are viable only when combined with the right type of correspondence relationship, correspondence structure can largely be determined from alternations observed in the data. Dissimilation is based on non-correspondence, so anytime we observe a dissimilated form in the output, it follows that the dissimilating consonants do not correspond. In the same way, when one consonant assimilates to agree with another, it follows that they must correspond. The only situation where correspondence cannot be determined from the output is when an alternation *does not* happen – it's only the fully faithful candidates in (3) that present an ambiguity of interpretation.[2]

Note that the availability of these four classes of candidates depends on what constraints are being considered. They are classified in (12) according to improvement relative to correspondence-related constraints; however, not all constraints offer the same possibilities for improvement. For instance, CC·IDENT constraints are limiter constraints that require featural agreement; assimilation obviously offers a way to improve on these. For structural limiter constraints, the parallel of this is not obvious. For instance, the equivalent of harmony to satisfy CC·EDGE-(Root) would be assimilation for the property of 'being in the root'. This could be imagined as the expanding the morphological root, such that it includes consonants in the output that aren't part of it in the input (i.e. /sa-⟨$_{\text{ROOT}}$za⟩/ → ⟨$_{\text{ROOT}}$sa-za⟩). I assume that GEN doesn't make candidates with such willy-nilly adjustments to morphological affiliation. Therefore, only three types of candidates are relevant for CC·EDGE-(Root); there are no possible candidates that satisfy this CC·Limiter constraint by having correspondence and an unfaithful mapping.

[2] Even in this case, it is often possible to determine the correspondence structure by comparing sets of output forms. If there are alternations in one form, it says something about the ranking of constraints; this bears on other forms. So, ambiguity in the interpretation of one piece of data does not translate to ambiguity of the entire analysis. Even when we encounter output forms which are ambiguous between two (or more) correspondence structures, it is frequently the case that only one of those possibilities is compatible with the correspondence patterns observed elsewhere in the language. See ch. 4, §4.2.4 for further discussion of this issue.

2.2.4. Relation to previous formulations of correspondence

The idea of surface correspondence has precedents in other proposed types of correspondence, most significantly Base-Reduplicant correspondence of McCarthy & Prince (1995/1999).

The formalization I propose here for the surface correspondence relation defines it as a single equivalence relation, which has the properties of being symmetric, transitive, and reflexive. This differs from previous implementations of the surface correspondence notion; this comparison is illustrated in the table in (4).

(4) Comparison to previous formulations of surface correspondence

Formulation	Symmetric?	Transitive?	Reflexive?	One relation?
Walker (2000a)	Yes	?	No	?
Walker (2000b, 2001)	No?[3]	No	No	No
Hansson (2001/2010)	No	?	No	?
Rose & Walker (2004)	Yes	?	No?	Yes?
Current proposal	Yes	Yes	Yes	Yes

As the table shows, no previous formulation shares all the characteristics of the definition of surface correspondence proposed here. The basis for positing these properties is discussed below. Note that there is disagreement among previous proposals disagree on the issue of symmetry: Walker's (2000a) initial proposal implies a symmetric relation, but subsequent work (Walker 2000b, 2001; Hansson 2001/2010) explicitly posits a non-symmetric relation (and one that is either asymmetric or anti-

[3] In Walker (2000b), explicit templates are given for CORR and CC·IDENT constraints, but the properties of the surface correspondence relation are not spelled out independently. In my reading of the definition of CORR constraints, it suggests that while the constraints do *apply* asymmetrically the correspondence *relation* might be symmetric: CORR·$C_1 \longleftrightarrow C_2$ constraints require that '…C_1 and C_2 *are correspondents of one another*' (Walker 2001:77 & 2000:325, emphasis mine). The definitions of CC·IDENT ('IDENT-CC', for Walker) constraints, on the other hand, imply that the correspondence relation is not symmetric: the antecedent for the required agreement is 'a correspondence relation *from C1 to C2*' (Walker 2000b:325, emphasis mine). Walker (2001:78) words the definition slightly differently, but also implies that non-symmetric surface correspondence structures are well-formed. Based on this, I assume that the correspondence relation used in these papers is not assumed to be symmetric.

symmetric; it's not fully clear which). The motive for positing non-symmetric correspondence is to analyze directional asymmetries in harmony patterns as asymmetries in correspondence; see §2.2.3.4 for further discussion of this issue. Walker (2000b, 2001; see also Hansson 2007) also treats correspondence as a set of pairwise relations, determined independently for each pair of consonants; this entails non-transitivity, and implies the possibility of multiple relations.

2.2.3.1. A single correspondence relation

The formulation of surface correspondence proposed here has a number of properties that are desirable from the perspective of the analyst using the theory. In this model, there is just one correspondence relation – rather than a separate correspondence for each feature, for instance. Since there is only one correspondence relation, and only a finite number of ways to structure this relation, it follows that the space of correspondence possibilities is finite. Moreover, since the correspondence relation is symmetric and transitive, this space of possibilities is straightforward to calculate. For any given output form, containing a given number of consonants, there are only as many surface correspondence possibilities as there are ways to partition the output consonants into sets. Thus, the number of possible correspondence structures is a function of the number of consonants in a form. This relationship is given by the Bell numbers: the number of ways to partition a set of *n* elements is equal to the *n*th Bell number, calculated by the formula shown in (5).

(5) The Bell numbers (Wilf 1990:24)

$$b(n) = \sum_{k=0}^{n-1} \binom{n-1}{k} b(k) \qquad (n \geq 1; b(0) \quad 1)$$

Using this single-relation definition of the surface correspondence relation, the theory makes clear and specific predictions about the set of surface correspondence possibilities for an output form. An output with only one consonant has only one possible partition, and thus only one possible surface correspondence structure. An output with two consonants allows for two correspondence possibilities; three consonants allow for 5 possible structures, as noted in the table in (6).

(6) Number of possible correspondence structures, up to 5 consonants

Number of Cs in output	Number of SCorr possibilities
1	1
2	2
3	5
4	15
5	52

Defining surface correspondence as a single relation also derives the potential for cross-featural interactions. Since there is just one correspondence relation, each output form has exactly one correspondence structure. There are not different correspondences for different features, for instance; as such, interactions between different features are to be expected. Since all correspondence is necessarily handled by the same, one, correspondence relation, it follows automatically that a correspondence requirement based on one feature can spur interactions that affect another feature. No extra mechanisms are needed to tie different features together.[4]

It is important to note that a single correspondence relation can give rise to multiple correspondence-based patterns at the same time, in the same language. Since

[4] This contrasts with some autosegmental theories, in which different features are on different tiers, and cannot interact without some additional theoretical machinery to connect them together – like the AGREE[F,G] constraints of Jurgec (2010), for example.

the correspondence relation is an equivalence relation, it partitions the output consonants into correspondence classes. It is absolutely possible for multiple classes to each contain more than one consonant; this was seen in (2h-j) above, in fact. Having just one correspondence relation does *not* mean that only one class of segments can 'be in correspondence' (thereby leaving everything else as 'not in correspondence'). Rather, it means that each surface form has one, definitive, correspondence structure; if an output form manifests multiple correspondence-driven alternations at once, the bases for each of these alternations must all stem from the same correspondence structure.

The ability of a single correspondence relation to do multiple things at once is empirically significant for languages that exhibit more than one correspondence-based process. For instance, Misantla Totonac (MacKay 1999, Hansson 2001/2010) has two consonant harmonies: uvular harmony among dorsal consonants, and anteriority harmony among sibilants. These classes of segments don't overlap – sibilants are always coronal, not dorsal. As such, a given output form can always have all of its sibilants partitioned into one class, and all of its dorsals partitioned into another class, with no interaction between these classes. Having just one correspondence relation does allow for multiple correspondence classes, so the theory predicts that multiple distinct consonant harmony patterns can occur side-by-side in the same output form. The same is true for harmony and dissimilation. A relevant example is Kinyarwanda, analyzed in chapter 3, which has both sibilant harmony (for retroflexion) and voiceless dissimilation (among obstruents), both of which are explained using a single correspondence relation.

It is also worth noting that correspondence structures are determined on a form-by-form basis, in a token-by-token way. Surface correspondence is a relation over all the consonants in the same output form, not over all the output forms of a language. If [t] corresponds with [d] in one form, it does not entail that all [t]~[d] pairs have the same correspondence. Correspondence patterns are not fixed across the entire set of outputs of a language.

2.2.3.2. A transitive relation

The surface correspondence relation proposed here is a transitive relation, unlike some previous formulations. This difference is significant for the treatment of interactions among more than two consonants. Consonants are partitioned into correspondence classes, and all members of a class correspond with each other. Correspondence cannot be chosen independently for each pair of consonants: it is constrained by transitivity (and symmetry, for that matter). As such, correspondence between two consonants is never an 'indirect' relationship mediated by a third consonant. This contrasts with the idea that correspondence among groups of three or more consonants should be decomposed into chains of independent pairs, such that the consonants on each end of the group correspond 'via' the ones in the middle (Hansson 2007; see also Walker 2000b, 2001).

2.2.3.3. A reflexive relation

As a relation that partitions output consonants into classes – an equivalence relation – surface correspondence is a reflexive relation. Since each output consonant is partitioned into some correspondence class, and each consonant is in correspondence with all the members of its class, it follows naturally that each consonant is in correspondence with itself.

While reflexive self-correspondence is not fundamentally important to the theory, it does raise a point about how constraint definitions should be framed: they must be defined in terms of the correspondence properties of pairs of consonants. Since correspondence is a reflexive relation, all output consonants are necessarily in correspondence with with at least themselves. An output consonant can be the only member of its correspondence class, but it cannot be excluded from the correspondence relation. So, in the formulation of the correspondence relation advanced here, there is no meaningful distinction to be made between consonants that *are in correspondence* vs. consonants that *are* ***not*** *in correspondence*. A constraint that says 'assign a violation to any output consonant that is in a surface correspondence relation' will penalize *all* output consonants, regardless of the correspondence structure.[5] In order to be sensitive to correspondence relationships between different consonants, constraint definitions must be formulated in terms of pairs of output consonants.

2.2.3.4. Symmetry vs. Asymmetry

The surface correspondence relation proposed here is a symmetric relation: if X is a correspondent of Y, then Y is also a correspondent of X. This is different from some earlier proposals that treat surface correspondence as crucially *not* symmetric (Walker 2000b, 2001; Hansson 2001/2010). I posit symmetric correspondence because it produces a more restricted set of correspondence options. Arguments for asymmetric

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[5] cf. Walker's (2000a) 'BIJECTIVITY', and McCarthy's (2010) 'MAX-CC'; these constraints assign violations based on whether Cs 'are in surface correspondence' or not. This notion does not translate straightforwardly into correspondence class terms.

correspondence in previous work have focused on directional harmony: consonant harmony systems where assimilation happens in a strictly right-to-left (regressive) or left-to-right (progressive) manner. The intent in these approaches is to treat asymmetries in the direction of harmony as asymmetries in the direction of correspondence. However, upon closer scrutiny it can be seen that the direction of harmony does not follow from the direction of correspondence. Even if we adopt an asymmetric correspondence relation, directional harmony is still an unexplained issue.

2.2.3.4.1. Symmetric correspondence is simpler

I take symmetric correspondence to be the null hypothesis: it offers a smaller space of correspondence possibilities, and is therefore a simpler model, than an asymmetric correspondence relation. Admitting asymmetric correspondence structures substantially increases the number of possible correspondence structures that any given string of segments can have. This leads to a considerable enlarging of the candidate space. For example, a string of two consonants [X…Y] has two possible correspondence structures when correspondence is symmetrical: X & Y either correspond with each other, or they do not. If asymmetric correspondence is also possible, this candidate space doubles to four: not only can X & Y correspond with one another or not, but it is also possible for X to be a correspondent of Y (without Y also being a correspondent of X), and vice versa.

The increased size of the candidate set in an asymmetric makes doing an analysis considerably more complicated. Since surface correspondence structures are not overtly visible, the surface correspondence structure of output forms must be deduced on the basis of alternations. With symmetric correspondence, this is relatively straightforward: agreement entails correspondence, and dissimilation entails non-correspondence – under-determinacy is an issue only for pairs of consonants that *don't* alternate. But, when asymmetric correspondence is thrown into the mix, then dissimilation and agreement aren't enough to fully determine the correspondence structure: agreement entails correspondence from X to Y *or* from Y to X, *or* both – a 3-way choice instead of a one-way (non)-choice. The symmetric model of correspondence does not require us to keep track of these disjunctive possibilities in constructing analyses.

2.2.3.4.2. Asymmetric correspondence doesn't explain directionality

Since symmetric correspondence is the simpler theory, the burden of proof falls on the asymmetric alternative. The question is whether an asymmetric theory of correspondence offers a significant advantage over the symmetric model. I believe it does not.

The primary reason why Walker & Hansson treat correspondence as asymmetric is because they hope to derive directionality patterns in harmony from directionality in the correspondence relation. The idea is that if harmony happens strictly from right to left, it means the correspondence that it's based upon also works strictly from right to left. This interpretation requires that surface correspondence structures may be asymmetric. If there is correspondence strictly '*from* C2 *to* C1', it means that C1 is a correspondent of C2, but C2 is *not* a correspondent of C1. This is obviously not possible with symmetric correspondence (where correspondence from C2 to C1 entails that there is also correspondence from C1 to C2).

The problem with the asymmetric correspondence approach is that directionality imposed on the correspondence relation actually does not determine the direction of assimilation. If correspondence happens from right to left, it does not follow that harmony also happens from right to left. Asymmetric directional correspondence, upon careful scrutiny, can be seen to allow assimilation in either direction. Obtaining directional harmony requires redundantly imposing directionality on the CC·IDENT constraints, independently of how the correspondence relation is formalized. Thus, asymmetric correspondence is neither necessary nor sufficient to explain directional harmony.

To demonstrate this point, let us consider an asymmetric version of correspondence, represented by the constraint Corr'-T←D in (7), from Walker (2000b, 2001)[6]. This constraint says that if [t] precedes [d], then [t] is a correspondent of [d]; however, it does not require the [d] to also be a correspondent of the [t]. Thus, this constraint is asymmetric and directional in nature: it requires [t] to be a correspondent of [d] in the string [t...d], but not when they occur in the reverse order [d...t].

(7) **CORR'-T←D:** (adapted from Walker 2000b:325, Walker 2001:77-78)
'Given an output string of segments S, and consonants t∈ S and d∈ S, where d follows t in the sequence of segments in S, then a relation is established *from* d *to* t'
(≈ '[t] must correspond with a following [d], but not vice versa')

Because CORR'-T←D requires correspondence only from right to left, there is an expectation that it will produce strictly right to left harmony, but this is not the case. Requiring correspondence only from right to left, does not entail that agreement under

[6] I have changed the name of this constraint, but have stuck to Walker's definition as closely as possible

that correspondence is also from right to left. Instead, CORR'-T D is equally satisfied by harmony in either direction. Thus, /t…d/ can surface as *either* [t…t] or [d…d].

The tableau in (8) illustrates the problem. The two harmonizing candidates are shown in (a) & (b). These candidates both have asymmetric right-to-left correspondence – correspondence is *from* the second stop *to* the first one (the asymmetric correspondence proposed by Walker 2000b, Hansson 2001/2010), denoted by '>'. The candidates in (a) & (b) both also undergo voicing harmony; where they differ is in the direction of the assimilation. In (a), we have right to left assimilation: the /t/ on the left changes to match the /d/ that follows it. In (b), we have left to right assimilation: the /d/ on the right changes to match the /t/ that precedes it. CORR'-T D does not distinguish between these candidates: both of them have two correspondent stops, so both satisfy the correspondence requirement. Moreover, in both (a) & (b), the correspondent stops have the same voicing; they both also satisfy any requirement for voicing agreement among correspondents, i.e. CC·IDENT-[voice].

(8) Direction of assimilation does not follow from direction of asymmetrical SCorr

Input: t…d Output: t…t		Corr'-T D	CC·IDENT-[voice]	(IO)·IDENT [−voice]	(IO)·IDENT[+voice]	**Remarks**
☞ a.	**$t_1…t_2$** $\mathcal{R}$': (t_2>t_1)	**(0)**	**(0)**	(0)	(1)	R-to-L assim.
☛ b.	**$d_1…d_2$** $\mathcal{R}$': (d_2>d_1)	**(0)**	**(0)**	**W (0~1)**	**L (1~0)**	L-to-R assim.
~ c.	**$t_1…d_2$** $\mathcal{R}$': (d_2>t_1)		W (0~1)	e (0~0)		faithful d>t corr.
~ d.	**$t_1…d_2$** $\mathcal{R}$': Ø	W (0~1)			L (1~0)	faithful non-corr.

The result is that the surface correspondence constraints cannot make the choice between right-to-left harmony in (8a) and left-to-right harmony in (8b).

Instead, the determination of directionality falls to lower-ranked constraints. In the illustration in (7), this is represented by the ranking of faithfulness for voicing, IDENT-[+voice], vs. faithfulness for voicelessness, IDENT-[−voice].

The crucial point seen here is that directionality imposed on the CORR constraints – or the correspondence relation itself – does not equate to directionality in assimilation. Just because correspondence is allowed to be asymmetric does not mean that CC·IDENT constraints which enforce agreement are at all sensitive to this asymmetry. For example, Corr'-T D requires correspondence for /t...d/ but not for /d...t/; this can give rise to a system where voicing harmony is required for /t...d/, but not for /d...t/ sequences. But, as long as the harmony is enforced by constraints that demand agreement in the output, this asymmetric correspondence can still give rise to assimilation in either direction. If CC·IDENT-[voice] merely requires that correspondents have matching values of [±voice], then it is equally satisfied by two voiceless consonants (7a), or by two voiced ones (7b). Agreement between two consonants can always be obtained by changing either consonant to so that it matches the other.[7] So, building a directional asymmetry into the CORR constraints or the correspondence relation cannot produce directional harmony unless the CC·IDENT constraints are also modified to be sensitive to this asymmetry. If all that matters is

[7] This is an important difference between Input-Output (I-O) correspondence, and surface correspondence. When two segments are in I-O correspondence, one is necessarily in the input. Since competitions are always among candidates that have the same input, it follows that only the output end of the correspondence can be changed – the input is held constant. For instance, IO·IDENT constraints assign violations for input-output disparities. These violations can be averted by keeping the output the same as the input; it is not possible to satisfy an IO·IDENT constraint by modifying the output segment, and then 'changing one's mind' and adjusting the correspondent in the input to make the two match. By contrast, when two consonants are in surface correspondence with each other, both are in the output – they are not held constant across competing candidates, and therefore both consonants can be changed.

agreement, then a strictly right-to-left correspondence can still give rise to left-to-right harmony, as it does in (8).

There is also no straightforward modification to the CC·IDENT constraints that allows them to control the direction of assimilation. The candidates $[t_1 \ldots t_1]$ (8a) & $[d_1 \ldots d_1]$ (8b) have assimilation in opposite directions, but as we have previously noted, both of them result in voicing agreement. Consequently, any constraint that is satisfied by voicing agreement among correspondents is necessarily satisfied by both directions of assimilation. A corollary of this is that directional agreement constraints, such as Rose & Walker's (2004:508) IDENT-C_LC_R(F), also lead to directionality only in the 'triggering' of agreement; they do not control the direction of assimilation. IDENT-C_LC_R(voice) is satisfied by both $[t_1 \ldots t_1]$ (7a) and $[d_1 \ldots d_1]$ (8b). Assimilating in either direction can produce agreement among correspondents, and that agreement necessarily satisfies any constraint that just requires correspondents to agree. Modifying CC·IDENT constraints so that they require agreement for only some inputs – e.g. for /t…d/ but not /d…t/ – does not entail anything about the direction of the assimilation which achieves the agreement.

What makes directional harmony problematic to explain with directionally asymmetric correspondence is that the direction of assimilation is a matter of the input-output mapping, not the output alone. The crucial difference between $[t_1 \ldots t_1]$ (8a) & $[d_1 \ldots d_1]$ (8b) is in *how* the voicing agreement is achieved, i.e. which consonant is unfaithfully mapped. The only way a CC·IDENT constraint can favor harmony in one direction and not the other is if it presupposes faithfulness: it would need to say 'if consonants C1 & C2 correspond, *and if C2 is faithful for voicing*, then C1 and C2 agree in voicing'.[8] Framing the agreement constrains in this way moots the issue of symmetry in the correspondence relation. If the directionality of assimilation is stipulated in the CC·IDENT constraints, then it doesn't need to be redundantly built into the correspondence relation.

The conclusion, then, is that directional harmony offers no sound basis for treating the surface correspondence relation as asymmetric rather than symmetric. Directional asymmetries in the correspondence relation do not equate to directional asymmetries in harmony. Whether correspondence is symmetric or not, the direction of assimilation – or in dissimilation, for that matter – depends on other factors; directionality is an unresolved issue either way. See §2.3.3.6 for further discussion of how directional systems can be approached using the symmetric correspondence model I propose.

2.2.3.4.3. Empirical evidence that surface correspondence is symmetric

There is also empirical evidence that supports treating surface correspondence as a symmetric relation: some languages have harmony with flexible directionality.

If the correspondence relation is not symmetric, and correspondence requirements are imposed asymmetrically (as suggested by Hansson 2001/2010, and Walker 2000b, 2001), the asymmetry that results is that segments will interact when they are in one order, but not in the other order. For instance, the asymmetric

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[8] Hansson (2001/2010) does this with targeted constraints (Wilson 2000), which do not assign countable violations. A conceivable – though extraordinarily stipulative – alternative would be a constraint that penalizes voicing disagreement *and* also penalizes deviation from underlying voicing values. The result is a markedness constraint that assigns violations depending on the input, and therefore has inconsistent preferences about output forms; it's ostensibly a rule of assimilation, written up in the guise of a ranked constraint. Defining constraints in this way is a major departure from the basic logic of constraint interactions in Optimality Theory, and it is antithetical to the notion that surface correspondence is a relation between *surface* consonants.

constraint Corr'-T D (from (7) above) requires correspondence from a [d] to a preceding [t]; as such, it demands correspondence for [t...d] sequences, but not [d...t] ones, where the [t] does not precede the [d]. The effect of asymmetric correspondence is asymmetries in which inputs 'trigger' harmony, as noted above.

While imposing directional asymmetries on the 'triggering' of correspondence do not force assimilation to have the same directionality, there is an accompanying prediction: the direction of assimilation is yoked together with the output feature. The tableau in (8) above demonstrates that right-to-left correspondence can give rise to left-to-right assimilation; however, this happens only because of a value-dominance effect (Baković 2000). The relative ranking of the faithfulness constraints, IDENT-[–voice] » IDENT-[+voice], dictates that agreement must be obtained by changing voiced consonants to match their voiceless correspondents; this is what causes /t...d/ to surface as [t_1...t_1] rather than [d_1...d_1]. So, the asymmetric correspondence constraint Corr'-T D can give rise to either right-to-left assimilation for [+voice], or left-to-right assimilation for [–voice]. But, because it does not require correspondence in [d...t] sequences, Corr'-T D *cannot* produce left-to-right assimilation for [+voice] (/d...t/ → [d_1...d_1]), nor right-to-left assimilation for [–voice] (/d...t/ → [t_1...t_1]).

So, asymmetric correspondence requirements tie the direction of assimilation to the value of the agreement feature found in the output. This means that assimilation in different directions must converge on different values of a feature. Similarly, unidirectional assimilation cannot yield agreement for both values of a feature. The direction of assimilation is fixed relative to the output feature, and vice versa.

Under a symmetric surface correspondence relation, by contrast, it is possible to derive dominance reversal effects: a harmony system can have one value as dominant in the default case, but switch to the other value under some circumstances. An example of this is nasal harmony in Tiene (discussed by Hansson 2001:118-120; see also Hyman 2006, Hyman & Inkelas 1997/1999, Ellington 1977). Nasal harmony in Tiene produces nasality agreement, but the result can be either two nasals or two non-nasals – the outcome depends on the segments involved. The pattern is illustrated by the examples in (9). An infixed /l/ will surface as [n] in the context of a following, root-final, nasal; thus, /l…m/ surfaces as [n…m], with right-to-left harmony to [+nasal] (9a). However, a suffixal /k/ also harmonizes to [ŋ] in the context of a preceding root-final nasal; in (9b), we see /ɲ…k/ surfacing as [ɲ…ŋ]. In this case, the same agreement for [+nasal] operates from left to right. Moreover, an infixed /s/ will not nasalize, and instead induces *denasalization* of a stem-final /m/ to [b]. Thus, in (8c), /s…m/ surfaces as [s…b], with left-to-right harmony to [–nasal].

(9) Tiene: dominance reversal in nasal harmony (Ellington 1977)

a. Right-to-left nasal harmony in applicative infix: /l...N/ → [n...N]

	dum-a	‘run fast’	⟨du=ne=m⟩-ɛ	‘run fast for’
cf.	jók-a	‘hear’	⟨jó=le=k⟩-ɛ	‘listen to’

b. Left-to-right nasal harmony in stative suffix: /N...k/ → [N...ŋ]

	vwuɲ-a	‘mix’	⟨vwuɲ-eŋ⟩-ɛ	‘be mixed’
cf.	ból-a	‘break’	⟨ból-ek⟩-ɛ	‘be broken’

c. Left-to-right *de*nasal harmony in causative infix: /s...N/ → [s...B]

	tóm-a	‘send’	⟨tó=se=b⟩-ɛ	‘cause to send’
cf.	lab-a	‘walk’	⟨la=sa=b⟩-a	‘cause to walk’

Here, the interacting segments each correspond with one another, and they end up agreeing one way (by nasalization of one C) or another (by denasalization of the other C). This result is expected if correspondence is symmetric, but not if it’s asymmetric.

Similar effects are found in dissimilation as well. An example is Takelma (Goodman 1992, Sapir 1912). Sonorants in Takelma exhibit dissimilation for nasality and coronality, but the direction of this dissimilation depends on the quality of the segments involved. This is illustrated in (10). The alternations are observed in a suffix /-Vn/ (10a), a ‘noun characteristic’ suffix found in locatives and before pronominal suffixes. The /n/ of this suffix undergoes coronal dissimilation following roots with an /l/ (10b), and undergoes nasal dissimilation following roots with /m/ (10c). After roots containing another /n/, the /n...n/ sequences surfaces as [l...m] (10d): both /n/s dissimilate - one for coronality, the other for nasality.

(10) Takelma: dissimilation with flexible directionality (Goodman 1992; Sapir 1912)

a. 'Noun characteristic' suffix is /-Vn/

/pep + Vn/	→ [pep-en]	'rushes'
/xt + Vn/	→ [xt-an]	'eel'

b. Left-to-right coronal dissimilation: /l...n/ → [l...m]

/hel + Vn/	→ [hel-am]	'board'
/lapʰ + Vn/	→ [lapʰ-am]	'frog'

c. Left-to-right nasal dissimilation: /m...n/ → [m...l]

/tʃam + Vn/	→ [tʃam-al]	'mouse'
/meh + Vn/	→ [meh-el]	'basket for cooking'

d. Bidirectional nasal & coronal dissimilation: /n...n/ → [l...m]

/xan + Vn/	→ [xal-am]	'urine'	*xa**n**-al, *xa**n**-am
/kʷan + Vn/	→ [kʷal-am]	'road'	

The 'Newtonian' pattern of bi-directional assimilation seen in (10d) seems at odds with the idea that correspondence holds asymmetrically, *from* the /n/ on the right *to* the /n/ on the left (per Hansson 2001/2010 and Walker 2000b, 2001). By contrast, the dissimilation we observe in (10d) is perfectly consistent with symmetric correspondence. Both /n/s are required to correspond with each other, so both can be changed to avoid this correspondence.

2.3. Surface Correspondence & CON

There are two essential kinds of correspondence-related constraints: CORR constraints, and CC·Limiter constraints. Both of these are specific classes of markedness constraints (rather than faithfulness): they assess only output forms, and are ignorant of input forms and of the input-output correspondence relationship.

As noted above, the constraints that refer to the structure of the surface correspondence relation assess violations by counting distinct pairs of surface consonants. The CORR constraints assess violations by counting pairs of segments that share features, and the CC·Limiter constraints assess violations by counting pairs of segments in the same correspondence class. Note that it is the constraints on surface correspondence that work in terms of independently-chosen pairs of consonants; the surface correspondence relation itself is restricted by transitivity and symmetry.

2.3.1. Section summary

The types of constraints that refer to surface correspondence are summarized in the table in (11). They break down into two essential categories: the CORR constraints, which assign violations for *non*-correspondence between consonants that share features (and are in the same domain of scope); and the CC·Limiter constraints, which assign violations to pairs of correspondents that do not meet certain conditions.

(11) Summary of Constraint types:

Constraint	*Informal description*	*Notable effects in dissimilation*	*Notable effects in harmony*
CORR Constraints			
CORR-D·[αF] CORR-CVC·[αF] CORR-Root·[αF] CORR-Stem·[αF] CORR-Word·[αF]	Demand surface correspondence, within a domain, based on shared features	Determine which feature(s) must dissimilate	Define preconditions: which class of consonants agree
CC·Limiter constraints			
CC·EDGE-(Dom) CC·EDGE-(Stem) CC·EDGE-(Root) CC·EDGE-(σ)	Prohibit correspondence across domain edges	Favor dissimilation across domain edges (but not inside the domain)	Domain bounding: harmony stops at domain edges
CC·SYLLADJ	Prohibits correspondence that skips over an inert intervening syllable	Favors dissimilation when Cs are in non-adjacent syllables	Restricts locality: harmony with one-syllable distance limit
CC·SROLE	Require correspondents to have matching syllable roles	Favors dissimilation between onsets & codas (but not for two onsets)	Coda inertness: prevents onsets from agreeing with codas
CC·IDENT-[F] CC·IDENT-Pos-[F]	Require featural agreement among correspondents	Favor dissimilation contingent on *dis*agreement (only non-identical Cs dissimilate)	Cause correspondents to assimilate (can also limit harmony)

The CORR constraints are all based on a single consistent schema; they are presented in more detail in §2.3.2. The CC·Limiter constraints are a more diverse class; they are presented in §2.3.3.

2.3.2. The CORR constraints - what they are

The CORR constraints demand surface correspondence between consonants. They assign violations when pairs of consonants share some particular feature(s), but do not correspond with each other; thus, they effectively penalize non-correspondent forms, in favor of alternatives where one correspondence class includes more output consonants.

The schema for defining Corr constraints is given in (12). By this schema, a Corr constraint takes two arguments: a domain, 'D', which defines its scope, and a set of feature specifications, '[αF]', that it 'targets'. Any given constraint in the Corr family assigns violations when two consonants share the feature(s) it targets, and occur in the same instance of its domain of scope. In other words, each constraint requires correspondence among all segments with the specification [αF] that co-occur in the same domain D.

(12) Corr-D·[αF]: 'if two [αF] consonants are in the same D, they must correspond'
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y both have the feature specification [αF], *and*
b. X & Y are both in the same domain D, *and*
c. X & Y are not in the same surface correspondence class
...where D is a morphological or phonological domain, and where [αF] is a set of feature specifications

Corr constraints built from the schema in (12) demand correspondence on the basis of *shared feature specifications.* Constraints may refer to a single feature specification, or to a combination of multiple feature specifications. The reference to shared features is a point of difference from some previous proposals where the Corr constraints are defined to pick out similar consonants in other ways (cf. Hansson 2001/2010; Walker 2000a, 2000b, 2001); see discussion in §2.3.2.3.1 below.

Each constraint also has a specified *domain of scope*. Each constraint requires correspondence between consonants that share some feature(s), *and that occur in the same domain.* The inventory of domains of scope assumed for the Corr constraints is listed in (13). The list includes morphological domains, like the root, stem, and word. It also includes a phonological domain, the CVC configuration. The CVC domain is taken to be two consonants separated by a single vowel, but not more than one (see §2.3.2.2 for more details about how this domain is interpreted and why)[9].

(13) Inventory of scope domains posited for CORR constraints

Morphological	Root
	Stem
	Word
Phonological	CVC configuration (≈ adjacent syllables)

These are the domains that are well-supported on the basis of the central analyses presented in this dissertation. This list of domains is not *in principle* an exhaustive one: it is possible that other cases of dissimilation might support adding additional domains to the list. But, these are the only domains that I consider to be empirically warranted.

2.3.2.1. The CORR constraints illustrated

Four examples of specific CORR constraints, drawn from the analysis of Kinyarwanda in chapter 3, are given in (14)–(17) below. Each constraint is built according to the template in (12); they differ from one another in the feature specifications they target, and/or in their domains of scope. The first two constraints, (14) & (15), both target sibilants; the last two, (16) & (17), target voiceless consonants instead. Similarly, the constraints in (14) & (16) have the stem domain as their domain of scope, while (15) & (17) have the CVC configuration as their domain of scope.

[9] The CVC configuration is a non-standard domain, but is well precedented. It is akin to Odden's (1994) 'Syllable adjacency', as well as the notion of 'transvocalic' consonants of Hansson (2001/2010). See also Rose (2000a) on the CVC sequence as a domain of adjacency.

(14) Corr-Stem·[+sibilant]: ‘if sibilants are in the same stem, they correspond’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [+sibilant]
b. X and Y are both members of the same stem
c. X & Y are not in the same surface correspondence class

(15) Corr-cvc·[+sibilant]: ‘if sibilants are in a CVC configuration, they correspond’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [+sibilant]
b. X and Y are in the configuration ...CVC...
c. X & Y are not in the same surface correspondence class

(16) Corr-Stem·[−voice]: ‘if voiceless Cs are in the same stem, they correspond’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [−voice]
b. X and Y are both members of the same stem
c. X & Y are not in the same surface correspondence class

(17) Corr-cvc·[−voice]: ‘if voiceless Cs are in a CVC configuration, they correspond’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [−voice]
b. X and Y are in the configuration ...CVC...
c. X & Y are not in the same surface correspondence class

Thus, the constraint Corr-Stem·[+sibilant] in (14) assigns a violation for any pair of sibilant consonants, found in the same stem, that do not correspond with each other. This is shown in the violation chart in (18). The constraint Corr-cvc·[−voice] in (17), by contrast, assigns a violation when a CVC configuration contains non-correspondent voiceless consonants (instead of non-correspondent sibilants). This is illustrated in the violation chart in (19).

It is crucial to note that satisfying a Corr constraint does not entail having correspondence between consonants. The candidate in (18b) illustrates this: it has a sibilant [z] that doesn’t correspond with the other sibilants [ʂ ʐ], yet it incurs no violations of Corr-Stem·[+sibilant] because the non-correspondent [z] is outside the stem domain. The fact that Corr constraints can be satisfied by non-corresponding consonants is hugely important for using the surface correspondence theory to explain dissimilation.

(18) Corr-Stem·[+sibilant] assigns violations only for non-correspondence between sibilants within the same stem (NB: ⟨ ⟩ marks stem domain)

	Output Candidate, SCorr classes	Corr-Stem·[+sibilant]	Remarks
(a)	**z**$_1$ i.⟨ **ʂ**$_2$ a. **ʐ**$_3$ e ⟩, Scorr$\mathcal{R}$: {z}{ʂ}{ʐ}	1	one violation for (s,ʐ); none for (z,s) or (z,ʐ), since [z] isn't in the stem
(b)	**z**$_1$ i.⟨ **ʂ**$_1$ a. **ʐ**$_2$ e ⟩, Scorr$\mathcal{R}$: {z ʂ}{ʐ}	1	one violation for (ʂ,ʐ)
(c)	**z**$_1$ i.⟨ **ʂ**$_2$ a. **ʐ**$_1$ e ⟩, Scorr$\mathcal{R}$: {z ʐ}{ʂ}	1	one violation for (ʂ,ʐ)
(d)	**z**$_1$ i.⟨ **ʂ**$_2$ a. **ʐ**$_2$ e ⟩, Scorr$\mathcal{R}$: {z}{ʂ ʐ}	0	no violations, since all the sibilants in the stem correspond
(e)	**z**$_1$ i.⟨ **ʂ**$_1$ a. **ʐ**$_1$ e ⟩, Scorr$\mathcal{R}$: {z ʂ ʐ}	0	no violations, since all the sibilants in the stem correspond

(19) Corr-cvc·[−voice] assigns violations only for non-corresponding voiceless consonants within the same CVC sequence

	Output Candidate, SCorr classes	Corr-cvc·[−voice]	Remarks
(a)	**t**$_1$ u. **k**$_2$ i. **s**$_3$ o. m$_4$ a, Scorr$\mathcal{R}$: **{t}{k}{s}**{m}	2	violations for (t,k), (k,s); none for (t,s), since [t] & [s] not in a CVC configuration
(b)	**t**$_1$ u. **k**$_2$ i. **s**$_2$ o. m$_3$ a, Scorr$\mathcal{R}$: **{t}{k s}**{m}	1	one violation for (t,k)
(c)	**t**$_1$ u. **k**$_1$ i. **s**$_2$ o. m$_3$ a, Scorr$\mathcal{R}$: **{t k}{s}**{m}	1	one violation for (k,s)
(d)	**t**$_1$ u. **k**$_2$ i. **s**$_1$ o. m$_3$ a, Scorr$\mathcal{R}$: **{t s}{k}**{m}	2	violations for (t,k) and (k,s)
(e)	**t**$_1$ u. **k**$_1$ i. **s**$_1$ o. m$_3$ a, Scorr$\mathcal{R}$: **{t k s}**{m}	0	voiceless Cs correspond; no violations

Different Corr constraints can disagree with each other, favoring different surface correspondence structures. The Corr constraints blindly evaluate the surface correspondence structure of each candidate by assessing the surface consonants one pair at a time. Violations of one CORR constraint do not depend on violations of other CORR constraints; this is because correspondence isn't 'created *by*' the CORR constraints, it simply is a property of each candidate. Thus, it's possible – and typical – for a candidate to satisfy some CORR constraints while violating others. This can be seen in the violation chart in (20), which shows all four of the CORR constraints (14)–(17) together, evaluating the same candidates.

(20) Interaction of CORR constraints with different domains and features

Candidates: Output form, SCorr structure		CORR-CVC·[+sibilant]	CORR-Stem·[+sibilant]	CORR-CVC·[−voice]	CORR-Stem·[−voice]	Remarks
(a)	t$_1$uk$_2$i⟨s$_3$am$_4$iʐ$_5$e⟩, $\mathcal{R}$: {t}{k}{s}{m}{ʐ}		* (s~ʐ)	** (t~k) (k~s)		Non-correspondence can violate multiple CORR constraints at once
(b)	t$_1$uk$_1$i⟨s$_1$am$_2$iʐ$_3$e⟩, $\mathcal{R}$: {t k s}{m}{ʐ}		* (s~ʐ)	✓		Corr. among [−voice] Cs doesn't affect CORR·[+sibilant] violations
(c)	t$_1$uk$_1$i⟨s$_2$am$_3$iʐ$_2$e⟩, $\mathcal{R}$: {t k}{s ʐ}{m}		✓	* (k~s)		'non-local' correspondence (in the stem) required by CORR-Stem·[+sibilant], but not by CORR-CVC·[+sibilant]
(d)	t$_1$uk$_1$i⟨s$_2$am$_3$iʐ$_4$e⟩, $\mathcal{R}$: {t k}{s}{m}{ʐ}		* (s~ʐ)	* (k~s)		CORR-CVC·[−voice] assesses violations regardless of the stem edge; it's not violated by (t~s) because they aren't in the same CVC configuration
(e)	t$_1$uk$_2$i⟨s$_2$am$_3$iʐ$_4$e⟩, $\mathcal{R}$: {t}{k s}{m}{ʐ}		* (s~ʐ)	* (t~k)		
(f)	t$_1$um$_2$i⟨s$_3$aʐ$_4$ik$_5$e⟩, $\mathcal{R}$: {t}{m}{s}{ʐ}{k}	* (s~ʐ)	* (s~ʐ)	✓	* (s~k)	CORR-CVC·[−voice] satisfied because no pairs of voiceless Cs are in the same CVC configuration
(g)	t$_1$u⟨s$_1$ak$_2$iʐ$_3$e⟩, $\mathcal{R}$: {t s}{k}{ʐ}		* (s~ʐ)	* (s~k)		Domains matter, but relative order of segments is irrelevant. CORR-CVC·[αF] constraints only care about pairs of Cs in a CVC configuration, and CORR-Stem·[αF] constraints only care about pairs of Cs in the stem
(h)	k$_1$u⟨s$_2$at$_2$iʐe⟩, $\mathcal{R}$: {k}{s t}{ʐ}		* (s~ʐ)	* (k~s)		
(i)	ʐ$_1$u⟨s$_2$at$_2$ik$_3$e⟩, $\mathcal{R}$: {ʐ}{s t}{k}	* (ʐ~s)	✓	* (t~k)	** (s~k) (t~k)	
(j)	t$_1$uk$_1$i⟨s$_1$am$_2$iʐ$_1$e⟩, $\mathcal{R}$: {t k s ʐ}{m}		✓	✓		Interaction of CORR constraints can favor extra corr. by transitivity (NB: no constraint demands [k]~[ʐ] corr.)

(NB: ⟨ ⟩ mark stem boundaries; syllable edges not shown; all syllables CV in shape) (checkmarks used to emphasize lack of violations; pairs of Cs are focus of violations)

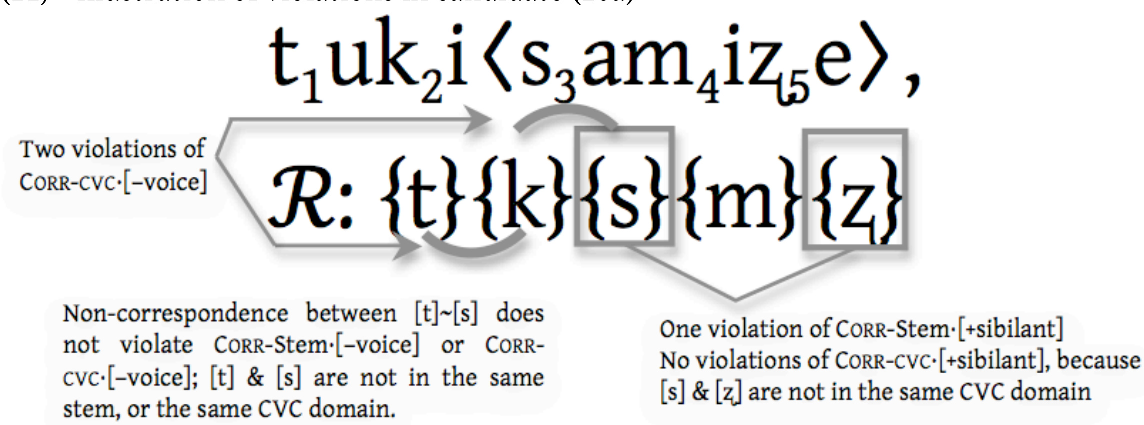
Since the CORR constraints may apply over either a phonological or morphological domain, the domain of scope of two CORR constraints is not necessarily in a subset/superset relation.[10] For instance, Corr-Stem·[+sibilant] assigns violations for non-pairs of corresponding sibilants in the same stem domain. Offending pairs may

[10] This is a significant difference from theories where domains are strictly hierarchical, e.g. the proximity scales of Suzuki (1998) and Hansson (2001/2010).

consist of two sibilants in non-adjacent syllables (as in 20b, e.g.), or they could be two sibilants that also happen to be in a CVC configuration, and that also violate Corr-cvc·[+sibilant] (as in (20f) above). Similarly, Corr-cvc·[−voice] requires correspondence between voiceless consonants in CVC configurations, whether they are outside the stem (as in (20c)), or straddle the stem edge (as in (20d)), or are both inside the stem (as in (20g)).

It is also possible for one consonant to be faced with two distinct correspondence demands, based on different features. This is the case for the stem-initial [s] in candidate (20a), for instance, as illustrated in detail (21) below. This [s] is in a CVC configuration with the preceding [k]; by not corresponding with each other, the pair violates Corr-cvc·[−voice]. The [s] is also in the same stem as [z̦], another sibilant; non-correspondence between this pair violates Corr-Stem·[+sibilant] (though not Corr-cvc·[+sibilant]). In situations like this, each Corr constraint assesses violations based on the correspondence structure of each candidate, and it is the ranking of the constraints that determines the optimal surface form, and the optimal correspondence structure that goes with it.

(21) Illustration of violations in candidate (20a)



The CORR constraint definitions do not demand exclusivity of correspondence. CORR constraints assign violations for non-correspondence between consonants that share some feature. They do not assign violations for additional correspondences among other consonants that lack their targeted feature set, nor do they penalize extra correspondence beyond the minimum they prescribe. Thus, multiple correspondence requirements are not contradictory, and are not inherently incompatible. This is seen in (19j) above: partitioning all of the sibilants *and* all of the voiceless consonants into a single correspondence class satisfies all CORR constraints that target [–voice] and all those that target [+sibilant]. CORR-CVC·[–voice] demands correspondence between voiceless consonants in CVC configurations, but it doesn't require that *only* the voiceless consonants correspond with each other. As long as each pair of voiceless consonants that are in the same CVC configuration are in the same correspondence class, this constraint doesn't care what else might be in that class. So, it doesn't assign violations for including the voiced [z̧] in the correspondence class with voiceless [t]; nor does CORR-Stem·[+sibilant] assign violations for the non-sibilant [t] corresponding with the sibilant [s].

2.3.2.2. About the CVC configuration as a domain of scope for CORR

One of the inventory of domains of scope for CORR constraints is the CVC configuration. This domain reflects a compromise between syllable-adjacency, and literal CVC sequences. Both of these are precedented in previous work as domains of consonant-to-consonant interaction (see, among others, Odden 1994, Suzuki 1998, Gafos 1999, Rose 2000a). However, neither one is sufficient for all cases of dissimilation or harmony. In some languages, dissimilation happens exclusively in CVC sequences, regardless of their syllabification; in others, dissimilation is observed for consonants that are in adjacent syllables, but are not in strict CVC sequences. Yet, at the same time, there isn't sufficient evidence to justify separating syllable-adjacency and CVC sequences as two distinct domains of scope. As Hansson (2010:175-176) points out, discerning between syllable adjacency and CVC sequences may be hard or even impossible, given language-specific limits on which consonants may occur in codas, and what kinds of clusters are permissible.

So, in the absence of good evidence that syllable-adjacency and the CVC sequence are crucially different domains of correspondence, I conflate them under the heading of the CVC domain. I take this domain to be defined as two consonants separated by one vowel, but not by two vowels. This is in line with Hansson's (2001/2010) notion of 'transvocalic' consonants: it is the minimal long-distance configuration, the closest two consonants can be while still being separated by a non-consonantal element (i.e. a vowel).

There is also evidence that the precise definition of the CVC domain varies cross-linguistically: languages differ in terms of what sort of neutral elements may intervene between two consonants that behave like members of the same CVC domain. For example, in some languages dissimilation happens across a short vowel but not a long one; in others, consonants in adjacent syllables may dissimilate even when another consonant intervenes between them. The table in (22) gives some illustration of this range of variation in how the CVC domain is characterized.

(22) Summary of dissimilation cases where CVC domain is not strictly a CVC sequence

CVC domain	Remarks (where dissim. occurs)	Example Languages
...CVC...	syllabification irrelevant; Cs not always in adjacent σs (may be same σ)	Guttural dissimilation in Tigre & Tigrinya (Rose 2000a)
CV̆.C V	V must be short; Cs always in adjacent σs; both always onsets	Rhotic dissimilation in Yindjibarndi (Wordick 1982); Dahl's Law voiceless dissimilation (in Kinyarwanda, a.o.) (Kimenyi 1979, Davy & Nurse 1982)
CV$^{(N)}$C V	second C may be preceded by homorganic nasal (or may be prenasalized); Cs always in adjacent σs	Dahl's Law voiceless dissimilation (in EkeGusii, Gikuyu, a.o.) (Davy & Nurse 1982)
.CVC. *or* C.(C)VC.	Cs are onset & coda of one syllable, or codas of two adjacent syllables	Rhotic dissimilation in Semelai (Kruspe 2004); labial dissimilation in La-mi (Cantonese secret lg.) (Yip 1988)
C(r)V.C V	first C may be followed by a rhotic; Cs always in adjacent σs	Coronal dissimilation in Colombian Spanish (de Ramirez 1996); Dorsal dissimilation in Judeo-Spanish? (Bradley & Smith 2011)
CV(C).C ↑ ↑	Cs may be onsets of adjacent σs, and separated by another coda C	Glottalization dissimilation in Okanagan Salish (Thompson & Thompson 1985)
CV(:)(r)C(C)V ↑ ↑	V may be long; Cs not always in adjacent σs (may be same σ); second C may be preceded by [r], and/or followed by another obstruent	Voicing dissimilation in Western Bade (Schuh 2002)
C.CV(:)C.CV[11] ↑ ↑	cluster-to-cluster dissimilation; vowel may be long or short	Gooniyandi NC-cluster dissimilation (McGregor 1990, Odden 1994)
C.CV̆(C)C.CV ↑ ↑	cluster-to-cluster dissimilation; vowel must be short; second NC cluster may be preceded by [r] or followed by another obstruent	Yindjibarndi NC-cluster dissimilation (Wordick 1982:34, Odden 1994)

Finally, it is worth observing that the CVC domain differs from the other, morphologically-defined, domains of scope in that it is phonologically mutable. That is, the status of one consonant as being in a CVC configuration with another is something that can be changed in the input-output mapping. Two consonants that are in the same CVC domain in the input can be pushed apart – by metathesis, or epenthesis for

[11] Note that for the last two cases in the table, Gooniyandi & Yindjibarndi, the dissimilation is a cluster-to-cluster interaction: it's dissimilatory deletion of the nasal in a nasal+consonant cluster, i.e. /NC...NC/ → [NC...ØC]. These two cases are unusual in that the status of two consonants as being in the same CVC domain depends on segments that don't intervene between them: the two nasals are in codas of adjacent syllables, but dissimilation does not occur unless each is also followed by an oral consonant. See chapter 9 for further discussion of NC dissimilation.

example – so they are not in the same CVC domain in the output. This has no parallel in other domains of scope: no amount of metathesis will remove a consonant from the word, and no amount of epenthesis will cause a segment to lose its morphological affiliation as part of the root.[12]

2.3.2.3. Comparison to previous definitions of CORR constraints

2.3.2.3.1. How the CORR constraints refer to features

The schema for CORR constraints proposed here (in (12) above) refers to a set of *shared feature specifications*. I use the term 'feature specification' here to refer to one specific value of one specific feature. In this respect the CORR constraints used here are like those proposed by Rose & Walker (2004), which also refer to shared feature specifications[13]. They are different from the CORR constraints used by Hansson (2001/2010) which refer to featural differences; they are also different from those proposed by Walker (2000a, 2000b, 2001), which refer to pairs of segments directly and are arranged into fixed rankings according to an abstract notion of similarity. The CORR schema makes reference only to a set of feature values, not to degrees of similarity defined in any other ways.

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[12] This property of the CVC domain has significant empirical consequences; for instance, it predicts dissimilatory effects in metathesis, something attested various Austronesian languages (Zuraw & Lu 2009).

[13] There is a small point of difference from Rose & Walker's (2004) formulation here; they allow CORR constraints to refer to variables over feature values. For example, their constraint 'CORR·T↔D' requires correspondence between consonants that are specified as [–sonorant, –continuant, αPlace] – i.e. it requires that homorganic stops correspond, regardless of their place of articulation. The schema in (5) does not allow constraints like this: it is not possible to have a constraint CORR·D-[–sonorant, –continuant, αPlace], because [αPlace] isn't a particular feature specification. The desired effect of correspondence only between homorganic consonants can still be obtained in this theory, by using multiple constraints, e.g. CORR·D-[–sonorant, –continuant, Dorsal] in tandem with CORR·D-[–sonorant, –continuant, Coronal].

The theory of correspondence developed here does not posit fixed hierarchies among the Corr constraints; this is a divergence from previous work in Agreement By Correspondence. Walker (2000a, 2000b, 2001), Hansson (2001/2010), and Rose & Walker (2004) all posit a fixed hierarchy among the Corr constraints. The guiding intuition behind this approach is that the more two similar consonants are, the more strongly they should be required to correspond. The theory proposed here does not derive this 'greater similarity stronger correspondence' effect, nor does it attempt to.[14] I assume that Corr constraints are freely rankable, like any other constraint.

The basis for having Corr constraints refer to *sets* of feature specifications, rather than single features, comes principally from the use of these constraints in consonant harmony, building on the work of Rose & Walker (2004) & Hansson (2001/2010). Harmony patterns commonly hold over classes of segments defined by more than one feature. For example, in Chaha, there is laryngeal agreement among just stops, to the exclusion of other obstruents (e.g. fricatives), as well as other non-continuants (e.g. nasals). The class of stops cannot be defined featurally without referring to both [–sonorant] *and* [–continuant]. Having the Corr constraints target a set of feature specifications allows for constraints like Corr-Root·[–sonorant, –continuant], which demands correspondence among all and only stops, and which explains the correspondence requirement in Chaha.

How does this reference to multiple features bear on dissimilation? When a Corr constraint refers to two (or more) feature specifications, it demands correspondence only among those consonants that share *both* (or *all*) of those

[14] In this respect, the SCTD also diverges from previous work on dissimilation which aims to link greater similarity to stronger impetus for dissimilation (Suzuki 1998; see also Pierrehumbert 1993, Frisch et al. 2004, a.o.).

specifications. This means that it can be satisfied by more than one kind of dissimilation.

For instance, CORR·[+F,+G] can be satisfied by dissimilation of [+F], or by dissimilation of [+G]. But, only one is necessary: it does not demand dissimilation for both features - either one is sufficient to make non-correspondence satisfy this CORR constraint. The choice between the two kinds of dissimilation will be determined by other factors in the grammar - most notably the ranking of faithfulness for [±F], and faithfulness for [±G]. It is conceivable that both types of dissimilation could coexist in a single language: one might be optimal in certain circumstances, and the other might better elsewhere. I do not know of any dissimilation patterns that are demonstrably like this, but I do not expect this situation to be common.

2.3.2.3.2. Reference to domains

The CORR constraints also refer to specific domains – as noted above, each CORR constraint assigns violations only for consonants that occur within its domain of scope. This is a point of difference from Rose & Walker's (2004) proposal: their CORR constraints are not restricted in scope. The CORR constraints used here are, in this respect, more along the lines of Hansson (2001/2010), who proposes families of CORR constraints that refer to the same features, but over different distances. There is one important difference, though: Hansson's CORR constraints refer to a distance, while the CORR constraints proposed here refer to a domain.

Restricting the scope of the CORR constraints is essential for capturing bounded dissimilation patterns. Harmony is agreement by correspondence: harmonizing consonants necessarily correspond with each other. However, dissimilation is an escape from correspondence requirements – dissimilating segments necessarily *do not* correspond with each other. Rose & Walker (2004:494, f.n. 16) consider Hansson's idea that CORR constraints are split into families that are scaled by distance. They explicitly reject this proposal, on the grounds that the only well-attested proximity limits in the consonant harmony typology are syllable-adjacency requirements, and that these can be explained by a single CC·Limiter constraint like CC·SYLLADJ ('PROXIMITY', for them), which restricts correspondence to consonants in adjacent syllables. While it is feasible to analyze distance limits in harmony with constraints that limit correspondence, it is not possible to explain distance limits in dissimilation in the same way. As noted above (§2.1.2), constraints that limit correspondence have the effect of *favoring* dissimilation, not inhibiting it; CC·Limiter constraints cannot impose limits on dissimilation. Restricting the domain of scope of the CORR constraints does impose limits on dissimilation: where correspondence between similar consonants is not required, no dissimilation is necessary.

Allowing CORR constraints to refer to specific domains leads to partial redundancy of explanation. For example, one-syllable distance limits in harmony can be explained as the result of CC·SYLLADJ as a CC·Limiter constraint that precludes correspondence across longer distances. Alternatively, the same pattern can be explained as the result of a CORR-CVC·[αF] constraint, with correspondence being required only for consonants in adjacent syllables, not those that are further apart. In other words, the theory offers two distinct analyses of some harmony patterns. This is perhaps unappealing on conceptual grounds, but is fully warranted on empirical ones. CC·SYLLADJ is necessary to explain dissimilation that happens only in non-adjacent syllables – this is found in Sundanese (see discussion in §2.3.3.4). It is also necessary to have CORR-CVC·[αF] constraints in order to explain dissimilation that happens only in adjacent syllables – this is found in Kinyarwanda (see ch. 4 for analysis). So, the constraints that give rise to this sort of redundancy are unavoidable[15].

The treatment of domains in the SCTD also differs from previous theories of dissimilation. Much previous work on dissimilation tries to connect For example, Suzuki (1998) posits a proximity hierarchy for the GOCP constraints that cause dissimilation (along similar lines as Hansson's (2001/2010) hierarchy). The intent of this approach is to make the theory derive 'proximity effects' – the idea is that the closer two similar segments are, the more strongly their co-occurrence will be avoided. While proximity effects of this sort have been demonstrated in cases of gradient similarity avoidance (Pierrehumbert 1993, Frisch et al. 2004, a.o.), it is not clear that dissimilation with active alternations works in the same way. From a typological standpoint, there is clearly not a universal implication based on distance: the occurrence of dissimilation over greater distance does not imply dissimilation over shorter distance. This is especially obvious in languages like Sundanese (chapter 4) and Zulu (chapter 7), where dissimilation occurs over long distances, yet consonants that are closer together surface faithfully.

2.3.2.3.3. Non-reference to relative linear order

The CORR constraints proposed here do not refer to the relative order of consonants: they require correspondence solely on the basis of shared features, and nothing else.

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[15] It is also worth noting that while CC·SYLLADJ and CORR-CVC·[αF] can both derive 1-syllable distance limits in harmony, they are not completely equivalent. They have different consequences for intervening segments; see §2.2.3.3.4 for more discussion.

This is a difference from some earlier proposals (Walker 2000b, 2001; Hansson 2001/2010), in which the CORR constraints make explicit reference to the relative order of the consonants. For instance, Walker's (2000b, 2001) the template for CORR constraints ('CORR·$C_1 \leftrightarrow C_2$') explicitly states that correspondence is only required when C_2 follows C_1 (and Hansson (2001/2010) takes a similar tack, albeit using asymmetric correspondence; see §2.2.3.4).

The reason CORR constraints proposed here don't refer to linear order is because nothing would happen if they did so. Correspondence is required only between consonants that share some feature specification(s). If two consonants share features, they do so regardless of their linear order. In the string [n...m], the two nasals share the feature [+nasal]; in the string [m...n], unsurprisingly, the two nasals still share the feature [+nasal]. Furthermore, the Surface Correspondence relation is (as explained in §2.2) a symmetric relation. A consequence of this is that in the string [n...m], if [n] needs to correspond with [m], it entails that [m] must also correspond with [n]. Given that correspondence is symmetric, requiring correspondence in one order also requires correspondence in the other order.

2.3.3. The CC·Limiter constraints

The CC·Limiter constraints assign violations for pairs of consonants that are in surface correspondence with one another, and that do not meet certain criteria. These criteria are specified as part of each constraint, and they may be featural or structural in nature. While CC·Limiter constraints are not all stamped from the same template, their definitions do share a common structure; this is given in (23). This is represented in the constraint names by the prefix ‘CC·’, standing for ‘Consonant Correspondence’.

(23) CC·(__________): ‘If consonants correspond, then they __________‘
For each distinct pair of output consonants X & Y, assign a violation if:
i) X & Y are in the same surface correspondence class, *and*
ii) ... (other content of individual constraints)

Note that these constraints do not specify any linear ordering relations between the pair of violating consonants. This is in keeping with the symmetric nature of the correspondence relation. Some constraint definitions are framed in an asymmetric way as a matter of expository convenience – they assign a violation ‘if X & Y correspond, and X has some set of properties’. In such cases, reference to X rather than Y is of no formal consequence, due to symmetry of the correspondence relation. A pair of output consonants [C1...C2] can violate a CC·Limiter constraint with C1 as ‘X’ and C2 as ‘Y’, with C1 as ‘Y’ and C2 as ‘X’. The point here is that because correspondence is symmetric, constraint definitions can refer to either member of a pair of correspondents, without implying anything about their relative order of precedence.

2.3.3.1. The CC·IDENT constraints

The most well-known class of CC·Limiter constraints are the CC·IDENT family of featural CC·Limiter constraints. The schema for CC·IDENT constraints is given in (24). These constraints assign violations when two consonants are in surface correspondence, but differ on some feature – they penalize disagreement between correspondents. Note that the CC·IDENT constraints are markedness constraints, not faithfulness constraints; despite sharing the name ‘IDENT’ with well-known input-output faithfulness constraints, the CC·IDENT constraints assign violations based on the output – not the input. CC·IDENT constraints have received substantial attention in previous work on Agreement By Correspondence (Walker 2000a, 2000b, 2001; Hansson 2001/2010, 2007; Rose & Walker 2004): they are the basis for correspondence to lead to agreement.

(24) CC·IDENT-[F]: 'If two consonants correspond, then they agree on [±F]'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is [αF], *and*
c. Y is [βF]

(...where F is some feature, [αF] & [βF] are its possible values, and α ≠ β)

The CC·IDENT constraints, as formulated here, differ from CORR constraints in how they relate to features: CC·IDENT constraints refer to features, but not to particular value-specifications of those features. This actually follows from the definition of surface correspondence as a symmetric relation. Recall from §2.2.1 that if consonant X is a surface correspondent of consonant Y, then Y is necessarily a correspondent of X as well. One consequence of this is that referring to values in the CC·IDENT constraints has no effect on their function. For instance, we could imagine splitting CC·IDENT-[voice] into two constraints, CC·IDENT-[+voice] and CC·IDENT-[−voice], as some previous authors have done (cf. Hansson 2001/2010, Rose & Walker 2004). But, these two 'opposing' constraints would assign exactly the same violations: both of them are violated when a [+voice] consonant is in correspondence with a [−voice] one; because surface correspondence is symmetric, this is the same as a [−voice] consonant being in correspondence with a [+voice] one. So, the definition of the surface correspondence relation proposed here means that CC·IDENT-[+voice] and CC·IDENT-[−voice] are logically equivalent to each other, and to CC·IDENT-[voice].

The analysis of Sundanese in chapter 4 motivates a positional variant of the basic CC·IDENT structure, CC·IDENT-Initial-[Lateral]. This positional constraint explains an asymmetry in Sundanese lateral harmony: stem-initial laterals induce lateral harmony, but stem-medial and stem-final laterals do not. The structure of this constraint is represented by the schema in (25). The form is the same as for the basic CC·IDENT constraints (24), but with the additional clause (25d) that one of the correspondents is in a designated prominent position. The idea is roughly the same as Beckman's (1998) positional faithfulness constraints, just applied to CC·IDENT constraints instead of Input-Output IDENT constraints.

(25) CC·IDENT-Pos-[F]: 'If two Cs correspond, and one is in (Pos), they agree on [±F]'
For each distinct pair of output consonants X & Y, assign a violation if:

a. X & Y are in the same surface correspondence class, *and*
b. X is [αF], *and*
c. Y is [βF], *and*
d. X is in the position 'Pos'

(...where 'Pos' denotes some prominent position, e.g. stem-initial)

The final clause of this definition refers to just one of member of the pair of consonants being assessed, X. The choice of X rather than Y is arbitrary; it does not imply any linkage between which correspondent is in the designated position and which value of the agreement feature it has. Since correspondence is symmetric, a pair of disagreeing correspondents can incur a violation as long as one of them is in the prominent position – it makes no difference which one that is.

2.3.3.2. The CC·EDGE constraints

The CC·EDGE constraints are a family of CC·Limiter constraints that penalize correspondence across the edges of domains. CC·EDGE constraints are built from the schema in (26): each individual constraint in this group refers to a particular morphological or prosodic domain; this is represented as the variable Dom in the generalized schema below. Each CC·EDGE constraint assigns a violation to any pair of correspondents that has one member inside the specified domain, and another member outside of that domain.

(26) CC·EDGE-(Dom): 'if two Cs correspond, then they are in the same (Dom)'
(≈ 'No surface correspondence across an edge of some kind of domain')
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is contained inside Dom_i, (an instance of the domain Dom), *and*
c. Y is not contained inside Dom_i

The domain that a CC·EDGE constraint refers to may be a morphological constituent, like the root, or the stem; or, it may be a prosodic unit, such as the syllable. Some of the domains that CC·EDGE constraints refer to also happen to be in the inventory of domains that the CORR constraints refer to. For instance, correspondence can be required within the stem by a CORR constraint Corr-Stem·[αF], and correspondence across the stem edge may be penalized by CC·EDGE-(Stem) – two different constraints that happen to make reference to the same domain, the stem. As far as the theory is concerned, this is a coincidence: morphological domains exist, and it's not unexpected that multiple things could refer to them. The set of domains that CORR constraints refer to and the set of domains that CC·EDGE constraints refer to are not crucially the same set of domains; parallelism between them is only incidental.

The idea of the CC·EDGE family of constraints draws on Itô & Mester's (1994) CRISPEDGE constraints, which prohibit multiply-linking autosegmental features across domain edges. Intuitively, these constraints work in an analogous way, but operate over surface correspondence structures instead of autosegmental representations.

The CC·EDGE constraints have the effect of favoring dissimilation across the edge of a domain, but not within it; in harmony, they also lead to agreement that is limited to hold only within a domain. This brings explanation to the observation made in the previous literature on Agreement By Correspondence (Hansson 2001/2010, Rose & Walker 2004) that consonant harmony patterns are frequently enforced only root-internally, or only stem-internally.

An example of dissimilation driven by a CC·EDGE constraint is Dahl's Law in Kinyarwanda, a pattern of dissimilation for [–voice]. This dissimilation produces alternations as in (27): the infinitival prefix /ku-/ has an underlying /k/, which normally surfaces as voiceless [k] (27a), but this consonant alternates with voiced [g] (27b) when the following syllable contains another voiceless consonant. This dissimilation occurs only when a pair of underlying [–voice] consonants straddles the edge of the stem domain, marked by '⟨ ⟩' in the output forms below. Thus, there is dissimilation when one voiceless consonant is in a prefix and the other is in the stem (27b), but there is no dissimilation when two [–voice] consonants are both inside the stem (28a), nor when both are outside the stem (28b).

(27) Kinyarwanda: Dahl's Law voiceless dissimilation

a. /ku-bon-a/ → [ku⟨bona⟩] 'to see'
(prefix has voiceless /k/; *[gu⟨bona⟩])

b. /ku-kor-a/ → [gu⟨kora⟩] 'to work'
(/k/→[g] voiceless dissimilation; *[**k**u⟨**k**ora⟩])

(28) Kinyarwanda: dissimilation happens only across the edge of the stem domain
  a. /ba-kop-i-e/ → [ba⟨kop^{j}e⟩] 'they gave a loan (perf.)'
   (no dissimilation stem-internally; *[ba⟨**gop**^{j}e⟩])

  b. /tu-ki-bon-a/ → [tuki⟨bona⟩] 'we see it'
   (no dissimilation outside the stem; *[**d**u**k**i⟨bona⟩])

The tableau in (29) shows how a CC·EDGE constraint, CC·EDGE-(Stem), is involved in generating this pattern. The input here is the example in (27b), with a pair of voiceless velar stops that straddle the left edge of the stem domain. The CORR constraint CORR-CVC·[–voice] requires them to correspond, which rules out one of the fully faithful candidates – the non-correspondent one in (29c). CC·EDGE-(Stem) rules out the other faithful candidate (29b), in which the two voiceless stops do correspond, because this correspondence spans across the edge of the stem. The result is that dissimilation for voicelessness (29a) is favored over faithfulness, because the faithful candidates all have penalized correspondence structures.

(29) Dahl's Law in Kinyarwanda: CC·EDGE-(Stem) as a CC·Limiter that favors dissimilation

Input: ku-kor-a Output: gu⟨ko.ra⟩		CC·EDGE-(Stem)	CORR-CVC·[–voice]	IDENT-[voice]
☞ a.	**g**$_1$u⟨**k**$_2$o.r$_3$a⟩ $\mathcal{R}$: **{g}{k}**{r}	(0)	(0)	(1)
~ b.	**k**$_1$u⟨**k**$_1$o.r$_2$a⟩ $\mathcal{R}$: **{k k}**{r}	**W** **(0~1)**		L (1~0)
~ c.	**g**$_1$u⟨**k**$_2$o.r$_3$a⟩ $\mathcal{R}$: **{k}{k}**{r}		W (0~1)	L (1~0)

Other languages show comparable patterns of cross-edge dissimilation, but at the level of other domains. For example, Zulu has a pattern of labial dissimilation that occurs only across the edge of the root, rather than the stem[16]. These other patterns are explained by essentially the same interaction as in this Kinyarwanda example, but involving different members of the CC·EDGE family.

The CC·EDGE constraints may also refer to prosodic domains rather than morphological ones: an example of this is seen in Cuzco Quechua glottalization dissimilation (analyzed in detail in ch. 5). The relevant generalization is that vowel-initial roots normally appear with initial epenthetic glottal stop; however, [h] gets epenthesized instead of [ʔ] if there is another glottalized consonant in another syllable of the root. This is illustrated by the examples in (30): [ʔ] is typically inserted to provide an onset before the root-initial vowel (a), but the choice of epenthetic consonant switches to [h] when there is an ejective in a following syllable (b).

(30) Cuzco Quechua: dissimilatory [ʔ]~[h] alternation in epenthesis

a. /asikuj/ → [**ʔ**a.si.kuj] 'to laugh'
([ʔ] appears before initial vowels; *[_a.si.kuj])

b. /aj**k'**a/ → [**h**aj.**k'**a] 'how many?'
([h] appears instead of initial [ʔ] before ejectives; *[**ʔ**aj.**k'**a])

The dissimilatory choice between [h] vs. [ʔ] in Cuzco Quechua is analyzed (in ch. 5) as the effect of CC·EDGE-(σ). In this language, correspondence is required among [+constricted glottis] consonants, but no correspondence is allowed across the edge of a syllable. The result is dissimilation from [+c.g.] [ʔ] to its [–c.g.] counterpart [h] when there is another [+c.g.] consonant in another syllable.

In harmony systems, the effect CC·EDGE constraints have is restricting harmony so it holds only for consonants within a domain. This accords with the observation

[16] The Zulu case is considered in detail in chapter 7.

previously made in the ABC literature (Rose & Walker 2004, Hansson 2010:326) – though not previously explained – that harmony patterns may hold only in the root, or only in the stem.

Kinyarwanda also exhibits an example of domain-bounded harmony, the effect of the constraint CC·EDGE-(Stem). The relevant generalization (Mpiranya & Walker 2005, et *seq*.; see also Kimenyi 1979) is that sibilant retroflexion harmony holds within the stem (again, marked by '⟨ ⟩' in the examples below) but there is no retroflex harmony across the edge of the stem. This is illustrated in (30) (examples from Kimenyi 1979, Walker & Mpiranya 2005). The form in (a) shows that sibilant harmony holds over all the sibilants in the stem; the form in (b) shows that it doesn't extend to sibilants in prefixes.

(31) Kinyarwanda: stem-bounded sibilant harmony

a. /ku-**s**a**s**-ii**ʂ**-a/ → [gu⟨**ʂ**a**ʂ**ii**ʂ**a⟩] 'to cause to make the bed'
(sibilant retroflexion harmony within the stem; *[gu⟨**s**a**s**ii**ʂ**a⟩])

b. /**z**i-saa**ʐ**-e/ → [**z**i⟨**ʂ**aa**ʐ**e⟩] 'it (Cl.10) became old (perf.)'
(no harmony across the stem-prefix boundary; *[**ʐ**i⟨ʂaaʐe⟩])

The tableau in (32) illustrates the role CC·EDGE-(Stem) plays in this pattern (analyzed in more detail in ch. 3). The sibilant retroflexion harmony is a case of agreement by correspondence. Sibilants in adjacent syllables are required to correspond due to CORR-CVC·[sibilant]; this correspondence is linked to retroflex harmony because CC·IDENT-[retroflex] requires correspondents to agree for retroflexion. The reason prefix sibilants don't harmonize is because CC·EDGE-(Stem) prohibits correspondence across the stem edge. This constraint dominates CORR-CVC·[sibilant], and it rules out all the candidates where the prefix sibilant corresponds with the sibilants in the stem – whether they agree (32b) or not (32c). Since the prefix sibilant is forbidden from corresponding with the stem sibilants, it doesn't need to agree with them: the winning candidate (32a) incurs no violations of CC·IDENT-[retroflex] because within each correspondence class, all of the members agree for retroflexion. CC·EDGE-(Stem) restricts agreement by limiting correspondence across the stem edge; within the stem, agreement works as normal.

(32) Sibilants in Kinyarwanda: CC·EDGE-(Stem) as a CC·Limiter that restricts harmony

Input: zi-saaʐ-e Output: zi⟨ʂaaʐe⟩		CC·EDGE-(Stem)	CC·IDENT-[retroflex]	CORR-CVC·[sibilant]	IDENT-[retroflex]
☞ a.	z$_1$i⟨ʂ$_2$aaʐ$_2$e⟩ $\mathcal{R}$: {z}{ʂ ʐ}	(0)	(0)	(1)	(1)
~ b.	ʐ$_1$i⟨ʂ$_1$aaʐ$_1$e⟩ $\mathcal{R}$: {ʐ ʂ ʐ}	**W (0~2)**		L (1~0)	W (1~2)
~ c.	z$_1$i⟨s$_1$aaʐ$_1$e⟩ $\mathcal{R}$: {z s ʐ}	**W (0~2)**	W (0~2)	L (1~0)	L (1~0)
~ d.	zi⟨s$_2$aaʐ$_3$e⟩ $\mathcal{R}$: {z}{s}{ʐ}			W (0~2)	L (1~0)
~ e.	z$_1$i⟨s$_2$aaʐ$_2$e⟩ $\mathcal{R}$: {z}{s ʐ}		W (0~1)	e (1~1)	L (1~0)
~ f.	ʐ$_1$i⟨ʂ$_2$aaʐ$_2$e⟩ $\mathcal{R}$: {ʐ}{ʂ ʐ}			e (1~1)	W (1~2)

Other languages exhibit comparable domain-bounded harmony patterns, for other domains. For instance, laryngeal harmony in Chaha (see Rose & Walker 2004 for detailed analysis) holds at the level of the root, rather than the stem. Harmony may also be bounded by prosodic domains, such as the syllable[17]; Obolo presents an example of this. The pertinent generalization in Obolo (Faraclas 1984, Rowland-Oke 2003) is that if a syllable has a nasal consonant as its onset, it cannot have a non-nasal coda – a kind

[17] cf. Hansson's (2001) claim to the contrary, and discussion thereof by Rose & Walker (2004:486 fn.)

of nasal consonant harmony. The harmony pattern is observed statically, as a gap in the Obolo syllable inventory: there are no syllables with a nasal onset and a non-nasal coda. This pattern is illustrated in (33) below.

(33) Obolo onset-coda nasal agreement:

a. Licit CVC syllables in Obolo:

✓[fùk]	‘read’	✓$[\mathrm{TVT}]_\sigma$
✓[bén]	‘carry’	✓$[\mathrm{TVN}]_\sigma$
✓[ɲám]	‘sell’	✓$[\mathrm{NVN}]_\sigma$

b. Impossible CVC syllables in Obolo:

*[nap]	(unattested)	*$[\mathrm{NVT}]_\sigma$

Obolo’s nasal harmony pattern holds only within the syllable, never across syllable edges. The examples in (34) show that the language does allow nasals & non-nasals to coexist in a CVC sequence – the nasal agreement requirement holds only for consonants that are in the same syllable.

(34) Obolo nasal harmony does not hold across the edge of a syllable

a.	tú.mù.kâ	‘instead of’	(*tu.**m**u.**ŋ**a, *tu.**b**u.ka)
b.	nì.ná.lék	‘complain’	(*ni.**n**a.**n**ek, *ni.**l**a.**l**ek)

The analysis of this pattern (presented in full in ch. 5) explains it in basically the same way as the Kinyarwanda example above – the only difference is which CC·EDGE constraint is involved. In Kinyarwanda’s stem-bounded harmony, it’s CC·EDGE-(Stem); in Obolo, it’s CC·EDGE-(σ).

2.3.3.3. CC·SROLE

CC·SROLE is a constraint on the position of correspondents within their (respective) syllables. The formal definition is given in (35); informally, what it says is that each pair of correspondents must have the same role within the syllable(s) containing them.

This constraint is based on the constraint 'SROLE-CC' proposed by Rose & Walker (2004:511; see also sources cited therein, and Walker 2000b), which demands that 'corresponding consonants must have identical syllable roles'. The definition of CC·SROLE proposed here differs from previous formulations in including an explicit algorithm for counting violations.

(35) CC·SROLE: 'If two Cs correspond, then they have matching syllable roles'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X has the syllable role SR_X, and Y has the syllable role SR_Y
(where $SR_X, SR_Y \in$ {onset, head-of-onset, nucleus, coda}) *and*
c. $SR_X \neq SR_Y$

The set of syllable role values considered by CC·SROLE consists of 'coda', 'nucleus', 'onset', and 'head-of-onset'; a pair of corresponding segments incurs a violation when one consonant has one of these four syllable roles, and the other consonant has any of the other three roles. The motivation for separating 'head-of-onset' from 'onset' is to distinguish between segments which *are* onsets by themselves and segments which are part of onset clusters – a distinction that is empirically crucial for Sundanese (see discussion below). I take the head of an onset to be the least sonorous consonant of that onset. Thus, in a sequence like [.ra.], the [r] has the syllable role 'head-of-onset', whereas the [r] in [.bra.] has the syllable role 'onset', because it is in the same onset cluster as another, less sonorous, consonant [b].[18]

[18] The notion that onset clusters have one consonant heads has precedents in previous Optimality Theoretic work on voicing assimilation and positional faithfulness (Beckman 1998, Lombardi 1999, Murray 2006), as well as work in Government Phonology. The definition of onset heads assumed here differs somewhat from previous work, but this is not central to the theory. What is crucial is only that the [r]s in [.bra.] and [.ra.] have different syllable roles; it does not matter what exactly those roles are.

The effect that CC·SROLE has is favoring dissimilation between consonants with different syllable roles, and also preventing harmony from applying to consonants that differ in this way.

CC·SROLE can be seen to cause dissimilation in Sundanese (see ch. 4 for detailed analysis). The relevant generalization is that two /r/s may co-occur when both are onsets, but not when one is a coda, or a non-head member of an onset cluster. This is illustrated by the examples in (35) below: a sequence /r…r/ dissimilates to [l…r] when one /r/ is in an onset position and the other is in a coda (35a), or when one /r/ is the head of an onset and the other is the non-head member of an onset cluster (36b). But, there is no dissimilation when two /r/s are the onsets of two syllables (36c-d).

(36) Sundanese: R-dissimilation conditioned by mismatching syllable roles

a. /h-ar-ormat/ → [h=a.l=or.mat] ‘respect (pl.)’
b. /c-ar-ombrek/ → [c=a.l=om.brek] ‘cold (pl.)’
(/r/~[l] dissimilation when /r/s have different syllable roles)

c. /r-ar-ahɨt/ → [r=a.r=a.hɨt] ‘wounded (pl.)’
d. /c-ar-uriga/ → [c=a.r=u.ri.ga] ‘suspicious (pl.)’
(no dissimilation when /r/s have the same syllable role)

The tableau in (37) illustrates how CC·SROLE favors dissimilation in this situation, using (36a) as an example. The input has two rhotics, one in an onset position and one in a coda. If they correspond, they violate CC·SROLE (37b); if they don’t correspond, they violate CORR-Stem·[rhotic] (37c). But, if they dissimilate (37a), they can satisfy CC·SROLE by not corresponding, and also satisfy CORR-Stem·[rhotic], because the resulting [l…r] sequence is not an instance of two rhotics that don’t correspond.

(37) Sundanese: CC·SROLE as a CC·Limiter that favors dissimilation

Input: h-ar-ormat Output: ⟨h=a.l=or.mat⟩		CC·SROLE	CORR-Stem· [rhotic]	IDENT- [rhotic]
☞ a.	⟨h$_1$=a.l$_2$=or$_3$.m$_4$at$_5$⟩	(0)	(0)	(1)

	$\mathcal{R}$: {h}**{l}{r}**{m}{t}			
~ b.	⟨h_1=a.**r**$_2$=or$_2$.$m_3$at$_4$⟩ $\mathcal{R}$: {h}**{r r}**{m}{t}	W (0~1)		L (1~0)
~ c.	⟨h_1=a.**r**$_2$=or$_3$.$m_4$at$_5$⟩ $\mathcal{R}$: {h}**{r}{r}**{m}{t}		W (0~1)	L (1~0)

In harmony systems, CC·SROLE has the effect of limiting harmony to hold only between those consonants with matching syllable roles (Rose & Walker 2004, Walker 2000b). An example of this is nasal harmony in Kikongo (Ao 1991): the generalization is that sonorants in onsets agree for nasality, but agreement does not hold between an onset and a coda. This is illustrated in (38) below: the applicative suffix /-il/ has an underlying non-nasal /l/ (38a); when the root contains a nasal consonant in an onset, this suffix (and others with /l/s) appears with [n] instead of [l] (38b). However, a nasal in a coda does not induce the same agreement (38c). Nasal harmony occurs only when the /l/ and the nasal have identcal syllable roles – it does not happen where correspondence between the participating consonants is penalized by CC·SROLE.

(38) Kikongo: CC·SROLE restricts nasal harmony to between onsets, and not codas

a. /sakid-il-a/ → [sa.ki.di.**l**a] 'to congratulate for'
(applicative suffix /-il/ has /l/; *[sa.ki.di.**n**a])

b. /ku-dumuk-il-a/ → [ku.du.**m**u.ki.**n**a] 'to jump for'
(/l/→[n] agreement after nasal /m/; *[ku.du.**m**u.ki.**l**a])

c. /somp-il-a/ → [som.pe.la] 'borrow from/for'
(suffix /l/ does not agree with coda [m]; *[so**m**.pe.**n**a])

This type of prohibition against harmony between onsets & codas was the initial motivation for Rose & Walker's SROLE-CC constraint (which CC·SROLE descends from). The Kikongo pattern is not analyzed in full in this dissertation, but the reader is referred to Rose & Walker (2004) for more detailed examination (see also Walker 2000b for analysis of a similar pattern in Yaka). The basic interaction is shown in the tableau in (39). Nasal harmony happens because CORR-Stem·[+sonorant] requires sonorants in the stem to correspond, and because CC·IDENT-[nasal] requires correspondents to agree for nasality. But, no harmony happens between coda nasals and onset sonorants, because CC·SROLE dominates CORR-Stem·[+sonorant].

(39) Kikongo: CC·SROLE as a CC·Limiter that restricts harmony

Input: somp-il-a Output: ⟨som.p-i.l-a⟩		CC·SROLE	CC·IDENT-[nasal]	CORR-Stem·[+sonorant]	IDENT-[nasal]
☞ a.	⟨s_1o**m**$_2$.p_3-i.**l**$_4$-a⟩ $\mathcal{R}$: {s}{m}{p}{l}	(0)	(0)	(1)	(0)
~ b.	⟨s_1o**m**$_2$.p_3-i.**n**$_2$-a⟩ $\mathcal{R}$: {s}{m n}{p}	W (0~1)		L (1~0)	W (0~1)
~ c.	⟨s_1o**m**$_2$.p_3-i.**l**$_2$-a⟩ $\mathcal{R}$: {s}{m l}{p}	W (0~1)	W (0~1)	L (1~0)	

2.3.3.4. CC·SYLLADJ

CC·SYLLADJ is a constraint on the locality of correspondents. Informally, it says that the syllables containing the members of any given correspondence class must form a contiguous group. In other words, if we examine each member of a correspondence class in order from left to right, each correspondent must be at least syllable-adjacent to the next. The formal definition is given in (40). It assigns violations when two consonants in the same correspondence class are separated by an intervening 'inert' syllable, one which does not also contain another member of that same correspondence class. Note that this definition does *not* require that all pairs of correspondents are in directly adjacent syllables. It allows consonants in non-adjacent syllables to correspond, as long as they also correspond with some consonant in each syllable that stands between them. That is, CC·SYLLADJ imposes a condition on the distance from one correspondent to the next, not on the distance covered by the whole class.

(40) CC·SYLLADJ: 'Cs in the same correspondence class must inhabit a contiguous span of syllables' (≈ 'correspondence cannot skip across an inert intervening syllable')
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class,
b. X & Y are in distinct syllables, ΣX & ΣY
c. there is some syllable ΣZ that precedes ΣY, and is preceded by ΣX
d. ΣZ contains no members of the same surface correspondence class as X & Y

The inspiration for CC·SYLLADJ is Rose & Walker's (2004) constraint 'PROXIMITY', which they propose to limit correspondence to only consonants in a group of contiguous syllables (an idea which also has precedents in Suzuki 1999 and Odden 1994). Rose & Walker's (2004:494) definition of the PROXIMITY constraint says: 'Correspondent segments are located in adjacent syllables.' The definition proposed in (39) above is enhanced to provide a clear algorithm for counting violations, that holds even over groups of more than two consecutive syllables. The definition assigns violations by counting pairs of correspondents separated by an 'inert' syllable; it is framed in this way so that it does not impose an upper bound for the size of a correspondence class. The idea is that CC·SYLLADJ is a limit on how much inert material can be skipped over between one correspondent and its closest neighbour, in keeping with the intuition behind Rose & Walker's Proximity constraint.

CC·SYLLADJ has a diverse range of empirical consequences. As a CC·Limiter constraint, it favors dissimilation only when consonants are in non-adjacent syllables. In harmony systems, it also has the effect of prohibiting agreement across an intervening syllable, resulting in a one-syllable distance limit[19]. And, being a constraint on locality, it may also have the effect of forcing correspondence between two non-local consonants to be mediated by what stands between them. This can produce 'segmental opacity' (or 'blocking') effects, both in harmony and in dissimilation; these are patterns where harmony or dissimilation the occurrence of harmony or dissimilation depends on the quality of intervening material – i.e. where dissimilation or harmony fails to occur across certain segments. All of these effects are attested crosslinguistically.

CC·SyllAdj can be seen to cause dissimilation in Sundanese, where /r/s may co-occur in adjacent syllables, but not in non-adjacent ones. The full Sundanese pattern is rather complex, and is analyzed in detail in chapter 4, but the generalization relevant here is that /r/s dissimilate when in non-adjacent syllables, but there is no dissimilation when two /r/s are in adjacent syllables. This is illustrated below.

(41) Sundanese: Dissimilation driven by CC·SyllAdj

a. /s-a**r**-idu**r**u/ → [s=a.**l**=i.du.**r**u] 'sit by a fire (pl.)'
(/r/~[l] dissimilation in non-adjacent syllables; *[s=a.**r**=i.du.**r**u])

b. /c-ar-uriga/ → [c=a.**r**=u.**r**i.ga] 'suspicious (pl.)'
c. /r-ar-ahɨt/ → [**r**=a.**r**=a.hɨt] 'wounded (pl.)'
(No dissimilation in adjacent syllables)

The tableau in (42) shows how CC·SyllAdj gives rise to this pattern. The input is the form in (41a), with two rhotics in non-adjacent syllables. The constraint Corr-Stem·[rhotic] requires correspondence between rhotics in the stem. This constraint rules out the faithful candidate in (42c) where the rhotics don't correspond with each

[19] This one-syllable restriction of consonant harmony is Rose & Walker's original motivation for proposing the 'Proximity' constraint that CC·SyllAdj is adapted from.

other, but it allows candidate (42a), where there is only one rhotic in the stem (and it corresponds with itself), and also candidate (42b) where there are two rhotics that are in correspondence. The choice between (42a) & (42b) is decided by CC·SyllAdj: it penalizes the faithful correspondent candidate (42b) because the corresponding rhotics are separated by the syllable [.du.] (and they do not correspond with the [d]). This leaves the dissimilating candidate (42a) as the winner; it violates faithfulness instead of either of the higher-ranked correspondence constraints.

(42) Sundanese: CC·SyllAdj as a CC·Limiter that favors dissimilation

Input: s-ar-iduru Output: ⟨s=a.**l**=i.du.**r**u⟩		CC·SyllAdj	Corr-Stem·[rhotic]	Ident-[rhotic]
☞ a.	⟨s_1=a.**l_2**=i.d_3u.**r_4**u⟩ $\mathcal{R}$: {s}**{l}**{d}**{r}**	(0)	(0)	(1)
~ b.	⟨s_1=a.**r_2**=i.d_3u.**r_2**u⟩ $\mathcal{R}$: {s}**{r r}**{d}	W (0~1)		L (1~0)
~ c.	⟨s_1=a.**r_2**=i.d_3u.**r_4**u⟩ $\mathcal{R}$: {s}**{r}**{d}**{r}**		W (0~1)	L (1~0)

The harmony-restricting effect of CC·SyllAdj is observed in Ndonga and Lamba (Rose & Walker 2004, Hansson 2001/2010, Fivaz 1986, Doke 1938). Both of these languages exhibit nasal consonant harmony with a 1-syllable locality limit, as analyzed in more detail by Rose & Walker 2004. This is illustrated by the examples in (43) below: suffixes with /l/s in Ndonga, such as the applicative /-il/, harmonize for nasality when there is a nasal in an adjacent syllable (43a), but not one further away (43b). The form in (43c) (Fivaz 1986:115), with the frequentative suffix /-olol/, shows that the one-syllable limit not an absolute limit that holds for all agreement in the word: the second /l/ in the /-olol/ suffix and the /n/ in the root /ton/ 'ring the bell' are in non-adjacent syllables, but nasal agreement holds over them.

(43) Ndonga: nasal harmony with a 1-syllable locality restriction

a. /kun-il-a/ → [ku.n-i.**n**-a] 'sow for'
   (/l/~[n] nasal harmony in adjacent syllables)

b. /nik-il-a/ → [ni.k-i.**l**-a] 'season for'
   (No nasal harmony in non-adjacent syllables; *[nik-i**n**-a])

c. /ton-olol-a/ → [to.**n**-o.**n**o.**n**-a] 'ring the bell again'
   (Agreement through consecutive syllables; *[to.**n**-o.**n**o.**l**-a])[20]

The tableau in (44) illustrates how CC·SYLLADJ produces the Ndonga pattern.[21] The basic nasal harmony pattern is interpreted like the Kikongo example above ((38), in §2.3.3.3): it's agreement by correspondence, driven by CORR-Stem·[+sonorant] and CC·IDENT-[nasal]. The limiting effect seen in examples like (43b) happens because CC·SYLLADJ dominates CORR-Stem·[+sonorant]. This means that CC·SYLLADJ over-rules the lower-ranked constraints that favor harmony; it restricts agreement because it prevents correspondence between two sonorants from skipping across an inert syllable like the [.ki.] in (43b/44b).

[20] The astute reader may note that the Ndonga suffix /-olol/ has an apparently bipartite structure, and can be analyzed as reduplication of a suffix /-ol/; indeed, this is precisely how Fivaz (1986:23) characterizes it. This does not bear on the issue at hand: even if the second /l/ in (42c) /ton-olol-a/ is due to reduplication, it still exhibits the same /l/→[n] nasal harmony, and does so even though it is not syllable-adjacent to the /n/ in the root.

[21] I say 'can produce' because this is not the only possible analysis of Ndonga. Syllable-adjacent harmony can be treated in two different ways in the theory. One possibility is that correspondence is required broadly, but limited by CC·SYLLADJ, as sketched out here. The other possibility is that correspondence is only required in CVC sequences – i.e. that the active CORR constraint is CORR-CVC·[+sonorant], rather than CORR-Stem·[+sonorant]. These two analyses make different predictions, but the Lamba & Ndonga cases don't provide any grounds for discriminating between them – either approach can capture the facts.

(44) Ndonga: CC·SyllAdj as a CC·Limiter that restricts harmony

Input: nik-il-a Output: ⟨ni.ki.la⟩		CC·SyllAdj	CC·Ident-[nasal]	Corr-Stem·[+sonorant]	Ident-[nasal]
☞ a.	⟨$\mathbf{n}_1$i.k_2i.$\mathbf{l}_3$a⟩ $\mathcal{R}$: {**n**}{k}{**l**}	(0)	(0)	(1)	(0)
~ b.	⟨$\mathbf{n}_1$i.k_2i.$\mathbf{n}_1$a⟩ $\mathcal{R}$: {**n n**}{k}	W (0~1)		L (1~0)	W (0~1)
~ c.	⟨$\mathbf{n}_1$i.k_2i.$\mathbf{l}_1$a⟩ $\mathcal{R}$: {**n l**}{k}	W (0~1)	W (0~1)	L (1~0)	

It is important to note that, under the formulation proposed above, CC·SyllAdj actually does not penalize *all* correspondence between consonants in non-adjacent syllables. Rather, it assigns violations only when two correspondents are separated by an intervening syllable that contains no other members of their correspondence class. The definition is repeated in (45) below for convenience, with the relevant clauses italicized.

(45) CC·SyllAdj: 'Cs in the same correspondence class inhabit a contiguous group of syllables (each is at least syllable-adjacent to the next)'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class,
b. X & Y are in distinct syllables, ΣX & ΣY
c. *there is some syllable ΣZ that precedes ΣY, and is preceded by ΣX*
d. *ΣZ contains no members of the same surface correspondence class as X & Y*

A pair of correspondents separated by an intervening syllable *does not* incur a violation of CC·SyllAdj if the intervening syllable also contains a member of their correspondence class. This is illustrated schematically in the violation table in (46) below. Each of the candidates has three consonants [p t k], in three successive syllables. CC·SyllAdj penalizes the candidate (40a) where only the first and last consonants ([p] & [k]) are in correspondence; this is because the intervening syllable contains only one consonant, [t], and that consonant does not correspond with [p] & [k]. CC·SYLLADJ does not assign a violation to candidate (46b), where no consonant corresponds with any others. It also assigns no violations to the candidate in (46c), where all three consonants are in the same correspondence class.

(46) Schematic Violation profile for CC·SYLLADJ

		CC·SYLLADJ
a.	[p_1a.t_2a.k_1a], $\mathcal{R}$:{p k}{t}	*
b.	[p_1a.t_2a.k_3a], $\mathcal{R}$:{p}{t}{k}	✓
c.	[p_1a.t_1a.k_1a], $\mathcal{R}$:{p t k}	✓

The candidate in (45c) has correspondence between consonants that are not in directly adjacent syllables, but it incurs no violation of CC·SYLLADJ; this follows from the definition in (45). This candidate has correspondence between two consonants in distinct syllables, so it fulfills the criteria (a) & (b) of the definition in (45). It also fulfills the criterion in (c), because the pair of correspondents [p]~[k] are separated by an intervening syllable (i.e. they are in non-adjacent syllables). But, no violation is incurred because it does *not* meet the criterion in (c): the intervening syllable contains a member of the same correspondence class.

The motivation behind this particular definition of CC·SYLLADJ is to have it allow surface correspondence structures like (46c), where there is correspondence between more than two consonants in a string of consecutive syllables, such that each correspondent is syllable-adjacent to the next. This explains the 'chaining' pattern observed in the Ndonga example in (43c), /ton-olol-a/ → [to.n-o.no.n-a]. Here, the root /n/ and the second /l/ in the suffix /-olol/ are in non-adjacent syllables, but they are not prevented from agreeing. This is because CC·SYLLADJ does not penalize correspondence between them, as long as their correspondence class also contains the sonorant in the intervening syllable. The tableau in (47) shows this result: candidate (47a) with the 'chained' correspondence structure fares no worse on CC·SYLLADJ than its non-'chained' alternatives (47b) & (47c). The only candidate that violates it is (47d), where correspondence holds between the root /n/ and the last /l/ of the suffix /-olol/ - where nasal agreement skips over the intervening [l].

(47) Ndonga: CC·SYLLADJ allows 'chaining' of consecutive correspondents

Input: ton-olol-a Output: ⟨to.no.no.na⟩		CC·SYLLADJ	CC·IDENT-[nasal]	CORR-Stem·[+sonorant]	IDENT-[nasal]
☞ a.	⟨t_1o.$\mathbf{n}_2$o.$\mathbf{n}_2$o.$\mathbf{n}_2$a⟩ $\mathcal{R}$: {t}**{n n n}**	**(0)**	(0)	(0)	(2)
~ b.	⟨t_1o.$\mathbf{n}_2$o.$\mathbf{n}_2$o.$\mathbf{l}_3$a⟩ $\mathcal{R}$: {t}**{n n}{l}**	e (0~0)		W (0~2)	L (2~1)
~ c.	⟨t_1o.$\mathbf{n}_2$o.$\mathbf{l}_3$o.$\mathbf{l}_3$a⟩ $\mathcal{R}$: {t}**{n}{l l}**	e (0~0)		W (0~2)	L (2~0)
~ d.	⟨t_1o.$\mathbf{n}_2$o.$\mathbf{l}_3$o.$\mathbf{n}_2$a⟩ $\mathcal{R}$: {t}**{n n}{l}**	W (0~1)		W (0~2)	L (2~1)
~ e.	⟨t_1o.$\mathbf{n}_2$o.$\mathbf{l}_2$o.$\mathbf{l}_2$a⟩ $\mathcal{R}$: {t}**{n l l}**	e (0~0)	W (0~2)		L (2~1)

2.3.3.5. CC·SYLLADJ and intervening segments

Because CC·SYLLADJ assigns no violations when two correspondents are in non-adjacent syllables are connected by an unbroken chain of syllables containing members of their same correspondence class, it can indirectly favor correspondence beyond the minimum demanded by the relevant CORR constraints in a system. If correspondence is permitted only between adjacent syllables, then the only way two consonants in *non*-adjacent syllables may be allowed to correspond is if each syllable that intervenes between them also provides another consonant in the same correspondence class.

Imposing locality restrictions in this way can make a correspondence-based interaction between consonants depend on the content of the intervening syllables.[22] That is, two consonants in non-adjacent syllables will correspond with other segments that intervene between them just to avoid having a correspondence class that skips across an intervening syllable. The result is 'excessive' correspondence; a situation where consonants may correspond because it satisfies CC·SyllAdj and renders the correspondence class sufficiently local, not because some Corr constraint expressly requires that correspondence.

The excessive correspondence spurred by CC·SyllAdj can, in both dissimilation and in harmony, give rise to 'segmental opacity' effects – cases where the presence of some specific intervening consonant(s) causes an observed long-distance interaction not to hold. In dissimilation, I will refer to this as the 'blocking by bridging' effect. CC·SyllAdj favors dissimilation only for consonants that are separated by an intervening syllable which contains no members of their correspondence class. But, if the intervening syllable contains a consonant that *is* part of their same correspondence class, there is no motive for dissimilation. The result is that dissimilation fails to occur when the intervening consonant(s) are eligible correspondents, and can 'bridge' the gap between the non-adjacent syllables.

The blocking by bridging interaction is illustrated below, using a case from Latin (analyzed in chapter 8). The dissimilation is a well known pattern of [l]~[r] alternations in the adjectival suffix /-alis/; this is illustrated in forms like (48a–b). This lateral dissimilation happens across coronal non-laterals, such as the [n] in (48c). The

[22] Early work Agreement By Correspondence presumed that segmental opacity effects could not arise; see Hansson (2007) for background discussion of this issue.

pertinent blocking effect – not as widely known as the basic dissimilation pattern – is illustrated in (48d): no dissimilation happens across non-coronals, such as the bilabial /m/.

(48) Latin: lateral dissimilation happens only across [–lateral] coronals
 a. autumn-ālis 'autumnal'
 (adjectival suffix /-ālis/)

 b. sol-āris 'solar'
 (lateral dissimilation; *sol-alis)

 c. lun-āris 'lunar'
 (lateral dissimilation across (non-liquid) coronal non-laterals; *lu**n**-a**l**is)

 d. plūm-ālis 'feathered' (≈ 'plumal')
 (lateral dissimilation 'blocked' by Cs with no [±lateral] value; *plu**m**-a**r**is)

The essential generalization in (48) is that lateral dissimilation may happen across intervening consonants only if they are coronal. This effect is derived by CC·SYLLADJ favoring dissimilation only when it is not possible to find an appropriate intermediate correspondent. The determination of *which* segments can be 'appropriate intermediate correspondents' falls to other constraints.

In the Latin example here, the choice can be understood as an effect of CC·IDENT-[lateral]. This constraint assigns a violation whenever a [+lateral] consonant corresponds with a [–lateral] one. Assuming that coronals produced with a distinctly non-lateral articulation, like [n], are specified as [–lateral], their correspondence with an [l] will violate CC·IDENT-[lateral]. By contrast, non-coronals like [m] are not distinctly lateral or non-lateral; they are not articulated with the front of the tongue, and are thus incapable of manifesting the [±lateral] distinction. As such, let us suppose that [m] is neither [+lateral] nor [–lateral]; it has no laterality specification whatsoever.

Since [m] doesn't have any laterality value, it can correspond with a [+lateral] [l] without violating CC·IDENT-[lateral]. This means non-coronals like [m] are allowed to correspond with [l]. The result is that a pair of /l/s in non-adjacent syllables can satisfy CC·SYLLADJ – and thereby avoid dissimilation – by recruiting an [m] in an intervening syllable into their correspondence class, such that the whole class is contained in a contiguous group of syllables.

This blocking by bridging effect is shown in the tableau in (49). The input is /plum-alis/, with two /l/s separated by an intervening syllable [.ma.]. CC·SYLLADJ penalizes the faithful candidate with [l]~[l] correspondence (49c); however, it doesn't have any preference between the dissimilating candidate in (49b) and the 'excessively correspondent' candidate in (48a) that gets the laterals into correspondence by also recruiting the intervening [m] into their correspondence class. Since the first /l/ is syllable-adjacent to the /m/, and the /m/ is syllable-adjacent to the suffix /l/, the entire {l m l} class in (49a) satisfies CC·SYLLADJ just as well as (49b). The excessive correspondence candidate wins on faithfulness for laterality; the outcome is that lateral dissimilation fails to occur across the intervening [m].

(49) Latin: CC·SYLLADJ can lead to blocking by 'bridging'

Input: plum-alis Output: ⟨plum-alis⟩		CORR-Stem·[+lateral]	CC·SYLLADJ	CC·IDENT-[lateral]	IDENT-[lateral]
☞ a.	⟨p_1**l_2**u.**m_2**-a.**l_2**is_3⟩ ℛ: {p}**{lml}**{s}	(0)	(0)	**(0)**	(0)
~ b.	⟨p_1**l_2**u.**m_3**-a.**r_4**is_5⟩ ℛ: {p}**{l}{m}{r}**{s}				W (0~1)
~ c.	⟨p_1**l_2**u.**m_3**-a.**l_2**is_4⟩ ℛ: {p}**{l l}{m}**{s}		W (0~1)		
~ d.	⟨p_1**l_2**u.**m_3**-a.**l_4**is_5⟩ ℛ: {p}**{l}{m}{l}**{s}	W (0~1)			

By contrast, when two /l/s are separated by /n/ instead of /m/, the same ranking from (49) produces lateral dissimilation. This is shown in (50); the input /lun-alis/ surfaces with dissimilation, as [lun-aris] (50a), because the 'excessive correspondence' candidate in (50b) violates CC·IDENT-[lateral].

(50) Latin: CC·SYLLADJ makes blocking depend on intervening segments

Input: lun-alis Output: ⟨lun-aris⟩		CORR-Stem·[+lateral]	CC·SYLLADJ	CC·IDENT-[lateral]	IDENT-[lateral]
☞ a.	⟨l_1u.**n_2**-a.**r_3**is_4⟩ ℛ: **{l}{n}{r}**{s}	(0)	(0)	**(0)**	(1)
~ b.	⟨l_1u.**n_1**-a.l_1is_2⟩ ℛ: **{lnl}**{s}			W (0~2)	L (1~0)
~ c.	⟨l_1u.**n_2**-a.l_1is_3⟩ ℛ: **{l l}{n}**{s}		W (0~1)		L (1~0)
~ d.	⟨l_1u.**n_2**-a.l_3is_4⟩ ℛ: **{l}{n}{l}**{s}	W (0~1)			L (1~0)

What CC·SYLLADJ does in (49) & (50) is make the quality of the intervening consonants matter for dissimilation. Because it is not violated by chaining correspondence structures, it allows for this type of correspondence as an alternative to dissimilation. In other words, it prompts the two laterals at the ends of the chain go searching for another link in the middle that connects them into a single correspondence class that doesn't violate the locality condition imposed by CC·SYLLADJ.

CC·SYLLADJ can produce 'segmental blocking' effects in consonant harmony systems as well, in approximately the same way as with dissimilation; we see this kind of pattern in Kinyarwanda (Walker et al. 2008), analyzed in chapter 3. The relevant generalization is that sibilant retroflexion harmony does not occur across non-retroflex coronal consonants, though it may (optionally) occur across other consonants. This is illustrated by the data in (51) (from Walker et al. 2008:504).

Retroflex sibilant harmony (optionally) occurs across an intervening retroflex rhotic (51a), or a labial (51b), or a velar (51c). However, harmony is not possible across intervening non-retroflex coronals like [t], [n], and [j] (shown in (51d–f, respectively).[23]

(51) Kinyarwanda: segmental blocking effects in long-distance sibilant harmony

a.	/-seɽuʐ-e/	→ -⟨ʂeɽuʐe⟩ *or* -⟨seɽuʐe⟩		‘provoke (perf.)’
b.	/-ásamuʐ-e/	→ -⟨áʂamuʐe⟩ *or* -⟨ásamuʐe⟩		‘open one’s mouth wide (perf.)’
c.	/-saka:ʐ-e/	→ -⟨ʂakaʐe⟩ *or* -⟨saka:ʐe⟩		‘cover (the roof) with (perf.)’
d.	/sítaaʐ-e/	→ -⟨sítaaʐe⟩	*-⟨ʂítaaʐe⟩	‘make stub (perf)’
e.	/súnuuk-iʐe/	→ -⟨súnuukiʐe⟩	*-⟨ʂúnuukiʐe⟩	‘show furtively (perf)’
f.	/zújaaʐ-e/	→ -⟨zújaaʐe⟩	*-⟨ʐújaaʐe⟩	‘become warm (perf)’

CC·SyllAdj produces this blocking effect by the same ‘bridging’ interaction seen in the Latin example above; this is shown in the tableau in (52). Correspondence is required among sibilants in the stem, by Corr-Stem·[sibilant]. But, since CC·SyllAdj is undominated, sibilants in non-adjacent syllables within the stem cannot correspond with each other exclusively; candidates with this non-local correspondence (52b) are ruled out. This narrows the playing field to two options: not having correspondence between the sibilants (52a), or having correspondence between them also include the intervening consonant, to make a chained correspondence structure (52c). If the intervening consonant is [–retroflex] (like [t n j] in the examples in (51d–f)), then including it in the same correspondence class as the harmonizing sibilants (as in c) incurs extra CC·Ident violations, causing it to lose to the faithful, non-correspondent candidate (52a). CC·SyllAdj spurs non-local sibilants to recruit intervening consonants

[23] This is a slight simplification of the generalization for illustrative purposes. The retroflex sibilants in the underlying forms in (48) are derived from alveolar ones by the perfective suffix /-i-e/. Walker et al. (2008) also report that there is a coronal [ɖ] that is retroflex, but still blocks the harmony like the non-retroflex coronals. The Kinyarwanda harmony system is analyzed more closely in chapter 3, and further details can be found there.

into correspondence. But, this extraneous correspondence only works when the bridging consonants are ones that don't pose a problem for retroflexion agreement: the harmony goes through only if the interveners are all [+retroflex] (like [ɽ]), or lack any [±retroflex] value (like [m] and [k]).[24]

(52) Kinyarwanda: CC·SyllAdj can lead to blocking by 'bridging' in harmony as well

Input: sí**t**aaz-i-e Output: ⟨**s**í.**t**aa.**ʐ**e⟩		CC·SyllAdj	CC·Ident-[retroflex]	Corr-Stem·[sibilant]	Ident-[retroflex]
☞ a.	⟨s$_1$í.t$_2$aa.ʐ$_3$e⟩ ℛ: {s}{t}{ʐ}	(0)	(0)	(1)	(0)
~ b.	⟨ʂ$_1$í.t$_2$aa.ʐ$_1$e⟩ ℛ: {ʂ ʐ}{t}	W (0~1)		L (1~0)	W (0~1)
~ c.	⟨ʂ$_1$í.t$_1$aa.ʐ$_1$e⟩ ℛ: {ʂ t ʐ}		W (0~2)	L (1~0)	W (0~1)

The bridging effect that emerges from CC·SyllAdj is a highly significant finding. Early work in agreement by correspondence (Hansson 2001/2010, Rose & Walker 2004) built on the idea that segmental blocking effects – familiar from local spreading phenomena – could not emerge from the surface correspondence theory.[25] But, this is not actually the case. The surface correspondence relation allows consonants to interact without being 'local' – strictly or otherwise – but this does not entail that all surface correspondence interactions are completely ignorant of locality and distance.[26] The significance of the bridging effect is that SCorr *can* generate systems where intervening consonants affect whether an alternation happens or not. Whether

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[24] This account requires that faithfulness for retroflexion is ranked differently for sibilants than for other obstruents. This is necessary to rule out the possibility of 'recruiting' intervening non-retroflex consonants into correspondence, then assimilating them to retroflex to achieve agreement, not represented in (49). The relevant candidate is ⟨ʂ$_1$í.ʈ$_1$aa.ʐ$_1$e⟩, ℛ: {ʂ ʈ ʐ}, and would need to be ruled out by a non-positional specialized faithfulness constraint like Ident-[−cont]-[retroflex].

[25] This has also subsequently been used as an argument against surface correspondence analyses of consonant harmony - see Jurgec (2010:321), for example.

[26] This is an observation also noted by Hansson (2007)

locality matters for correspondence or not is a matter of the constraints involved and how they interact.

2.3.3.6. Handling directionality with CC·Limiter constraints

Directionality is an unresolved issue in surface correspondence theory. As §2.2.3.4 pointed out, the direction of correspondence-driven assimilation does not follow from the CORR constraints & CC·IDENT constraints that enforce agreement. These constraints favor correspondence and agreement on the surface, but this output can be achieved equally well by assimilation from right to left, or from left to right. The choice between these two possibilities is determined by other factors. I do not take up the issue of directionality in detail in this dissertation, but some of the factors that affect it are identified below, with the patterns they give rise to.

2.3.3.6.1. Value-dominant harmony

Value-dominance refers to agreement that favors one value of the agreeing feature over the other (Baković 2000). This can arise from correspondence in two ways: markedness, and value-specific faithfulness.

The tableau in (53) shows how markedness constraints can tip the balance in agreement interactions. The input here has one voiceless consonant, and one voiced one. Both consonants are required to correspond by CORR·[Labial], and agreement for voicing is demanded by CC·IDENT-[voice]. Both of these constraints can be satisfied by agreement in either direction: the /b/ can assimilate to the voicelessness of the earlier /p/ (a), or the /p/ can assimilate to the voicing of the /b/ to its right (b). The surface correspondence constraints narrow the competition down to these two agreeing candidates, but do not decide between them. A markedness constraint like *[+voice] can break this tie. This constraint penalizes all voiced segments. In doing so, it penalizes agreement to [+voice], and favors agreement to [–voice]. The result is 'assimilation to the unmarked', an interaction well-understood from the literature on other kinds of agreement (Baković 2000, Lombardi 1999).

(53) Value-dominant harmony from markedness

Input: p…b Output: p…p, *b…b		CORR· [Labial]	CC·IDENT- [voice]	*[+voice]	**Remarks**
☞ a.	$p_1 \ldots p_1$ $\mathcal{R}$:{p p}	(0)	(0)	(0)	LtoR assim.
~ b.	$b_1 \ldots b_1$ $\mathcal{R}$:{b b}	(0)	(0)	**W** **(0~2)**	RtoL assim
~ c.	$p_1 \ldots b_1$ $\mathcal{R}$:{p b}		W (0~1)	W (0~1)	faithful corr.
~ d.	$p_1 \ldots b_2$ $\mathcal{R}$:{p}{b}	W (0~1)		W (0~1)	faithful non-corr.

So, general markedness constraints can do the job of deciding between two agreeing & correspondent candidates. The result is harmony that favors assimilation to the unmarked outcome, regardless of linear direction. The constraint system in in (46) favors voicing agreement that produces [–voice] consonants, no matter what order the /b/ & /p/ are in, because *[+voice] penalizes agreement that yields more voiced consonants.

Breaking the tie between two agreeing candidates requires only that some constraint favors one outcome over the other. This constraint does not necessarily have to be a markedness constraint – value dominance can also arise from faithfulness constraints specific to one value of a feature (along the lines of Pater 1999; see also McCarthy & Prince 1995/1999, Rose & Walker 2004). This is illustrated in (54) below.

Here, faithfulness for [±voice] is split into two constraints: IDENT-[–voice] prohibits mapping /p/→[b], while IDENT-[+voice] prohibits mapping /b/→[p]. The relative ranking of these constraints can determine which value is chosen for agreement. The agreeing candidate that wins is the one that satisfies the higher of the two IDENTS. If IDENT-[+voice] » IDENT-[–voice] as in (54), the result is harmony where [+voice] is chosen for agreement at the expense of being unfaithful to underlying [–voice] specifications.

(54) Value-dominance from split-value faithfulness

Input: p…b/ Output: b…b, *p…p		CORR· [Labial]	CC·IDENT- [voice]	(IO) IDENT- [+voice]	(IO) IDENT- [–voice]	**Remarks**
☞ a.	$b_1…b_1$ $\mathcal{R}$:{b b}	**(0)**	**(0)**	(0)	(1)	R-to-L assim.
~ b.	$p_1…p_1$ $\mathcal{R}$:{p p}	**(0)**	**(0)**	**W** **(0~1)**	**L** **(1~0)**	L-to-R assim
~ c.	$p_1…b_1$ $\mathcal{R}$:{p b}		W (0~1)	e (0~0)		faithful corr.
~ d.	$p_1…b_2$ $\mathcal{R}$:{p}{b}	W (0~1)			L (1~0)	faithful non-corr.

Since the primary focus of this dissertation is dissimilation, the issue of value-dominant harmony does not play a central role. As such, the analyses presented in the following chapters for the most part do not require us to distinguish between IDENT-[+F] and IDENT-[–F] (only the analysis of Obolo in chapter 5 requires them to be ranked differently). For simplicity of presentation, I will conflate split-value IDENT constraints together where feasible.

Under a symmetric surface correspondence relation, it is also possible to derive dominance reversal effects: harmony can have one value as dominant, but switch to the other value under some circumstances. An example of this is nasal harmony in Tiene (discussed by Hansson 2001:118-120; see also Hyman 2006, Hyman & Inkelas 1997/1999, Ellington 1977). Nasal harmony in Tiene produces nasality agreement, but the result can be either two nasals or two non-nasals – the outcome depends on the segments involved. An affixal /l/ will surface as [n] in the context of a stem-final nasal; however, an affixal /s/ will not nasalize, and instead induces *denasalization* of a stem-final /m/ to [b]. Thus, /l…m/ surfaces as [n…m], with right-to-left harmony to [+nasal], while /s…m/ surfaces as [s…b], with left-to-right harmony to [–nasal]. The interacting segments each correspond with one another, and they end up agreeing one way (by nasalization of one C) or another (by denasalization of the other C). This result is expected if correspondence is symmetric, but not if it's asymmetric.

2.3.3.6.2. Positional faithfulness & Position-controlled patterns

In a harmony system, a tie between two agreeing candidates can also be broken by positional faithfulness constraints; this results in 'positional control' effects, on the same order as stem-control in harmony (Baković 2000, Hansson 2001/2010).

This is illustrated in (55) below, using a positional faithfulness constraint (Beckman 1998) specific to segments within the stem, IDENT-Stem-[voice]. This constraint produces stem-controlled harmony. The two harmonized candidates (a) & (b) tie on the surface correspondence constraints, as well as on regular IDENT-[voice]. But, if one is contained in a stem and the other is not, then stem-specific faithfulness favors the agreement that allows the stem-internal consonant to surface faithfully.

(55) Positional faithfulness makes the faithful position control harmony

	Input: ⟨p⟩…b/ Output: ⟨p⟩…p	CORR·[Labial]	CC·IDENT-[voice]	IDENT-[voice]	IDENT-Stem-[voice]	**Remarks**
☞ a.	⟨p_1⟩…p_1 $\mathcal{R}$:{p p}	(0)	(0)	(1)	(1)	LtoR assim.
~ b.	⟨b_1⟩…b_1 $\mathcal{R}$:{b b}	(0)	(0)	**e (1~1)**	**W (0~1)**	RtoL assim
~ c.	⟨p_1⟩…b_1 $\mathcal{R}$:{p b}		W (0~1)	L (1~0)		faithful corr.
~ d.	⟨p_1⟩…b_2 $\mathcal{R}$:{p}{b}	W (0~1)		L (1~0)		faithful non-corr.

(Stem edges marked with angle brackets)

Hansson (2001/2010) identifies numerous examples of stem-control in consonant harmony. The analysis of Obolo in chapter 5 shows how the same approach can be extended to other positional faithfulness constraints: Obolo has onset-controlled nasal harmony within syllables.

2.3.3.6.3. Strict right-to-left harmony can be derived by CC·ANCHOR-R

Previous work in the ABC literature has observed that strict right-to-left directionality is a universal tendency across consonant harmony systems (Hansson 2001/2010; see also Rose & Walker 2004). Strictly right to left harmony can be derived from a symmetric correspondence relation in the same method as stem-control, by using a positional faithfulness constraint defined in terms of correspondence classes. A tentative formulation of this is CC·ANCHOR-R (56), inspired by the Anchor constraints of Nelson (2003).

(56) CC·ANCHOR-R-[F]: ‘if a C is rightmost among its SCorr class, it is faithful for [±F]’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X precedes Y, *and*
c. there is no other Z that corresponds with Y and is preceded by Y, *and*
d. The [±F] value of Y differs from the [±F] value of its input correspondent Y’

This constraint can effectively nail down the rightmost correspondent in a class as faithful; it results in a position-controlled pattern like that in (55), but where control of harmony to the rightmost correspondent in the class. If a group of consonants must agree, and the rightmost one cannot be changed, then any assimilation must happen in the others – meaning that the Cs on the left change to match the one on the right. The result is strictly right-to-left assimilation. This is shown in (56) below.

(57) CC·ANCHOR-R can force right-to-left harmony

Input: /p…b/ Output: [b…b]		CORR· [Labial]	CC·IDENT-[voice]	IDENT-[voice]	CC·ANCHOR-R-[voice]	Remarks
☞ a.	$b_1…b_1$ $\mathcal{R}$:{b b}	(0)	(0)	(1)	(0)	R-to-L assim.
~ b.	$p_1…p_1$ $\mathcal{R}$:{p p}	(0)	(0)	e (1~1)	W (0~1)	L-to-R assim.
~ c.	$p_1…b_1$ $\mathcal{R}$:{p b}		W (0~1)	L (1~0)		faithful corr.
~ d.	$p_1…b_2$ $\mathcal{R}$:{p}{b}	W (0~1)		L (1~0)		faithful non-corr.

I posit CC·ANCHOR-R tentatively; it is not crucial for any of the analyses pursued in the following chapters. It is also unusual among the CC·Limiter constraints: other limiters are markedness constraints, but CC·ANCHOR-R is crucially a faithfulness constraint.

Note that while CC·ANCHOR-R can impose directionality on agreement, it does not have the same effect in dissimilation. In the SCTD, dissimilating segments necessarily *don't* correspond with each other. This means that CC·ANCHOR-R does not necessarily prefer right-to-left dissimilation. If /p...b/ dissimilates to [t...b],{t}{b}, then it violates CC·ANCHOR-R, because the dissimilated {t} is rightmost in its class and is not faithful. By the same token, dissimilation of /p...b/ to [p...d],{p}{d} also violates CC·ANCHOR-R, because of the unfaithful [d]. Explanations of directionality that work for harmony don't necessarily hold for dissimilation in a parallel way, because they are based on surface correspondence structures that aren't parallel.

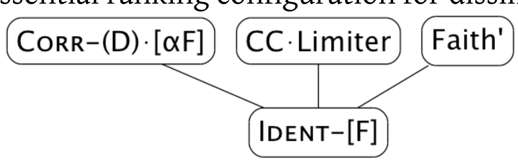
The focus of this dissertation is to develop surface correspondence as a theory of long-distance dissimilation. Directionality of alternations is an unresolved issue, but one that is largely tangential to the basic approach to dissimilation, and so I will not take this question up in full. The only substantive point I want to make about directionality is that the theory is not silent on the matter – it offers a number of prospects for further work. The most notable of these is that directionality effects can arise from interactions of the constraints, rather than being stipulated in the definition of the correspondence relation.

2.4. How dissimilation arises, and what it means

Dissimilation occurs, in the theory advanced here, only when two (or more) consonants are required – by a CORR constraint – to correspond, and where some constraint – one of the CC·Limiter constraints – penalizes faithful correspondence between them, and where both of those constraints dominate faithfulness for their shared feature(s). This interaction is summarized schematically in the list of criteria in (58). This corresponds to the ranking configuration depicted in (59) - this is the basic set of ranking conditions needed for dissimilation to happen. The constraint given as ‘Faith’’ in this diagram represents other faithfulness constraints beyond faithfulness for the feature that spurs correspondence (Ident-[F]) (the ranking Faith’» Ident-[F] represents all other factors being held constant, per (58d)).

(58) Necessary criteria for dissimilation to occur:
A pair of input segments /X,Y/ will dissimilate to [X,Z] only if:
a. X & Y are subject to a requirement for correspondence
(They share a feature, and are both in the domain of scope of a Corr constraint)
b. Correspondence between X & Y is *not* permitted (in that configuration)
c. X & Z are *not* required to correspond (in that configuration)
d. The configuration of X,Y,Z cannot be changed

(59) Essential ranking configuration for dissimilation



The criterion in (58a) represents the effect of the Corr constraint, and (58b) represents the effect of a CC·Limiter constraint that favors their dissimilation (and disfavors faithful correspondence).

Two other requirements must hold as well, in (58c) & (58d). First (58c), the result of doing dissimilation must be a pair of consonants that are ostensibly *not* required to correspond – dissimilation happens to escape from a correspondence requirement, so the dissimilated segment cannot be subject to the original correspondence requirement. This means that the Corr constraints control what type of dissimilation happens: minimally, a dissimilating segment needs to escape from the class of segments over which the correspondence is required. Second (57d), in order for dissimilation to happen, it must be the optimal way of achieving satisfactory non-correspondence. Since it is not necessarily the only way of doing so, other factors must be fixed. This means that faithfulness for the dissimilating feature (IDENT-[F]) must be dominated by whatever faithfulness constraints (represented as Faith' in (58)) penalize other ways of achieving non-correspondence – for instance, constraints like Linearity to prohibit metathesizing one consonant so that it is not in a CVC configuration with another.

For example, suppose the CC·Limiter constraint is CC·SROLE. This constraint penalizes onset-coda correspondence, so it favors dissimilation when an onset & coda are required to correspond. But, an alternative to dissimilation in this case is metathesis. If we can freely rearrange the consonants to make their syllable roles whatever we wish, then dissimilation is not necessary. An onset-coda pair of consonants could, instead of dissimilating, change their positions to be a pair of onsets (or a pair of codas). Dissimilation must occur only when the non-dissimilatory alternatives are ruled out. This comes down to faithfulness for the dissimilating feature relative to the constraints violated by those alternative solutions.

Note that the same interaction between faithfulness constraints applies to consonant harmony as well. The CC·IDENT constraints that demand agreement are CC·Limiter constraints like any other: they favor assimilation only because they penalize correspondence between disagreeing consonants. In order for assimilation to happen, faithfulness for the assimilating feature must dominate faithfulness for the feature that defines the harmonizing class. CORR constraints rule out faithful non-correspondence, and CC·Limiter constraints rule out faithful correspondence. The choice among remaining alternatives – dissimilation and assimilation among them – comes down to the ranking of other (faithfulness) constraints.

Extrapolating from the criteria in (58), we can identify specific cross-linguistic and typological predictions made by any given set of surface correspondence constraints. Three prominent predictions are presented below. In chapters 3–6, I examine how these predictions are borne out in specific languages, and chapter 9 considers them from a typological perspective, based on a large cross-linguistic survey of long-distance dissimilation patterns.

2.4.1. Typology of dissimilation

Dissimilation, in the surface correspondence theory developed here, happens as an escape from correspondence requirements. Since the CORR constraints are what impose those requirements, it is the CORR constraint in a dissimilation system that determines which feature must dissimilate. Extrapolating from this leads to a typological prediction: the set of CORR constraints determines the typology of dissimilation. If there is a CORR constraint that targets some feature, then dissimilation of that feature is predicted to be possible. This is significant because previous investigations of the typology of harmony suggest that the CORR constraints may not be a complete and uniform set: there may be CORR constraints for some features, but not others. The result is a typology with gaps: if there is no CORR constraint for a given feature, then dissimilation for that feature should never be necessary. Further consideration of this prediction is taken up in chapter 9, which looks at the typology of attested dissimilation patterns.

2.4.2. Where dissimilation happens

Limiting correspondence favors dissimilation: the CC·Limiter constraint in a basic dissimilation system crucially penalizes dissimilation, and this is the basis for consonants to dissimilate instead of remaining faithful and satisfying the CORR constraint by corresponding. This means that the CC·Limiter constraints are what determine *where* dissimilation happens. Dissimilation happens only where correspondence is penalized, and the CC·Limiter constraints are what impose those penalties.

2.4.3. Relation to harmony and the Mismatch property of SCTD

CORR constraints and CC·Limiter constraints both participate in not just dissimilation, but also consonant harmony; consequently, it follows from the surface correspondence theory of dissimilation that dissimilation should be typologically related to consonant harmony in predictable ways. This prediction is independent of assumptions about exactly which constraints comprise the set of surface correspondence constraints: regardless of how the constraints are defined, they necessarily have effects on both harmony and dissimilation. And, ideally, those effects should be observable in both of these empirical domains.

The general outcome is a consistent mismatch between the typologies of dissimilation and consonant harmony. This mismatch property of the theory follows from how the constraints on correspondence relate to harmony and to dissimilation, even irrespective of what those constraints are. Individual surface correspondence constraints predict complementarity of harmony & dissimilation. As such, the typologies of the two phenomena are predicted to be different in consistent ways, no matter what the set of CORR and CC·Limiter constraints includes. Any specific hypothesis about what is included in the set of surface correspondence constraints comes with specific predictions about both harmony and dissimilation.

CORR constraints determine the segments that required to agree in a harmony system, and they also determine the features that alternate in a dissimilation system. Consequently, the features that undergo dissimilation should correlate not with the features that harmonize, but with the features that define the classes of segments that undergo harmony. If there exists a CORR constraint that refers to a particular feature, then it predicts *both* dissimilation for that feature, and also harmony among the class of consonants that share that feature. Thus, if there is a constraint CORR·[+liquid] that demands correspondence among liquid consonants, it should give rise to *both* (i) harmony among liquid Cs, for some other feature (e.g. for laterality; /r…l/ → [l…l]), *and* (ii) dissimilation for [+liquid], producing alternations between liquids and non-liquids (e.g. /r…r/ → [r…t]).

Limiter constraints inhibit correspondence, and give rise to dissimilation; as such, the prediction is that limits on harmony correlate with the occurrence of dissimilation, rather than correlating with limits on dissimilation. Thus, if harmony bounded to within some domain is attested, we expect to find dissimilation across the edge of that domain, rather than dissimilation bounded within it – both are consequences of the same CC·EDGE constraint.

2.4.3.1. CORR constraints and the Mismatch property

Regarding the CORR constraints, the Mismatch property of the SCTD predicts that the set of features which dissimilate should correlate with the classes over which harmony occurs. The theory *does not* predict that the features that dissimilate should correlate with the features on which agreement is enforced in consonant harmony. What the surface correspondence theory predicts, instead, is that if there is dissimilation for a feature, then there can be harmony among the class of segments that share that feature.

2.4.3.2. CC·Limiter constraints and the Mismatch property

Regarding the CC·Limiter constraints, the Mismatch property predicts that there should be a correlation between observed limits in consonant harmony and necessary conditions observed for dissimilation. That is, if a given CC·Limiter constraint exists in CON, then it can both inhibit harmony, and favor dissimilation. For example, if there is a constraint CC·EDGE-(Stem), then we expect to find languages where consonant harmony is bounded by the edges of the stem domain, and we also expect to find languages where dissimilation happens only *across* the edge of the stem domain. And, in fact, we do find this: for instance, Kinyarwanda manifests both of these stem-edge effects (as chapter 3 will show). A similar parallelism is also found for both CC·SYLLADJ & CC·SROLE in Sundanese (see ch. 4), and other languages show the same thing for the rest of the CC·EDGE family, and for the CC·IDENT constraints (see ch. 5 & ch. 6).

The mismatch prediction as it relates to CC·Limiter constraints comes with some qualifications. The theory does not predict that *all* attested restrictions on consonant harmony must have analogs in dissimilation. For instance, the CORR constraints take scope only over a specified domain; as such, two consonants may fail to harmonize simply because they aren't in that domain. So, the domain limits inherent to CORR constraints can produce restrictions on consonant harmony as well – restrictions that aren't due to the influence of any CC·Limiter constraint. As such, the theory doesn't predict *all* of the conditions where harmony fails must also be conditions that dissimilation depends on. Rather, the prediction is about the constraint set: a given CC·Limiter constraint can both cause harmony to fail, and cause dissimilation to happen. It doesn't predict that the CC·Limiter constraints are the full story for all restrictions on harmony patterns.

2.4.3.3. Harmony & dissimilation in the same language

Another prediction not explicitly identified above is that two consonants cannot both harmonize and dissimilate simultaneously. Harmony is agreement by correspondence: consonants must agree only if they correspond. Conversely, dissimilation is escape from correspondence: consonants that dissimilate do not correspond. As such, the surface correspondence theory of dissimilation predicts that a language may exhibit both consonant harmony and dissimilation, but they must have mismatching distributions. It is not possible for agreement for one feature to be enforced on consonants that dissimilate for another feature. This follows from correspondence being a single relation, and an equivalence relation. Consonants either correspond or don't – they cannot correspond and also *not* correspond at the same time.

This prediction appears to be accurate cross-linguistically, as will be seen in the analyses of Kinyarwanda & Sundanese in the next two chapters. Kinyarwanda is a language that exhibits both dissimilation and harmony (both mentioned briefly in examples in §2.3 above), and it bears this prediction out: the consonants that harmonize never dissimilate, and vice versa. In Sundanese, the effect is even more obvious: this is a language that also has both harmony & dissimilation, and where both processes involve the same segments – it has rhotic dissimilation and liquid harmony for laterality. The finding in Sundanese is the same complementarity: harmony occurs only in structural contexts where dissimilation fails to occur, and vice versa.

2.4.3.4. The Mismatch property & other theories

The Mismatch property is a significant point of difference between surface correspondence and alternative theories of dissimilation – especially those that link dissimilation & assimilation together.

A number of authors have previously tried to derive dissimilation & assimilation from the same mechanism; these theories predict that dissimilation and harmony should be matched, and not mis-matched. For instance, Yip (1989) proposes to derive both agreement and dissimilation from the OCP, with assimilation being interpreted as OCP-driven autosegmental fusion. Jurgec (2010) does the same thing albeit with alignment constraints instead of the OCP; see also Gallagher (2010) the same basic approach with perceptual distinctness constraints in lieu of OCP constraints. Yoking both phenomena together in this way predicts that the typologies of dissimilation and harmony should match up: if there is dissimilation for one feature, there can be assimilation for it as well, and vice versa. What the surface correspondence theory predicts, instead, is that if there is dissimilation for a feature, then there can be harmony among segments that share that feature.

The SCTD also predicts that domains will be mismatched in harmony and dissimilation, in the same manner as features. CC·EDGE constraints give rise to edge-bounded harmony, and also give rise to cross-edge dissimilation – *not* edge-bounded dissimilation. The consequence for the typology is that domains are predicted to behave oppositely in harmony and in dissimilation: if a domain bounds harmony, then it enables dissimilation across it. The same logic holds in the other direction as well: if dissimilation happens across a particular domain, the prediction is that harmony may be bounded by that domain – not that harmony may depend on crossing that edge.

Chapter 3
Kinyarwanda: The effects of domain edges, and the adequacy of a single SCorr relation

3.1. Introduction

Kinyarwanda is a Bantu language (sub-group J.60) spoken in Rwanda, which exhibits two long-distance consonant interactions. The first is sibilant harmony: sibilants agree for retroflexion within the stem domain, which consists of the root plus suffixes (as in many Bantu languages; see §3.2.1 below for details). The second interaction is a dissimilation pattern known as Dahl's law: voiceless stops in prefixes dissimilate to voiced stops if the stem-initial consonant is voiceless. These are illustrated in (1) & (2) below; in each output form, the stem is marked off by '⟨ ⟩'. These alternations are represented schematically in (3) & (4).

(1) **Sibilant Harmony**: /s z/→ [ʂ ʐ] before another /ʂ ʐ/ later in the verb stem.
(Example from Kimenyi 1979:43[1])

a.	/ku-**s**a**s**-ii**ʂ**-a/ →	gu⟨**ʂ**a**ʂ**ii**ʂ**a⟩	'to cause to make the bed'
b.	cf. /ku-sas-a/ →	gu⟨sasa⟩	'to make the bed'

(2) **Dahl's Law**: /k t/ → [g d] in prefixes, before a stem-initial voiceless consonant.
(Examples from Kimenyi 1978:17, 1979:65)

a.	/**k**u-**k**óɽ-a/ →	**g**ú⟨**k**oɽa⟩	'to work'
b.	cf. /kú-βon-a/ →	kú⟨βona⟩	'to see'

[1] Kimenyi (1978, 1979) terms this 'palatal harmony', and describes the relevant post-alveolar fricatives as pre-palatal (i.e. as [ʃ ʒ]). For consistency, I have adapted Kimenyi's transcriptions to match the transcription conventions used in more recent work (Mpiranya & Walker 2005, Walker & Mpiranya 2006, Walker, Byrd & Mpiranya 2008).

(3) Sibilant Harmony, schematized:
⟨$_{\text{stem}}$ S … Ṣ ⟩ → ⟨$_{\text{stem}}$ Ṣ … Ṣ ⟩

(4) Dahl's Law, schematized:
…T V. ⟨T …⟩ → …D V. ⟨ T …⟩

Both of these patterns share the characteristic of operating over distance – minimally, across an intervening vowel. Though each pattern is subject to various other morphological and phonological conditions, they also share the characteristic of being sensitive to the prefix-stem boundary. Sibilant harmony is confined to within the stem; although it can (optionally) hold across multiple syllables, harmony never extents past the stem edge, to sibilants in prefixes (5).

(5) Harmony happens only within the stem, not across the stem edge

a.	/zi-saʐ-e/	→ zi⟨ʂaʐe⟩	'it$_{\text{CL.10}}$ became old (perf.)'
		*ʐi⟨ʂaʐe⟩	
b.	/zi-ːʐ-e/	→ zii⟨ʐe⟩	'it$_{\text{CL.10}}$ came (perf.)'
		*ʐii⟨ʐe⟩	

Dissimilation, on the other hand, occurs *only* across the stem edge (6); it does not happen between consonants that both inside the stem (6a), or both outside it (6b).

(6) Dahl's Law dissimilation occurs only across the stem edge, not inside or outside it

a.	/ba-kop-i-e/	→ ba⟨kopʲe⟩	'they gave a loan (perf.)'
		*ba⟨gopʲe⟩	
b.	/tu-ki-βon-a/	→ tuki⟨βona⟩	'we see it$_{\text{CL.7}}$'
		*duki⟨βona⟩	

In this chapter, I will show how the surface correspondence theory developed in chapter 2 can explain not just Kinyarwanda's sibilant harmony, but also the Dahl's Law dissimilation pattern. Unifying the assimilation and dissimilation as twin results of surface correspondence further explains the complementarity between the two patterns. The proposed analysis also shows how a single surface correspondence relation can cause two distinct patterns of assimilation and dissimilation, at the same time, in the same language. The analysis of Kinyarwanda also serves to demonstrate how the theory handles various recurrent phenomena in harmony and dissimilation systems, including domain bounding effects, locality conditions, and segmental blocking (examined further in chapter 8).

Kinyarwanda's sibilant harmony is analyzed as a type of Agreement By Correspondence (Rose & Walker 2004; Hansson 2001/2010; Walker 2000a, 2000b, 2001; see also ch. 2). Sibilants are required to correspond, and correspondent consonants are required to agree for retroflexion. This agreement is obtained by choosing the [+retroflex] value when it is underlyingly present, and changing underlyingly [–retroflex] sibilants to [+retroflex] as needed.

This retroflex harmony arises from the interaction of three kinds of constraint. CORR constraints targeting [+sibilant] require surface correspondence among sibilants. A CC·Ident markedness constraint requires surface correspondents to agree in retroflexion. Retroflexion assimilation occurs because these two markedness constraints dominate input-output faithfulness for retroflexion. In other words, the CORR & CC·IDENT constraints are satisfied by imposing agreement on correspondent sibilants, at the cost of violating the lower-ranked (IO)·IDENT-[retroflex] (in the ranking configuration CORR, CC·Limiter » IDENT). The agreement is confined to within the stem domain because CC·EDGE-(Stem) prohibits surface correspondence across the stem edge.

Dissimilation of voiceless consonants across the stem-prefix boundary also results from constraints on surface correspondence, but it reflects a different way of satisfying them – by not having correspondence. Like the analysis of sibilant retroflexion harmony, the interacting consonants are required to correspond with each other: a CORR constraint targeting [–voice] requires correspondence between voiceless consonants in adjacent syllables. Also like harmony, the alternation happens because correspondent consonants are subject to further requirements. CC·EDGE-(Stem), a structural limiter constraint, requires correspondent consonants to be on the same side of the stem edge – it prohibits correspondence across the edge. This combination of requirements leads to a dilemma for pairs of voiceless consonants that straddle the stem edge: they are required to correspond on the one hand, but forbidden from doing so on the other.

The Dahl's Law dissimilation alternation satisfies these two constraints by changing pairs of voiceless consonants to make them better as non-correspondents. Correspondence is based on similarity: consonants are required to correspond only because they share some feature. Changing a voiceless-voiceless pair of stops to a voiced-voiceless pair satisfies the requirement for correspondence between voiceless consonants. Pairs of consonants like [g...k] don't share the feature [–voice], so they don't need to correspond in order to satisfy CORR·[–voice]. Not having correspondence between them also satisfies CC·EDGE-(Stem): if two consonants don't correspond with each other, it doesn't matter whether they straddle the stem edge. So, dissimilation satisfies both the CORR and CC·Edge constraints, at the cost of violating faithfulness for voicing (as well as markedness against voiced obstruents, for that matter).

This unified account also explains the complementary relationship between sibilant harmony and Dahl's law. Harmony is a means of making consonants into better correspondents; it is contingent on them being in correspondence. Dissimilation, conversely, satisfies surface correspondence constraints by making consonants dissimilar enough that they're allowed to not correspond; it entails non-correspondence. Both patterns arise from the same surface correspondence relation: correspondence partitions the surface consonants of each candidate just once, not separately for each feature. Any effect that depends on surface correspondence depends on the one correspondence structure of the optimal form. Put differently, the one correspondence structure of any candidate is the basis for how it bears out sibilant harmony, and voiceless dissimilation, and any other correspondence-driven pattern in the language.

Since harmony is based on correspondence & dissimilation is based on non-correspondence, constraints that impose limits on correspondence can affect on both interactions at the same time, albeit in opposite ways. We see this with the constraint CC·EDGE-(Stem), which is undominated in Kinyarwanda. This means that consonants in the stem are allowed to correspond with each other, but not with consonants outside of the stem. Since correspondence is allowed within the stem, sibilant harmony occurs within this domain, and dissimilation does not. When consonants are separated by the stem edge, correspondence between them is forbidden: therefore, the stem edge has the effect of both obstructing sibilant harmony, and also enabling voiceless dissimilation. By limiting surface correspondence itself – regardless of which features incite correspondence – CC·EDGE-(Stem) causes both of these effects at the same time.

This inverse distribution of the two patterns matches the predictions of the surface correspondence theory, and follows from a single surface correspondence relation underpinning both phenomena.

3.2. Proposal

3.2.1. Representational Preliminaries

3.2.1.1. Morphological structure

The stem in Kinyarwanda consists of the root, and any suffixes; the word consists of the stem, and any prefixes. Prefixes are situated outside of the stem domain. This is the same structure posited in previous work on Kinyarwanda (e.g. Kimenyi 1979; Walker, Byrd & Mpiranya 2008).

(7) Morphological structure of Kinyarwanda
    Word = Prefixes + $\langle_{\text{STEM}}$ Root + Suffixes $\rangle$

The Bantuist literature traditionally recognizes a richer word structure than the one shown in (8). The stem domain is defined in the same way, but the word also includes additional domains. These are the 'macrostem', which consists of the stem plus object prefixes; and, for at least some authors (e.g. Yip 2002:110), the 'inflectional stem', which consists of subject and tense/aspect prefixes[2]. This fuller structure is shown in (9), following Poletto (1999) (see also Hyman & Ngunga 1994; Myers 1997; Downing 1998; Schadeberg 2003, among others).

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[2] There is also some variance in the use of the terminology. For example, the term 'stem' is sometimes used to refer to unaffixed roots (cf. Kisseberth & Abasheikh 2004, a.o.), and Myers (1997) uses 'macrostem' to refer to the 'Word' defined in (8) – including prefixes, and excluding only proclitics. Some interpretations of the stem also exclude the final vowel, but this is irrelevant here.

(8) Full Bantu verb structure

Word = [$_{\text{INFL STEM}}$ Sbj & TAM Pfxs]–[$_{\text{MACROSTEM}}$ Obj Pfxs ⟨$_{\text{STEM}}$ Root + Sfxs + final vowel⟩]

Ex:	ba-	ɽá-	-gu-	⟨-tuk-	-a⟩
	3.PL.SBJ	T	2.sg.obj	insult	-FV
	‘they insult you’				

I will assume only the simpler structure in (7) rather than the full structure in (8); this is only a matter of convenience. It is not problematic to recognize other domains like the macrostem, but the stem and the root are the only domains crucial for the analysis of Kinyarwanda.[3]

For ease of parsing examples, output forms will have the stem demarcated by angle brackets as in the examples above. Examples where a stem is given with no prefixes are preceded by ‘-’, e.g. as “-⟨sasa⟩”, following the same convention as Walker, Byrd & Mpiranya. For semantic reasons, some of these stem-only forms are not necessarily acceptable words on their own, but would be full words with the addition of the appropriate prefix(es).[4]

3.2.1.2. Segments and features

Three segmental features are pertinent for the analysis: voicing, retroflexion, and sibilance. Dahl’s Law is a pattern of voiceless dissimilation; it involves the voiceless segments, which are {p t c k pf ts ʈʂ f s ʂ ç h}. All other consonants are voiced – either voiced obstruents, or sonorants. Sibilant harmony holds over all sibilants: {s z ʂ ʐ}, and their counterpart NC sequences {ns nz ɳʂ ɳʐ}; it is not crucial to the analysis whether

[3] This is generally true for the other Bantu languages considered in this dissertation, including Zulu (ch. 7), and Kikongo & Oshindonga (ch. 2).

[4] Kinyarwanda uses bare stems as imperative forms, so stems with meanings appropriate for imperatives may be licit words in their own right. Other bare stems would (I presume) form grammatical words with the addition of one or more prefixes – subject, tense/aspect, and/or object markers for verb stems, and noun class markers for nominal stems.

these are interpreted as prenasalized consonants or clusters. This harmony is agreement for retroflexion, represented with the feature [±retroflex][5]. The [+retroflex] consonants are {ʂ ʐ t͡ʂ (ɳ) ɽ}; the alveolar sibilants {s z} are [–retroflex]. All other non-retroflex coronals (the alveolars and palatals) are assumed to be [–retroflex] as well; this is not crucial for the analysis of the basic harmony pattern, but it allows the analysis to explain certain blocking effects (see §3.4.3 for discussion).

The consonant inventory of Kinyarwanda is given in (9) (after Walker, Byrd & Mpiranya 2008:501). The consonants in parentheses occur only in limited distribution. [ɱ ɳ ŋ] are found only in homorganic NC clusters. Kimenyi (1979) interprets [b] as fortition of the fricative [β]; it occurs in NC clusters ([ᵐb]), and before glides (in [bw bj]), but [b] & [β] are not regarded as distinct underlying segments.

(9) Kinyarwanda consonant inventory

	plosive	nasal	fricative	affricate	flap	approximant
labial	p (b)	m	β	p͡f		w
labio-dental		(ɱ)	f v			
alveolar	t d[6]	n	s z	t͡s		
postalveolar (retroflex)		(ɳ)	ʂ ʐ	t͡ʂ	ɽ	
palatal	c ɟ	ɲ	ç			j
velar	k g	(ŋ)				
glottal			h			

[5] I use [±retroflex] as an expository convenience, since the relevant fricatives are transcribed as retroflexes. This feature could just as easily be [±anterior] instead, which would be consistent with Kimenyi's description of the relevant fricatives as palatal, and also consistent with Walker et al.'s findings that they are retroflexed (for at least the two speakers they measured).

[6] Walker et al. (2008) report that in NC sequences, retroflex [ɳɖ] is found instead of alveolar [nd]. They note that this is a departure from previous work (Kimenyi 1978, 1979; Mpiranya & Walker 2005, Walker & Mpiranya 2006). I will treat these sequences as alveolar /nd/, on the grounds that they behave like non-retroflex coronals in blocking sibilant harmony (examined in §3.4.3), and that [ɖ] otherwise does not occur in the language.

3.2.2. Sibilant harmony generalizations & their interpretation

3.2.2.1. The basic sibilant retroflex harmony pattern

Kinyarwanda exhibits retroflexion agreement among sibilants in the same stem. This agreement produces visible alternations when an alveolar sibilant in the root is followed by a suffix that contains a retroflex sibilant (10a-d), and before certain vocalic suffixes that cause systematic retroflexion of a preceding segment (10e-g).

(10) Sibilant Harmony examples: (Kimenyi 1979, Walker et al. 2008)

a.	/ku-uzuz-iiʂ-a/	→ ku⟨uʐuʐiiʂe⟩	‘to cause to fill’
		cf. ku⟨uzuza⟩	‘to fill’
b.	/ku-sooz-iiʂ-a/	→ gu⟨ʂooʐeeʂa⟩	‘to cause to finish’
		cf. gu⟨sooza⟩	‘to finish’
c.	/βa-n-ziz- + iʐe/	→ βaaɳ⟨ʐiʐiʐe⟩	‘they punished me (for sth) (perf)’
		cf. βaan⟨ziza⟩	‘they punished me (for sth) (imperf)’
d.	/ba-ɽez-iʐe/	→ ba⟨ɽeʐ-eʐe⟩	‘they just educated with’ (perf)
		cf. ba⟨ɽeza⟩	‘they educate with’ (imperf)
e.	/-sas- + i/	→ -⟨ʂaʂi⟩	‘bed maker’
		cf. -⟨sasa⟩	‘make the bed (inf)’
f.	/-soo^{n}z- + i/	→ -⟨ʂoo^{n}ʐi⟩	‘victim of famine’
		cf. -⟨soo^{n}za⟩	‘be hungry (inf)’
g.	/-sas- + i-e/	→ -⟨ʂaʂe⟩	‘make the bed (perf.)
		cf. -⟨sasa⟩	‘make the bed (inf)’

In (10e-g), sibilant harmony is induced by derived retroflex sibilants. In these forms, a root with two sibilants is followed by the agentive nominal suffix /-i/ (10e-f), or the other form of the perfective marker, /-i-e/ (10g). These suffixes trigger a regular set of changes to root-final consonants, a morphological pattern that Kimenyi (1979) calls ‘consonant mutation’. Part of this consonant mutation pattern involves alternations between alveolar sibilants and retroflex ones (11)[7]. The forms in (10e-g) are evidence for sibilant harmony because the root-final, "mutated", retroflex sibilants cause retroflexion of another preceding sibilant in the stem. That is, (10e) /-sas-i/ 'bed maker' comes out as [-⟨ʂaʂi⟩], and not as *[-⟨saʂi⟩]: it has two retroflex sibilants, instead of just the one retroflex expected from the usual consonant mutation before the agentive suffix /-i/.

(11) Suffix-induced alveolar ~ retroflex mutations are independent of harmony:

a.	/-t͡ʂiimbaɽaz- +i-e/	→ -⟨t͡ʂiimbaɽaʐe⟩	'make drink slowly (perf)' (Mpiranya & Walker 2005)	
b.	/umu-ɽas-i/	→ umu⟨ɽaʂi⟩	'a shooter'	
		cf. kú⟨ɽasa⟩	'to shoot'	(Kimenyi 1979:45)

I will not take up a full analysis of the consonant mutations in (11), but it is necessary to note that they are morphological in nature. The appearance of retroflex sibilants in (11) is not something predictable from the regular phonotactics of Kinyarwanda. The examples in (12) show that an alveolar sibilant can otherwise occur before [i] (12a), and a retroflex sibilant may occur before vowels other than [i] (12b). Thus, Kinyarwanda's retroflex sibilants cannot be generally analyzed as underlying /S+i/ sequences: their distribution is not predictable apart from the harmony pattern.

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[7]According to Kimenyi's (1979:44-46) description of consonant mutation, coronals become palatalized (=retroflexed, in the case of sibilants), velars become coronals, labials have a palatal off-glide, and /h/ becomes [ç]. Stops also become fricatives or affricates, and /ɽ/ becomes [z]. Consonant mutation is also seen in example (9d) (from Kimenyi 1979:46). Kimenyi gives the underlying representation as /ba-rer-y-ye/; the base form [bareza] reflects an /r/→[z] mutation caused . This [z] changes to [ʐ] before the perfective suffix /-iʐe/, as seen in the harmonized form [bareʐeʐe]. Note also that the initial consonant in (9d) is transcribed by Kimenyi as [b] rather than [β], but it is the same 3rd-person class 2 prefix as the [βa-] in example (9c).

(12) S̢ & S are not in complementary distribution: (Walker et al. 2008:504)
   a. -⟨ziɽa⟩ ‘be forbidden (taboo)’
   b. -⟨ʐuuɽa⟩ ‘finish (intr)’
   c. -⟨ʂíɽa⟩ ‘thief’

3.2.2.1.1. An aside on the directionality of harmony

Retroflex assimilation in Kinyarwanda takes place only when an alveolar sibilant precedes a retroflex one. Thus, the harmony applies in a “right-to-left” manner[8] and the alternations it produces all involve agreement for [+retroflex] (rather than [–retroflex]). I don’t propose an account of these two aspects of the Kinyarwanda pattern here; the focus of this chapter is not the harmony itself, but how it relates to dissimilation. See chapter 2 (§2.3.3.6) for discussion of how these kinds of directional and featural asymmetries can be derived using the symmetric model of surface correspondence advanced here.

3.2.1.2. Stem-bounding in sibilant harmony

Kinyarwanda’s sibilant harmony is a stem-bounded pattern: sibilants outside the stem, in prefixes, never harmonize with sibilants in the stem (Mpiranya & Walker 2005:6). This is illustrated in (13). The stem-bounding effect holds regardless of whether the retroflex in the stem is underlying or derived (13a vs. 13b), and whether or not retroflexion assimilation occurs within the stem (13b vs. 13c). It also holds even between sibilants in adjacent syllables – the configuration where agreement is mandatory, not optional (see §3.2.1.3 below).

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[8] Kinyarwanda has no suffixes with underlying non-retroflex sibilants. Mpiranya & Walker (2005:16) note one example with an [ʂ…s] output sequence derived by spirantization of /ɽ/: [-⟨ógeeʂeɽeza⟩] ‘wash for/with’ (⟨ /-óg-iiʂ-iɽ-iɽ-i-a/), which suggests that harmony does not apply between a retroflex sibilant and a following alveolar one.

(13) **Stem-Bounding**: retroflexion harmony applies only to sibilants within the stem, not those outside it (Mpiranya & Walker 2005:6, except where noted)

a. /si-n-ki-⟨ʂ̺aak-a⟩/ → sii.ŋ-gi.⟨ʂ̺aa.ka⟩ *ʂ̺iiŋ⟨giʂ̺aaka⟩ 'I don't want it'[9]
b. /zi-⟨saaz-i-e⟩/ → zi.⟨ʂ̺aa.ʐe⟩ *ʐi⟨ʂ̺aaʐe⟩ 'it$_{(10)}$ became old (perf.)'
c. /zi-⟨:z-i-e⟩/ → zii.⟨ʐe⟩ *ʐii⟨ʐe⟩ 'it$_{(10)}$ came (perf)'

The stem-bounding effect in sibilant harmony is interpreted as bounding of the correspondence relation that harmony is based on. That is, sibilants within the stem may correspond, but a group of correspondents may never straddle the edge of the morphological stem. This prevents prefix sibilants from corresponding with those in the stem, which in turn prevents the retroflex agreement from applying into the prefixes.

3.2.1.3. Locality in sibilant harmony

Sibilant harmony in Kinyarwanda is also subject to a locality condition: sibilants are only required to agree when they are in adjacent syllables (Walker, Byrd & Mpiranya 2008:504; see also Mpiranya & Walker 2005, Kimenyi 1979:43). This mandatory harmony is illustrated by the syllable-adjacent sibilants in (14), where disagreement is impossible. But, when two sibilants are in non-adjacent syllables, harmony is not required: it either does not occur (15a-e), or only optionally occurs (15f).[10]

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[9] Example (13a) is from Kimenyi (1979:70). Kimenyi lists a second variant form, [sii.ŋhi.⟨ʂ̺aa.ka⟩]. This variation is due to an optional pattern of post-nasal debuccalization, which is not relevant here; the significant point is that both variants have no sibilant harmony in the prefix [si-].

[10] Mpiranya & Walker (2005:16) note that harmony triggered by the causative suffix /-iiʂ̺/ optionally does not apply to stem-initial sibilants. I will not address this optionality in the analysis, but it can be explained straightforwardly by stem-initial positional faithfulness (Beckman 1998).

(14) **Syllable-Adjacency:** retroflex agreement is obligatory only between sibilants in adjacent syllables:

a. /-mes-iiʂ-a/ → -⟨me.ʂee.ʂa⟩ *-⟨meseeʂa⟩ 'cause to wash (cloth)'
b. /-baaz-iiʂ-a/ → -⟨baa.ʐii.ʂa⟩ *-⟨baa.zii.ʂa⟩ 'cause to plane' (Kimenyi 1978:19)
c. /-saaz- +i-e/ → -⟨ʂaa.ʐe⟩ *-⟨saaʐe⟩ 'become old (perf)'
d. /-siiz- +i-e/ → -⟨ʂii.ʐe⟩ *-⟨siiʐe⟩ 'level off (perf)'

(15) Harmony between sibilants in two non-adjacent syllables is not required:

a. /-som-iiʂ-a/ → -⟨so.mee.ʂa⟩ *-⟨ʂomeeʂa⟩ 'cause to drink'
b. /-ásam-iiʂ-a/ → -⟨á.sa.mii.ʂa⟩ *-⟨áʂamiiʂa⟩ 'cause to open mouth'
c. /-anzik-iiʂ-a/ → -⟨a.nzi.kii.ʂa⟩ *-⟨aɳʐikiiʂa⟩ 'make s.o. begin grinding'
d. /-soɽ-iiʂ-iʐe/ → -⟨so.ɽee.ʂe.ʐe⟩ *-⟨ʂoɽeeʂe.ʐe⟩ 'cause to pay tax (perf)'
e. /-síítaaz-i-e/ → -⟨síítaaʐe⟩ *-⟨ʂíítaaʐe⟩ 'make stub (perf)'
f. /-seɽuz-i-e/ → -⟨ʂeɽuʐe⟩ *or* -⟨seɽuʐe⟩ 'provoke (perf)'

The difference between non-harmony (15a-e) and optional harmony (14d) depends on the suffix(es) responsible for inducing the harmony, and also on the quality of the consonant in the intervening syllable(s). I will regard the non-harmonized possibility in (15a-e) as the basic case. The option of long-distance harmony is explained under an alternate ranking of the same constraints, following the same lines as Mpiranya & Walker (2005). Analysis of the optional non-local harmony is taken up in more detail in §3.4.2.

In a chain of three or more adjacent syllables that each contain a sibilant, harmony extends through all of them (16) (examples (a-g) from Kimenyi 1979:43, (h) from Walker et al. 2008:503).

(16) Sibilant Harmony over a chain of consecutive syllables:

a.	/ku-sas-iiʂ-a/	→ gu⟨ʂa.ʂii.ʂa⟩ *gu⟨sa.ʂii.ʂa⟩, *gu⟨sa.sii.ʂa⟩	‘to cause to make the bed’
b.	/ku-uzuz-iiʂ-a/	→ ku.⟨u.ʐu.ʐii.ʂa⟩	‘to cause to fill’
c.	/ku-soz-iiʂ-a/	→ gu.⟨ʂo.ʐee.ʂa⟩	‘to cause to finish’
d.	/ku-saz-iiʂ-a/	→ gu.⟨ʂa.ʐii.ʂa⟩	‘to cause to get old’
e.	/ku-soonz-iiʂ-a/	→ gu.⟨ʂoo.ɳʐee.ʂa⟩	‘to cause to get hungry’
f.	/n-sas-iiʂ-iʐe/	→ n⟨ʂa.ʂii.ʂi.ʐe⟩	‘I just caused (X) to make the bed’
g.	/a-zeseɽez- +i-e/	→ a.⟨ʂe.ʂe.ɽe.ʐe⟩	‘he miscut the nail (perf)’
h.	/βa-n-ziz- + iʐe/	→ βaa.ɳ⟨ʐi.ʐi.ʐe⟩	‘they punished me (for sth) (perf)’

Forms like (16) show that the one-syllable limit holds as a local restriction on the distance between one sibilant and the next, and not as a global limit over all sibilants in the whole stem. Sibilant harmony does not apply to a pair of sibilants in non-adjacent syllables, but a group of harmonizing sibilants *can* span across more than two syllables, so long as each sibilant is only one syllable away from the next. And, in these cases, the agreement appears to be fully mandatory: neither Kimenyi (1979) nor Mpiranya & Walker (2005) nor Walker et al. (2008) observe any optionality in forms like these[11]. The occurrence of harmony in these forms shows that correspondence between non-local sibilants is tolerated. The locality condition reflects a limit on the scope of the correspondence requirement, rather than the effect of a CC·Limiter constraint.

The “chaining” effect seen in cases like this is interpreted in the surface correspondence theory as correspondence being enforced over multiple overlapping domains. Correspondence is demanded (by the constraint CORR-CVC·[+sibilant])

[11] Kimenyi (1979:45) does not explicitly indicate that the non-harmonized equivalents of the forms in (15) are unacceptable. But, Mpiranya & Walker (2005:16) present some of the same forms, and explicitly mark the non-harmonized forms as unacceptable.

between any and every pair of syllable-adjacent sibilants. In a form like (16c) [gu.⟨ʂo.ʐee.ʂa⟩], there are two such pairs: (ʂ,ʐ) & (ʐ,ʂ). Since the root-final [ʐ] is syllable-adjacent to the [ʂ] in the following causative suffix, and is also syllable-adjacent to the [ʂ] that precedes it in the root, it is obligated to correspond with both [ʂ]s. Given the transitive nature of the SCorr relation, having both of these correspondences at the same time yields a single correspondence class, {ʂ ʐ ʂ}, that contains all three sibilants. CC·IDENT-[retroflex] evaluates agreement within each correspondence class, so correspondence among all three sibilants leads to agreement among all three.

3.2.2. Dahl's Law dissimilation

3.2.2.1. The basic voiceless dissimilation pattern

Dahl's Law is a pattern of voiceless dissimilation common across East African Bantu languages. Canonically, this dissimilation happens when a voiceless stop – most commonly /k/ – precedes another voiceless consonant in the following syllable (Bennett 1967, Kimenyi 1979:67, Davy & Nurse 1982, a.o.). This dissimilation most commonly manifests as a sporadic historical change in roots (Nurse 1979, Bastin 2003), but some languages exhibit Dahl's Law dissimilation synchronically (Davy & Nurse 1982).

In Kinyarwanda, Dahl's Law is synchronically active, and gives rise to productive voiceless-voiced alternations in prefixes. The dissimilation appears to hold over all voiceless consonants. The only voiceless consonants productively found in prefixes in

Kinyarwanda are /t/ and /k/[12]; they dissimilate to [d] and [g], respectively. This dissimilation can be caused by any voiceless consonant, including stops, fricatives, and /h/. Some examples are given in (17).

(17) Dahl's Law voiceless dissimilation, exemplified: (data from Kimenyi 1978, 1979)

a.	/**k**u-**k**óɽ-a/	→ **g**ú⟨**k**o.ɽa⟩	'to work' (infinitive prefix /ku-/→[gu])
b.	/**t**u-**p**im-a/	→ **d**u⟨**p**i.ma⟩	'we measure' (1.pl prefix /tu-/→[du])
c.	/a-**k**á-**s**ozi/	→ a.**g**a⟨**s**o.zi⟩	'hill' (Cl. 12 noun prefix /a-ka-/→[a.ga])
d.	/**k**i-**t**abo/	→ **g**i⟨**t**a.bo⟩	'book' (Cl. 7 noun prefix /ki-/→[gi])*
e.	/a-**k**a-**s**ek-a/	→ a.**g**a⟨**s**e.ka⟩	'and then he smiles' (Narr. pfx. /a-ka-/→[a.ga])
f.	/tu-**k**i-**h**-a/	→ tu.**g**i⟨**h**a⟩	'we gave it to (X)' (Cl. 7 V agr. pfx. /ki-/→[gi])
g.	/ɲo**k**o-**k**uɽu/	→ ɲó.**g**o⟨**k**u.ɽu⟩	'grand-mother' (/ɲoko/→[ɲogo])[13]

In the basic case, the dissimilation happens in a CVC configuration formed by the combination of a CV prefix with a following root. Thus, the two voiceless consonants are typically in adjacent morphemes, and in adjacent syllables, and are separated by only a short vowel. In this basic case, Dahl's Law appears to have no morphological exceptions. Based on the data provided by Kimenyi (1978, 1979), the dissimilation happens with all prefixes and roots that meet the morphological and locality conditions for alternations to occur. These criteria are detailed below.

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[12] /s/ and /h/ are also found in one prefix each. The only prefix with [s] is [sii-], which marks negation in verbs with 1st-person singular subjects. This prefix never occurs directly before the stem; it is always separated by at least the 1st-person subject marker /n-/, and any tense/aspect morphology. As such, it cannot occur in any contexts where the /s/ would be expected to dissimilate.
Kimenyi (1979) does not report any dissimilation for prefixal [h]s, though examples of them are rare. Underlying /h/ occurs only in the homophonous class 16 subject & object prefixes, both of which are /ha-/. The occurrence of this these prefixes seem to be rather uncommon: class 16 is restricted to locative terms, and Bastin (2003) notes that its occurrence is rare in the J group of Bantu, which includes Kinyarwanda. Prefixal [h] may also be derived in prefixes from voiceless stops. Kinyarwanda has a process that changes post-nasal voiceless stops to either [h] or corresponding voiced stops, e.g. /n-ka-kin-a/ → [ŋga⟨kina⟩] ~ [ŋha⟨kina⟩] 'and then I play' (Kimenyi 1979:69).

[13] The morpheme /ɲoko/ 'mother' usually behaves as a root, not a prefix; however, in (19h) it attaches to the beginning of a full stem /kuru/ 'big, great', and Dahl's Law is observed.

3.2.2.2. Locality in Dahl's Law: syllable-adjacency

Dahl's Law dissimilation happens only when two voiceless consonants are in adjacent syllables, as in the examples in (17) above. There is no dissimilation when two voiceless consonants are more than one syllable apart (18).[14] Note that dissimilation fails across any intervening syllable, even one containing another underlyingly voiceless consonant as in (18b). This is a point of difference between Kinyarwanda and some other languages that exhibit Dahl's Law (cf. Davy & Nurse 1982, Lombardi 1995; see also Suzuki 1998).[15]

(18) Syllable-Adjacency: No voiceless dissimilation between non-adjacent syllables (Examples from Kimenyi 1978, 1979).

a.	/i-**k**i-ma**s**a/	→ i.**k**i⟨ma.**s**a⟩, *i.**g**i⟨ma.**s**a⟩	'bull'
b.	/**t**u-**k**i-**s**om-a/	→ **t**u.**g**i⟨**s**o.ma⟩	'we read it'
c.	/ku-**t**á-**k**in-a/	→ kú.**d**á⟨**k**í.na⟩	'not to play'
d.	/u-**t**a-z̯eez̯ee**t**-a/	→ u.**t**a.⟨z̯ee.z̯ee.**t**a⟩	'who doesn't leak'
e.	/ɲó**k**ó-βú**k**we/	→ ɲo.**k**o⟨βu.**k**we⟩	'your mother-in-law'
f.	/n**t**í-ba-**k**oɽ-e/	→ n**t**í.ba.⟨**k**o.ɽe⟩	'that they not work'
g.	/ba-**t**a-ɽaa-**s**om-a/	→ ba.**t**a.ɽaa.⟨**s**o.ma⟩	'haven't they read it yet?'

The non-dissimilation in forms like (18) is interpreted as the lack of any required correspondence. The CORR constraint relevant for Dahl's Law is CORR-CVC·[–voice]: correspondence is required between voiceless consonants in a CVC

[14] Kimenyi (1979:68) also observes that dissimilation does not happen to voiceless consonants separated by a long vowel at the stem edge. This can be seen to follow from the same syllable-adjacency condition, if we interpret the relevant long vowels as bisyllabic. This issue is taken up in more detail in §3.4.

[15] For instance, in Southern Gikuyu, a string of multiple prefix /k/s yields multiple dissimilations: /ka-kaa-ke-ikia/ → [ɣa-ɣaa-ɣi-⟨ikia⟩] 'he (cl.12) will throw it (cl.7)' (Davy & Nurse 1982:164). Languages where Dahl's Law operates in this way present a significantly different pattern than Kinyarwanda, and thus require a different analysis. For Dahl's Law in languages like Southern Gikuyu, Lombardi (1995) argues for an analysis based on agreement. In her approach, the apparent 'extension' of dissimilation through chains of /k/s is actually the result of a rule that spreads voicing from one prefix to the next. It would be possible to construct an agreement by correspondence analysis based on this interpretation, but I will not take this up here.

configuration. The voiceless consonants in non-consecutive syllables in these examples are not in a CVC configuration. Therefore, they are not required to correspond with each other, so no dissimilation occurs.

3.2.2.3. The Cross-edge condition on Dahl's Law

Dahl's Law dissimilation occurs systematically only between consonants on opposite sides of a stem boundary. No dissimilation occurs when two syllable-adjacent voiceless consonants are both outside of the stem, in prefixes (19). There is also no dissimilation root-internally (20). Dahl's Law dissimilation in Kinyarwanda happens only across morpheme edges, never morpheme-internally, as Kimenyi (1979:65) points out.

(19) No prefix-to-prefix dissimilation (Kimenyi 1978, 1979)

a. /n**t**i-**k**i-**t**u-ku-ha-e/ → n**t**i.**k**i.**t**u.gu⟨he⟩ 'it shouldn't give us to you'
cf. *n**d**i.**k**i.**t**u.gu.⟨he⟩
*n**t**i.**g**i.**t**u.gu.⟨he⟩
*n**d**i.**g**i.**t**u.gu.⟨he⟩

b. /**t**u-**k**i-βona/ → **t**u.**k**i⟨βo.na⟩ 'we see it'

c. /**t**u-**k**i-vaŋg-a/ → **t**u.**k**i⟨vaa.ŋga⟩ 'we mix it'

d. /**t**u-**t**a-ku-kuund-a/ → **t**u.**t**a.gu⟨kuu.nda⟩ 'if we don't like you'

e. /**k**i-**k**a-ki-tem-a/ → **k**i.**k**a.gi⟨te.ma⟩ 'and then it cut it'

f. /nti-ba-zaa-na-**ki-ku**-íi-éerek-ir-a-ho/
→ nti.ba.za.a.na.**k**i.**k**wi.⟨je.re.ke.rá.ho⟩
'they won't even show it to you for themselves on it'

(20) No dissimilation root-internally (Kimenyi 1978, 1979)[16]

a. /ba-**k**o**p**-i-e/ → ba⟨**k**o**p**ʲe⟩ *ba⟨**g**o**p**ʲe⟩ 'they give a loan (perf)'

b. /zi-**t**a**t**u/ → zi⟨**t**a**t**u⟩ *zi⟨**d**a**t**u⟩ 'three'

c. /βa-ɽa-ku-**t**u**k**-a/ → βaɽágu⟨**t**u**k**a⟩ *βaɽágu⟨**d**u**k**a⟩ 'they insult you'

d. /tu-**t**ee**k**-a/ → du⟨**t**ee**k**a⟩, *tu⟨**d**ee**k**a⟩ 'we cook'

e. /ku-**t**wíí**k**-a/ → gú⟨**t**wíi**k**a⟩, *gu⟨**d**wii**k**a⟩ 'to burn'

---

[16] Note that the non-dissimilating consonants in (42) are /t/ and /k/, the two consonants for which the dissimilation can systematically be observed in prefixes. Kimenyi (1979) gives plenty of other examples of voiceless consonants co-occurring in roots; I have avoided examples with fricatives, as they can never be observed to dissimilate.

In the SCTD, cross-edge dissimilation is understood as the result of a limit on correspondence imposed by CC·Edge constraints. If two voiceless consonants are in adjacent syllables – i.e. in a CVC configuration – they are required to correspond. When they are both inside the stem, or both outside the stem, they satisfy this requirement with faithful correspondence. But, if two voiceless consonants are separated by the edge of the stem domain, correspondence between them is prohibited by CC·EDGE-(Stem). This forces them to satisfy the demand for correspondence between voiceless consonants by dissimilating, so that one is voiced, and no correspondence between them is necessary.

In the basic case, there is no dissimilation when a voiceless consonant in a suffix follows a root-final voiceless consonant. This is illustrated by the examples in (21). However, Kimenyi (1979) also reports that dissimilation *may* occur at the root-suffix boundary, though it "is sporadic" (p.70) and "applies only to a very small number of lexical items" (p.71). This is shown by the examples in (23); the root-suffix boundary is marked by '–' within the stem domain.

(21) General case: no dissimilation stem-internally, from suffix to root:[17]

a. /βa-andi**k**-iiʂ-a/ → βa⟨andi**k**-iiʂa⟩ ‘they write with’
cf. *βa⟨andi**g**-iiʂa⟩; no dissim. before causative sfx /-iiʂ/
b. /ku-**k**ó-iiʂ-a/ → gú⟨**k**o-oʂa⟩ ‘to make give bridewealth’
c. /ku-**k**é-iiʂ-a/ → gú⟨**k**é-eʂa⟩ ‘to make be day’

d. /ku-tu**t**-i**k**-a/ → gu⟨tu**t**-i**k**a⟩ no gloss, but cf. gu⟨tu**t**-a⟩
cf. *gu⟨tu**d**-i**k**a⟩; no dissim. before neutral sfx /-ik/
e. /ku-fa**t**-i**k**-a/ → gu⟨fa**t**-i**k**a⟩ cf. gu⟨fa**t**-a⟩, gu⟨fa**t**-ira⟩
*gu⟨fa**d**-i**k**a⟩

f. /ku-ʂu**k**-u**k**-a/ → gu⟨ʂu**k**-u**k**a⟩ cf. gu⟨ʂuk-a⟩, gu⟨ʂuk-ura⟩
*gu⟨ʂu**g**-u**k**a⟩; no dissim. before stative sfx /-uk/
g. /ku-bu**k**-u**k**-a/ → ku⟨bu**k**-u**k**a⟩ cf. ku⟨buk-a⟩, ku⟨buk-ura⟩
*ku⟨bu**g**-u**k**a⟩

(22) In only some lexical items, dissimilation from suffix to root: (Kimenyi 1979:70)

a. /ku-fút-ik-a/ → gú⟨fud-ika⟩, *gú⟨fut-ika⟩ ‘to make mistakes’
b. /ku-ʂót-ik-a/ → gú⟨sod-eka⟩ ‘to tie’
c. /ku-ɽit-uk-a/ → gu⟨ɽid-uka⟩ ‘to get uprooted’
d. /ku-sát-uk-a/ → gú⟨sad-uka⟩ ‘to split’

Analysis of this alternate dissimilation pattern is taken up in §3.4.1, and dissimilation in these cases is explained by an alternate ranking of the same constraints. The interaction is essentially the same as in the basic case: it’s dissimilation that occurs because correspondence is prohibited across the edge of a domain. The difference is that in this variation on the pattern, it’s not just the stem edge that behaves in this way, but also the edge of the root domain.

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[17] Examples (a)-(c) are from Kimenyi (1979); (d)-(g) are taken from a different word list constructed by Kimenyi (2009). This source does not include glosses or morpheme breakdown; the status of the forms in (d)-(g) as roots with a final voiceless C followed by a /-Vk/ suffix is based on the inclusion of words that appear to have the same root, either with no /-Vk/ suffix, or with other suffixes, e.g. the applicative /-Vɽ/.

3.2.3. The complementarity of the two patterns

The facts of sibilant harmony & Dahl's Law dissimilation presented above lead to convergent generalizations about the restrictions Kinyarwanda imposes on surface correspondence structures in general. These are stated in (23) & (24). First, correspondence is permitted between consonants inside the stem. The basis for this meta-generalization is that sibilant harmony (agreement predicated upon correspondence) occurs inside the stem, and dissimilation (favored by limits on correspondence) does not occur stem-internally. Second, correspondence across the stem edge is not permitted. The basis for this is that sibilant harmony (both the optional long-distance harmony, and the mandatory harmony between adjacent syllables) systematically fails to extend across the edge to sibilants in prefixes, while dissimilation occurs only across the edge.

(23) Surface Correspondence is permitted inside the stem:
   a. Sibilant harmony occurs within the stem domain
   b. Dissimilation does not occur within the stem

(24) Surface Correspondence across the stem edge is not allowed:
   a. Sibilant harmony is halted at the edge of the stem
   b. Dissimilation occurs across the edge of the stem

This sort of complementary relationship between dissimilation and harmony is a natural outcome of the theory of surface correspondence advanced here; it follows from the Mismatch property of the SCTD identified in chapter 2. Consonant harmony is Agreement-By-Correspondence (Rose & Walker 2004): it is agreement predicated on correspondence among the harmonizing consonants. Dissimilation is avoidance of correspondence requirements; it is a means of supporting non-correspondence between consonants, which occurs when having correspondence would incur some penalty (i.e. a violation of some constraint, in this case CC·EDGE-(Stem)). Consequently, the theory predicts that harmony & dissimilation can exist in complementary distribution around domain edges: a prohibition against cross-edge correspondence can simultaneously enable dissimilation and restrain harmony.

The relationship between sibilant retroflexion harmony and Dahl's Law in Kinyarwanda is squarely in line with the Mismatch property – it's a consequence of harmony and dissimilation both stemming from the same surface correspondence relation. The sensitivity to the edge of the stem domain, shared by both phenomena, is explained by the constraint CC·EDGE-(Stem).

CC·EDGE-(Stem) restricts surface correspondence generally: it imposes a restriction on the structure of the surface correspondence relation, regardless of what features or what CORR constraints inspires that correspondence. Consequently, this one Limiter constraint can affect multiple correspondence-driven interactions at once – and in Kinyarwanda, we see this happening. CC·EDGE-(Stem) is undominated in this language; it dominates the CORR constraints that want sibilants to correspond, and it also dominates the CORR constraint that requires voiceless consonants to correspond. The result is that correspondence across the stem edge is prohibited both in sibilant harmony, and in Dahl's Law: by restricting correspondence generally, it affects any and all patterns driven by lower-ranked CORR constraints.

Note that this doesn't mean that *any* limiter constraint always *must* affect both harmony & dissimilation. For instance, if one CORR constraint dominates CC·EDGE-

(Stem) and another Corr constraint is dominated by it, then the stem edge will affect one correspondence-based pattern but not the other. The more interesting point is that a single limiter constraint *can* affect two (or more) patterns at the same time. This situation is readily explained, because all correspondence-based interactions stem from a single correspondence relation.

Dahl's Law and sibilant harmony also share a locality sensitivity: both are mandatory only for consonants in adjacent syllables, and they happen optionally (for sibilant harmony) or not at all (Dahl's Law) when consonants are further apart. This parallelism is coincidental, but it's a coincidence that reflects the structural similarity of all the Corr constraints. Corr constraints have the structure Corr-D·[F]; they all refer to both a set of features, and a domain of scope (discussed in more detail in the next section). As such, it's expected that constraints can demand correspondence based on different features, but have the same domain of scope. This is what the shared locality sensitivity represents. The mandatory syllable-adjacent sibilant harmony is driven by Corr-cvc·[+sibilant], and Dahl's Law is driven by Corr-cvc·[–voice] – both Corr constraints demand correspondence only within a CVC domain.

3.2.4. Constraints

3.2.4.1. Corr constraints

Three specific Corr constraints are used to explain the patterns in Kinyarwanda; they are defined in (25)-(27). A fourth Corr constraint, defined in (28), will be considered as well, but is not crucially ranked in the analysis of the Kinyarwanda facts. It is included here to represent how the proposed analysis interfaces with the broader space of Corr constraints - the existence of other CORR constraints does not bear on the ranking conditions needed to explain the Kinyarwanda patterns. These four CORR constraints are differentiated by two parameters: the feature they refer to ([–voice] or [+sibilant]), and their domain of scope (the CVC domain, or the stem domain as defined in (7) previously).

(25) CORR-Stem·[+sibilant]: 'if sibilants are in the same stem, they correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [+sibilant]
b. X and Y are both members of the same stem
c. X & Y are not in the same surface correspondence class

(26) CORR-CVC·[+sibilant]: 'if sibilants are in a CVC configuration, they correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [+sibilant]
b. X and Y are in the configuration ...CVC...
c. X & Y are not in the same surface correspondence class

(27) CORR-Stem·[–voice]: 'if voiceless Cs are in the same stem, they correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [–voice]
b. X and Y are both members of the same stem
c. X & Y are not in the same surface correspondence class

(28) CORR-CVC·[–voice]: 'if voiceless Cs are in a CVC configuration, they correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are both [–voice]
b. X and Y are in the configuration ...CVC...
c. X & Y are not in the same surface correspondence class

The syllable-adjacency condition in Dahl's Law is evidence for restricting the domain of scope of the CORR constraints – a departure from Rose & Walker's (2004) formulation. In order to achieve the correct dissimilation pattern for Dahl's Law in Kinyarwanda, there must be a CORR which penalizes non-correspondence between two [–voice] consonants only when they are in adjacent syllables – and, crucially, *not* when they are farther apart. CORR·[αF] constraints that don't refer to distance cannot assign violations in this pattern, and subsequently cannot restrict dissimilation to happen in only adjacent syllables. It is also worth noting that the same locality-sensitivity is also evident in Kinyarwanda's sibilant harmony: retroflex agreement is mandatory only for sibilants in adjacent syllables. This follows naturally from allowing CORR constraints to have their scope restricted to the CVC domain: the mandatory syllable-adjacent harmony is an effect of CORR-cvc·[+sibilant], parallel to the constraint CORR-cvc·[–voice] needed to explain Dahl's Law.

3.2.3.2. Limiter constraints

Limiter constraints assign violations based on the properties of correspondent consonants; they require members of the same correspondence class to have certain properties. As noted in chapter 2, the Limiters are not a homogenous class of constraints: they are not all from the same schema. Two limiter constraints are necessary for the basic analysis, as defined below. One (29) is a CC·Ident constraint, which demands featural agreement among correspondents. The other (30) is in the CC·Edge family of constraints, which penalize correspondence across domain edges.

(29) CC·IDENT-[retroflex]: 'If two Cs correspond, then they agree for [±retroflex]'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is [+ retroflex], *and*
c. Y is [– retroflex]

CC·IDENT-[retroflex] enforces retroflex agreement among correspondents. It operates by penalizing pairs of correspondents that have different values of [±retroflex]. This provides the impetus for the sibilant harmony pattern: given that sibilants must correspond, assimilation for [±retroflex] can achieve the requisite agreement among them.

(30) CC·EDGE-(stem): ‘no correspondence across the edge of the stem’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are in surface correspondence
b. X is contained in a morphological stem domain, D_{MS}
c. Y is not contained in D_{MS} (i.e. is not in the same stem)

The constraint CC·EDGE-(stem) penalizes surface correspondence that spans across the edge of a morphological stem. This has a two-way effect: it both favors dissimilation across the edge of the stem (by penalizing correspondence in that circumstance), and restrains sibilant harmony (by penalizing correspondence between sibilants in the stem and sibilants in prefixes).

Another CC·EDGE constraint (31) extends the basic analysis to account for the potential occurrence of Dahl’s Law dissimilation at the root-suffix boundary (noted in §3.2.2.3).

(31) CC·EDGE-(root): ‘no correspondence across the edge of the root’
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are in surface correspondence
b. X is contained in a morphological root domain, D_{MR}
c. Y is not contained in $D_{MS\ R}$(i.e. is not in the same root)

While Dahl’s Law does not generally apply within the root, Kimenyi (1979:70) notes that a few lexical items *do* exhibit dissimilation conditioned by voiceless consonants in suffixes (see (22) above). In these items, the same dissimilation that usually happens just across the stem edge happens across the edge of the root as well. Analysis of this this variation of the basic pattern is taken up in §3.4.1.

3.2.3.3. Input-Output Faithfulness constraints

The remaining constraints pertinent to the basic analysis of voiceless dissimilation & sibilant harmony in Kinyarwanda are of the standard Input-Output faithfulness variety; they are members of the Ident family. The analysis centers on three features: [±retroflex] (what sibilants harmonize for), [±sibilant] (which defines the class of harmonizing consonants), and [±voice] (the type of dissimilation that occurs).

(32) IDENT-[retroflex]: Faithfulness for retroflexion
Where X is an output segment, and X' is its correspondent in the input, assign a violation if X & X' have different specifications for the feature [±retroflex]

(33) IDENT-[voice]: Faithfulness for voicing
Where X is an output segment, and X' is its correspondent in the input, assign a violation if X & X' have different specifications for the feature [±voice]

(34) IDENT-[sibilant]: Faithfulness for sibilance
Where X is an output segment, and X' is its correspondent in the input, assign a violation if X & X' have different specifications for the feature [±sibilant]

The surface correspondence constraints – both CORR constraints and CC·Limiter constraints – are markedness constraints. They drive alternations by dominating the relevant faithfulness constraints; these are IDENT-[retroflex] and IDENT-[voice]. IDENT-[sibilant] plays a different role in the analysis than the other faithfulness constraints; it is *not* crucially dominated. Rather, undominated IDENT-[sibilant] ensures that retroflex agreement among sibilants is never achieved by dissimilating one sibilant to some other, non-sibilant, consonant that is not required to participate in the harmony. It forces disagreeing sequences to assimilate in retroflexion (i.e. /s…ʂ/→ [ʂ…ʂ]) rather than dissimilating in sibilance (e.g. /s…ʂ/ → [f…ʂ]).

3.3. Treatment of the basic case

3.3.1. Input-output mappings

The Kinyarwanda data exhibits two dimensions of variation, as noted above: sibilant retroflexion harmony may or may not occur between non-adjacent syllables, and Dahl's Law dissimilation may or may not occur in suffixes. These different possibilities are explained as alternative rankings of the same set of constraints that produce these different options; analysis of these alternatives is taken up in §3.4. First, as the basic case, let us consider only the basic version of each pattern: an idealized variety of Kinyarwanda where (i) sibilant harmony happens *only* between adjacent syllables (and not over longer distances), and (ii) Dahl's Law dissimilation happens only across the stem edge (and not also across the root edge). This variety of Kinyarwanda is represented by the combination of input-output mappings in the table in (35).

(35) Kinyarwanda: input-output mappings in the basic case

	Input form	Output form	SCorr Classes	Remarks
Sibilant retroflexion harmony				
a.	/-saʂ-i/ 'bed-maker'	-⟨**ʂ**a**ʂ**i⟩	{ʂ ʂ}	Sibilant harmony for adjacent syllables within the root
b.	/-baaz-iiʂ-a/ 'cause to plane'	-⟨baa**ʐ**ii**ʂ**a⟩	{b}{ʐ ʂ}	Sibilant harmony for adjacent syllables in the stem
c.	/zi–saʐ-e/ 'it$_{CL10}$ became old (perf.)'	**z**i⟨**ʂ**a**ʐ**e⟩	{z}{ʂ ʐ}	Sibilant harmony blocked at the left edge of the stem
d.	/ku–sas-iiʂ-a/ 'to cause to make the bed'	**g**u⟨**ʂ**a**ʂ**ii**ʂ**a⟩	{g}{ʂ ʂ ʂ}	Sibilant harmony throughout a chain of 3 sibilants
e.	/-seɽuʐ-e/ 'provoke (perf.)'	-⟨**s**eɽu**ʐ**e⟩	{s}{ɽ}{ʐ}	No harmony required between non-adjacent syllables
Dah's Law dissimilation				
f.	/ku–koɽa/ 'to work'	**g**u⟨**koɽa**⟩	{g}{k}{ɽ}	Dissimilation across left edge of stem
g.	/ba–kop-i-e/ 'they gave a loan (perf.)'	ba⟨**k**o**p**^{j}e⟩	{b}{k p}	No dissimilation root-internally
h.	/tu-ki-bon-a/ 'we see it'	**t**u**k**i⟨bona⟩	{t k}{b}	No dissimilation among prefixes
i.	/ba-ta-ɽaa–som-a/ 'haven't they read yet?'	ba**t**aɽaa⟨**s**oma⟩	{b}{t}{ɽ}{s}{m}	No dissimilation between *non*-adjacent syllables
j.	/tu-ki-som-a/ 'we read it'	**t**u**g**i⟨**s**oma⟩	{t}{g}{s}{m}	Dissimilation does not 'daisy chain' iteratively
k.	/ku-buk-uk-a/ (no gloss)	~ ku⟨bu**k**u**k**a⟩	{k}{b}{k k}	No suffix-to-root dissimilation (for most lexical items)

The output forms shown in (35) are the overt segmental forms, observed directly in the data. The input forms are their underlying representations, modified in some cases to indicate regular consonant mutations that are crucial for understanding the sibilant harmony pattern. For instance, the input in (a) actually has the root /-sas-/ (the same root as in (d)), but the agentive suffix /-i/ systematically changes root-final alveolar sibilants to retroflexes. The same kind of mutation is also responsible for the root-final retroflex sibilants in (c) & (e). These derived retroflexes behave like underlying ones in causing retroflex harmony; for simplicity of presentation, I've included them in the underlying forms to indicate where the [+retroflex] value comes from.

The basis of the analysis is the surface correspondence structure of the output forms, given in the 'SCorr classes' column. These are integral to why each input form maps to the output form shown: the output form is optimal *because of* its correspondence structure.

The Surface Correspondence structure of each output is determined by applying the theory to the data. The correspondence structures in the table in (35) reflect the only combination of possible co-optima that matches the output forms we observe in Kinyarwanda. In other words, this is the only set of compatible candidates that yields the correct segmental patterns. While the theory admits other possible correspondence structures, many can be summarily ruled out for Kinyarwanda. Assimilation is optimal only to achieve agreement between correspondents; therefore, where sibilant harmony is observed overtly, we know correspondence must hold. Dissimilation is optimal only to escape from a requirement for penalized correspondence; therefore, consonants observed to dissimilate must be ones that are prohibited from corresponding.

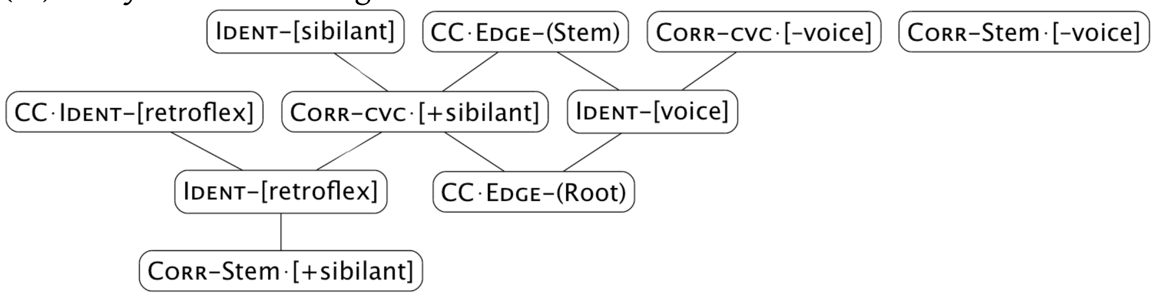
By the same token, correspondence beyond the minimum needed to produce alternations can only incur extra penalties. As such, correspondence with inert consonants is typically sub-optimal – there's no reason to have correspondence where it isn't necessary. Sonorants and voiced stops generally behave as inert in both sibilant harmony and voiceless dissimilation, so they are treated as inert in the analysis: correspondence with them is not required, so those candidates are omitted.[18]

[18] This is a slight oversimplification: Walker, Byrd & Mpiranya (2008) report that the optional non-local sibilant harmony is blocked by intervening coronal stops (but not velars or labials). This blocking phenomenon is taken up in §3.5, and correspondence with non-sibilants is considered there.

3.3.2. Ranking

The ranking that derives the basic case of Kinyarwanda is given in (36).

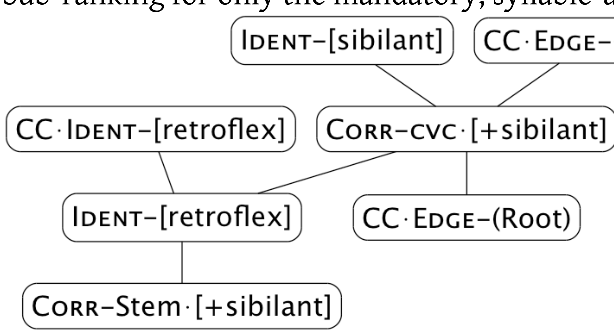
(36) Kinyarwanda: ranking for the basic case



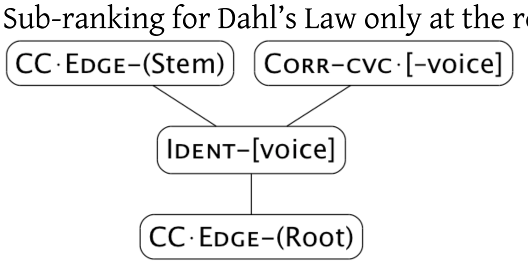
The support for the basic case ranking is presented in §3.3.3 below. The ranking can be dissected into two sub-systems: one that explains the sibilant harmony pattern, and one that explains the voiceless dissimilation. These sub-rankings are given in (37).

(37) Basic case subsystems:

a. Sub-ranking for only the mandatory, syllable-adjacent, sibilant harmony



b. Sub-ranking for Dahl's Law only at the root-prefix boundary (= the stem edge)



The following section shows how these rankings explain the generalizations observed. The dissimilation pattern is considered in §3.3.3.1, and the harmony pattern is treated in §3.3.3.2.

3.3.3. Analysis

3.3.3.1. Explaining Dissimilation

Dahl's Law dissimilation in Kinyarwanda occurs across the edge of the stem (i.e. from roots to prefixes). This means some constraint(s) must dominate faithfulness for [±voice]. In this analysis, those constraints are, minimally, CORR-CVC·[–voice], and CC·EDGE-(Stem). This is shown in the tableau in (38).

(38) [–voice] dissimilation happens at the stem edge

Input: ku-koɽ-a Output: gu⟨koɽa⟩		CC·EDGE -(Stem)	CORR-CVC· [–voice]	IDENT- [voice]	CC·EDGE- (Root)	Candidate Remarks
☞ a.	$g_1u.\langle k_2o.ɽ_3a\rangle$ $\mathcal{R}$: {g}{k}{ɽ}	(0)	(0)	(1)	(0)	Dissimilation
~ b.	$k_1u.\langle k_2o.ɽ_3a\rangle$ $\mathcal{R}$: {k}{k}{ɽ}		W (0~1)	L (1~0)		Faithful non-correspondence
~ c.	$k_1u.\langle k_1o.ɽ_2a\rangle$ $\mathcal{R}$: {k k}{ɽ}	W (0~1)		L (1~0)	W (0~1)	Faithful correspondence

This ranking produces no dissimilation in the stem. In this situation, correspondence between the voiceless consonants does not involve crossing the edge of the stem, so the faithful correspondent candidate (a) incurs no violations of CC·EDGE-(Stem). Since CC·EDGE-(Stem) is the only CC·Limiter constraint which dominates IDENT-[voice], this means no is necessary. (NB: the boundary between the root and suffixes is marked by '-' within the stem domain).

(39) No dissimilation within the stem, across the root edge

Input: ku-bu**k**-u**k**-a Output: ku⟨bu**k**-u**k**a⟩		CC·Edge-(Stem)	Corr-cvc·[−voice]	Ident-[voice]	CC·Edge-(Root)	Candidate Remarks
☞ a.	$k_1u.⟨b_2u.\mathbf{k}_3u.\mathbf{k}_3a⟩$ $\mathcal{R}$: {k}{b}**{k k}**	(0)	(0)	(0)	(1)	Faithful correspondence
~ b.	$k_1u.⟨b_2u.\mathbf{g}_3u.\mathbf{k}_4a⟩$ $\mathcal{R}$: {k}{b}**{g}{k}**			W (0~1)	L (1~0)	Dissimilation, non-corr.
~ c.	$k_1u.⟨b_2u.\mathbf{k}_3u.\mathbf{k}_4a⟩$ $\mathcal{R}$: {k}{b}**{k}{k}**		W (0~1)		L (1~0)	Faithful non-correspondence

It follows also that there is no dissimilation within the root. Here, not even CC·Edge-(Root) favors non-correspondence.[19]

(40) No dissimilation within the root

Input: ba-**k**o**p**-i-e Output: ba⟨**k**o**p**ʲe⟩		CC·Edge-(Stem)	Corr-cvc·[−voice]	Ident-[voice]	CC·Edge-(Root)	Candidate Remarks
☞ a.	$b_1a.⟨\mathbf{k}_2o.\mathbf{p}^j_2e⟩$ $\mathcal{R}$: {b}{k p}	(0)	(0)	(0)	(0)	Faithful correspondence
~ b.	$b_1a.⟨\mathbf{g}_2o.\mathbf{p}^j_3e⟩$ $\mathcal{R}$: {b}**{g}{p}**			W (0~1)		Dissimilation, non-corr.
~ c.	$b_1a.⟨\mathbf{k}_2o.\mathbf{p}^j_3e⟩$ $\mathcal{R}$: {b}**{k}{p}**		W (0~1)			Faithful non-correspondence

The same ranking also yields no dissimilation when two voiceless consonants are both in prefixes, for exactly the same reason. In this situation, both of the voiceless consonants are outside of the stem. Correspondence between them therefore does not cross the stem edge, so dissimilation is not supported: the faithful candidate with correspondence wins.

[19] Although none of the constraints shown here favor the losing candidates in (40), they aren't harmonically bounded. Other CC·Limiter constraints, like CC·Edge-(σ) would favor them. These constraints are not relevant for the analysis of Kinyarwanda, though.

(41) No prefix-to-prefix dissimilation

Input: **t**u-**k**i–vaŋg-a Output: **t**u**k**i⟨vaŋga⟩		CC·EDGE-(Stem)	CORR-CVC·[–voice]	IDENT-[voice]	CC·EDGE-(Root)	**Candidate Remarks**
☞ a.	**t_1**u.**k_1**i⟨$v_2$aa.ŋ$_3$$g_4$a⟩ $\mathcal{R}$: {**t k**}{v}{ŋ}{g}	(0)	(0)	(0)	(0)	Faithful correspondence
~ b.	**d_1**u.**k_2**i⟨$v_3$aa.ŋ$_4$$g_5$a⟩ $\mathcal{R}$: {d}{k}{v}{ŋ}{g}			**W** (0~1)		Dissimilation, non-corr.
~ c.	**t_1**u.**k_2**i.⟨$v_3$aa.ŋ$_4$$g_5$a⟩ $\mathcal{R}$: {t}{k}{v}{ŋ}{g}		**W** (0~1)			Faithful non-correspondence

There is also no dissimilation for voiceless consonants in non-adjacent syllables. This is because the constraint that critically favors dissimilation is CORR-CVC·[–voice], which only penalizes non-correspondent [–voice] consonants in adjacent syllables. Thus, a root with an initial voiceless consonant triggers dissimilation in an immediately preceding prefix, but for another voiceless consonant further away. This is shown below.

(42) No long-distance (>1σ) dissimilation

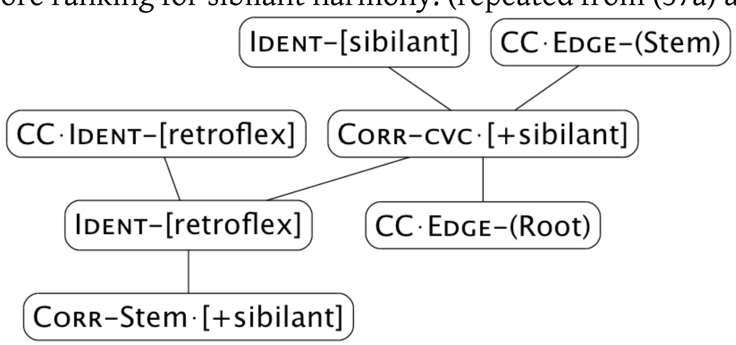
Input: **t**u-**k**i–**s**om-a Output: **t**u**g**i⟨**s**oma⟩		CC·EDGE-(Stem)	CORR-CVC·[–voice]	IDENT-[voice]	CC·EDGE-(Root)	**Candidate Remarks**
☞ a.	**t_1**u.**g_2**i.⟨**s_3**o.m_4a⟩ $\mathcal{R}$: {t}{g}{s}{m}	(0)	(0)	(1)	(0)	Only Local Dissimilation
~ b.	**d_1**u.**g_2**i.⟨**s_3**o.m_4a⟩ $\mathcal{R}$: {d}{g}{s}{m}			**W** (1~2)		Local & non-local dissimilation
~ c.	**t_1**u.**k_1**i.⟨**s_2**o.m_3a⟩ $\mathcal{R}$: {t k}{s}{m}		**W** (0~1)	L (1~0)		Faithful non-corr. across stem edge
~ d.	**t_1**u.**k_1**i.⟨**s_1**o.m_2a⟩ $\mathcal{R}$: {t k s}{m}	**W** (0~2)		L (1~0)	**W** (0~2)	Faithful corr. across stem edge

The input here is /tu-ki-som-a/ 'we read it', which surfaces as [tugisoma] (a), with dissimilation in the prefix /ki-/ that immediately precedes the stem. The candidate in (b) is an alternative in which dissimilation further applies between /s/ in the root and the voiceless /t/ of the first prefix (across the intervening, dissimilated, syllable [gi]). This candidate incurs more violations of IDENT-[voice] than the winner in (a), but does not satisfy the CC·Edge-(Stem) or Corr-cvc·[–voice] constraints any better. Thus, when dissimilation is supported by the ('local') Corr·cvc constraints, it does not extend further than the 1-syllable distance domain built into the definition of this constraint. This is the case even if the intervening syllable contains another voiceless consonant that also dissimilates; the dissimilation does not "propagate" through a string of adjacent syllables.

3.3.3.2. Explaining Sibilant harmony

In the basic case, Kinyarwanda sibilant harmony is contingent on syllable-adjacency: sibilants correspond and agree if they are in adjacent syllables, but not if they are farther apart. The core ranking conditions that derive this pattern are shown in (43).

(43) Core ranking for sibilant harmony: (repeated from (37a) above)



This sub-system can be further dissected into three basic components, as in (44).

(44) The sibilant harmony ranking, broken down into component parts

Component	Ranking
Correspondence & retroflexion agreement for syllable-adjacent sibilants	CC·Ident-[retroflex], Corr-cvc·[+sibilant] » Ident-[retroflex]
Stem-bounding: harmony across the root edge, but not across the stem edge	CC·Edge-(Stem), Ident-[sibilant] » Corr-cvc·[+sibilant] » CC·Edge-(Root)
Harmony between adjacent syllables, but not more distant ones	Corr-cvc·[+sibilant] » Ident-[retroflex] » Corr-Stem·[+sibilant]

The ranking in (43) produces retroflex harmony between sibilants in adjacent syllables within the stem, as shown in (45) below.

(45) Harmony between syllable-adjacent sibilants in the stem, across the root edge

	Input: -baaz-iis̢-a Output: -⟨baaz̢-iis̢a⟩	CC·EDGE-(Stem)	IDENT-[sibilant]	CC·IDENT-[retroflex]	CORR-CVC·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)	CORR-Stem·[+sibilant]	Candidate Remarks
☞ a.	-⟨b$_1$aa.z̢$_2$-iis̢$_2$a⟩ $\mathcal{R}$: {b}{z̢ s̢}	(0)	(0)	(0)	(0)	(1)	(1)	(0)	corr. & agr. across root edge
~ b.	-⟨b$_1$aa.z$_2$-iis̢$_3$a⟩ $\mathcal{R}$: {b}{z}{s̢}				W (0~1)	L (1~0)	L (1~0)	W (0~1)	faithful non-corr.
~ c.	-⟨b$_1$aa.z$_2$-iis̢$_2$a⟩ $\mathcal{R}$: {b}{z s̢}			W (0~1)		L (1~0)	e (1~1)		faithful corr., disagrmnt
~ d.	-⟨b$_1$aa.v$_2$-iis̢$_3$a⟩ $\mathcal{R}$: {b}{v}{s̢}		W (0~1)			L (1~0)	L (1~0)		sibilant dissim., non-corr.

Since harmony for [+retroflex] requires an unfaithful mapping, faithfulness for [±retroflex] is crucially dominated. It must be dominated by one of the CORR·[+sibilant] constraints to rule out faithful non-correspondence (b), and by CC·IDENT-[retroflex] to rule out faithful correspondence with no agreement (c). Additionally, IDENT-[sibilant] must dominate IDENT-[retroflex], to rule out dissimilation instead of assimilation. This is represented by the candidate in (d), which maps an underlying sibilant, /z/, to a non-sibilant fricative [v] – thereby faithfully preserving its underlying [–retroflex] specification, at the cost of dissimilating for [+sibilant].

Kinyarwanda's sibilant harmony is stem-bounded: it never applies to prefixes, and is confined to the stem domain. The bounding effect is analyzed as a consequence of correspondence across the stem edge being prohibited by CC·EDGE-(Stem). This follows from the ranking CC·EDGE-(Stem), IDENT-[sibilant] » CORR-cvc·[+sibilant], shown in (46).

(46) Sibilant harmony is bounded by the stem edge:

Input: /zi-saʐ-e/ Output: zi⟨ʂaʐe⟩		CC·EDGE-(Stem)	CC·IDENT-[retroflex]	IDENT-[sibilant]	CORR-CVC·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)	CORR-Stem·[+sibilant]	Candidate Remarks
☞ a.	z$_1$i.⟨ʂ$_2$a.ʐ$_2$e⟩ $\mathcal{R}$: {z}{ʂ ʐ}	(0)	(0)	(0)	(1)	(1)	(0)	(0)	harm. in stem; faithful non-corr. across edge
~ b.	ʐ$_1$i.⟨ʂ$_1$a.ʐ$_1$e⟩ $\mathcal{R}$: {ʐ ʂ ʐ}	W (0~2)			L (1~0)	W (0~2)	W (0~2)		full corr. & agrmnt in stem & prefix
~ c.	z$_1$i.⟨f$_2$a.ʐ$_3$e⟩ $\mathcal{R}$: {z}{f}{ʐ}			W (0~1)	L (1~0)	L (1~0)			sibilant dissim. at stem edge, full non-corr.

The comparison (a) ~ (b) shows that CC·EDGE-(Stem) crucially dominates CORR-CVC·[+sibilant]: correspondence is not allowed across the stem edge. The ranking IDENT-[sibilant] » CORR-cvc·[+sibilant] stops this restriction from giving rise to dissimilation (cf. Dahl's Law in §3.3.3.1): IDENT-[sibilant] favors the faithful, non-correspondent, candidate (a) over the alternative with sibilant dissimilation (c).

In the basic case, there is no long-distance sibilant harmony; an input like /-seɽuʐ-e/ surfaces faithfully, as [-⟨seɽuʐe⟩], with faithful non-correspondence between the sibilants. This follows from IDENT-[retroflex] being dominated only by CORR-cvc·[+sibilant] and not by the more general CORR-Stem·[+sibilant]. This is shown in (46). The important comparison is candidates (a) ~ (b): the sibilants are both in the stem, but don't correspond (or agree), so correspondence between them (CORR-Stem·[+sibilant]) must be dominated.

(47) No (required) sibilant harmony for non-adjacent syllables:
CORR-CVC·[+sibilant] » IDENT-[retroflex] » CORR-Stem·[+sibilant]

Input: /-seɽuʐ-e/ Output: -⟨seɽuʐe⟩		CC·EDGE-(Stem)	CC·IDENT-[retroflex]	IDENT-[sibilant]	CORR-CVC·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)	CORR-Stem·[+sibilant]	Candidate Remarks
☞ a.	-⟨s$_1$e.ɽ$_2$u.ʐ$_3$e⟩ ℛ: {s}{ɽ}{ʐ}	(0)	(0)	(0)	(0)	(0)	(0)	(1)	corr. & agreement across root edge
~ b.	-⟨ʂ$_1$e.ɽ$_2$u.ʐ$_1$e⟩ ℛ: {ʂ ʐ}{ɽ}					W (0~1)		L (1~0)	faithful non-correspondence
~ c.	-⟨s$_1$e.ɽ$_2$u.ʐ$_1$e⟩ ℛ: {s ʐ}{ɽ}			W (0~1)				L (1~0)	faithful corr., disagreement

The comparison (a)~(c) shows that the ranking CC·IDENT-[retroflex] dominates CORR-Stem·[+sibilant]. This ranking condition is entailed[20], but the candidate in (c) shows that the possibility of long-distance correspondence without agreement is definitively ruled out. This means that the optionality in the long-distance sibilant harmony is a choice of whether the sibilants correspond, rather than a choice about whether agreement between correspondents is enforced.

The ranking obtained above derives the correct behavior for groups of more than 2 sibilants with no further stipulations or assumptions. Recall (from §3.2.1.3) that when three sibilants are in a string of three consecutive adjacent syllables, agreement is mandatory throughout the whole group (i.e. /saziʂa/ → [ʂaʐiʂa], *[saʐiʂa]). In forms like these, agreement is mandated between the first and third sibilants, even though this pair of consonants does not meet the adjacent-syllable locality condition. This happens because both of them are independently required to correspond with the

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[20] CC·IDENT-[retroflex] » IDENT-[retroflex] (46c), and IDENT-[retroflex] » CORR-Stem·[+sibilant] (47b), therefore CC·IDENT-[retroflex] » CORR-Stem·[+sibilant].

sibilant(s) in the intervening syllable(s), and agreement is evaluated based on correspondence structure, irrespective of proximity.

(48) Local agreements "chain together" in strings of more than 2 sibilants:[21]

Input: /-sas-iiʂ-a/ Output: -⟨ʂaʂiiʂa⟩		CC·EDGE-(Stem)	CC·IDENT-[retroflex]	IDENT-[sibilant]	CORR-CVC·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)	CORR-Stem·[+sibilant]	Candidate Remarks
☞ a.	-⟨$ʂ_1$a.$ʂ_1$ii.$ʂ_1$a⟩ ℛ: {ʂ ʂ ʂ}	(0)	(0)	(0)	(0)	(2)	(2)	(0)	corr. & assim. for all 3 sibilants
~ b.	-⟨s_1 a.$ʂ_2$ii.$ʂ_2$a⟩ ℛ: {s}{ʂ ʂ}				W (0~1)	L (2~1)	L (2~1)	W (0~2)	harm. only to closest σ (no 'chaining')
~ c.	-⟨s_1a.$s_1$ii.$ʂ_2$a⟩ ℛ: {s s}{ʂ}				W (0~1)	L (2~0)	L (2~0)	W (0~2)	faithfulness, corr. based on agrmnt (no harm. at all)

The winning candidate in (a) has all three sibilants in the same correspondence class, and changes all of them to [+retroflex] to achieve agreement. This form has each pair of local sibilants in correspondence, so it incurs no violations of CORR-CVC·[+sibilant]. This is because CORR-CVC·[+sibilant] does not limit correspondence in any way; it requires correspondence between syllable-adjacent sibilants, but does not penalize correspondence that stretches over longer distances. The candidates in (b) & (c) show other correspondence structures, in which correspondence holds only between pairs of syllable-adjacent sibilants (and not over longer chains). For an input form like /-sas-iiʂ-a/ that has 3 sibilants in 3 consecutive syllables, this entails a fatal violation of CORR-CVC·[+sibilant]. The middle sibilant is required to be in the same

[21] One significant candidate is omitted here: [gu-sasiisa], with the SCorrℛ {g}{s s s}. This form represents majority-rules harmony: instead of changing two /s/s to [ʂ]s, it changes the one /ʂ/ to [s]. This candidate incurs one less violation of IDENT-[retroflex], so it would beat the desired winner here. This form would be ruled out by whatever mechanism is responsible for enforcing the right-to-left directionality in the harmony pattern. I do not propose an analysis of this here, but see chapter 2 (§2.3.3.6) for some possible explanations of directionality in harmony..

correspondence class as both of the other sibilants; partitioning all three sibilants into a single class is the only surface correspondence structure that meets this demand. When all three sibilants are in the same correspondence class, achieving retroflex agreement within that class means two instances of assimilation rather than one.

3.3.3.3. The (non)-interaction of Dissimilation & Harmony

Aside from their shared sensitivity to the stem domain, Sibilant Harmony & Dahl's Law in Kinyarwanda do not interact with each other: a root-initial sibilant may 'trigger' dissimilation and 'undergo' harmony at the same time, and a suffix sibilant may 'trigger' harmony without also triggering dissimilation. This result emerges automatically from the proposed ranking, because the constraints responsible for each pattern are effectively separate sub-systems within the grammar. CC·EDGE-(stem) is the only constraint that crucially ranked relative to members of both subsets. As such, the ranking needed to explain Dahl's Law (§3.3.3.1) and that needed for sibilant harmony (§3.3.3.2) are fully consistent with each other, and do not conflict. This is illustrated by the tableau in (49).

(49) The full ranking: Dahl's Law & Sibilant Harmony in concert

Input: /ku-sas-iis̢-a/ Output: gu⟨s̢as̢iis̢a⟩		CC·EDGE-(Stem)	CC·IDENT-[retroflex]	IDENT-[sibilant]	CORR·CVC-[−voice]	IDENT-[voice]	CORR-CVC·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)	CORR-Stem·[+sibilant]
☞ a.	g$_1$u.⟨s̢$_2$a.s̢$_2$ii.s̢$_2$a⟩ 𝓡: {g}{s̢ s̢ s̢}	(0)	(0)	(0)	(0)	(1)	(0)	(2)	(2)	(0)
~ b.	k$_1$u.⟨s̢$_2$a.s̢$_2$ii.s̢$_2$a⟩ 𝓡: {k}{s̢ s̢ s̢}				W (0~1)	L (1~0)		e (2~2)	L (2~1)	
~ c.	g$_1$u.⟨s$_2$a.s̢$_3$ii.s̢$_3$a⟩ 𝓡: {g}{s}{s̢ s̢}				W (0~1)	e (1~1)	W (0~1)	L (2~1)	L (2~0)	W (0~1)

Candidate (a) shows the winning form, where [–voice] dissimilation and retroflex harmony both occur. Candidate (b) shows a conceivable alternative, where the application of sibilant harmony somehow prevents dissimilation from occurring. This candidate loses based on CORR-CVC·[–voice] » IDENT-[voice] (a ranking condition necessary for dissimilation in general). Candidate (c) shows another conceptual possibility, where the root-initial /s/ interacts with the prefix consonant, and this somehow 'blocks' it from harmonizing with the other sibilants in the stem. The analysis predicts nothing of the sort: this candidate is sub-optimal on the basis of CORR-CVC·[+sibilant] » IDENT-[retroflex] (a ranking necessary for sibilant harmony in the basic case).

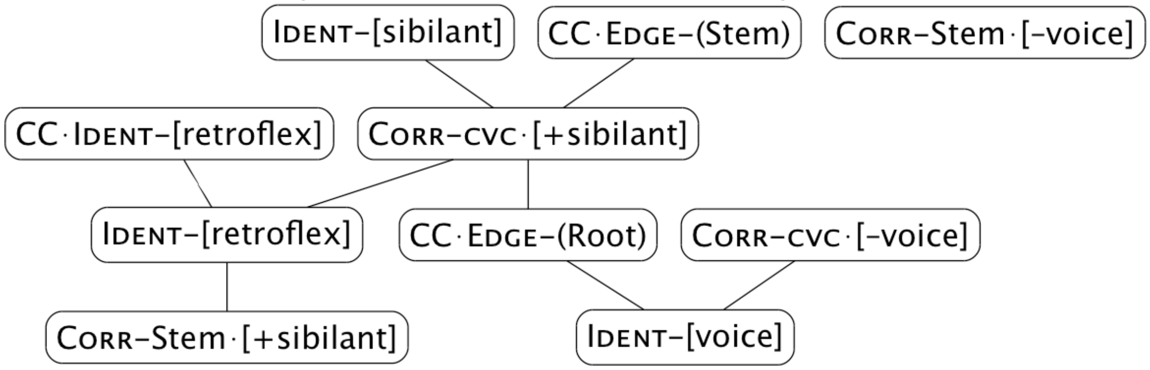
The main point here is that the lack of any interference between the two patterns is expected, due to how dissimilation & harmony operate in surface correspondence. Harmony is an effect of correspondence, while dissimilation is an effect of non-correspondence. Consequently, both can happen simultaneously, and operate independently, even though they are based on the exact same surface correspondence relation.

3.4. Extensions & discussion

3.4.1. The possibility of Dahl's Law in suffixes

Kimenyi (1979:70) notes that a small number of lexical items manifest Dahl's Law dissimilation between roots & suffixes (as noted in (21-22), in §3.2.2.3). Dissimilation in this case is obtained by an alternate ranking of the same constraints used in the basic case. This alternate ranking is given in (50).

(50) Alternate ranking for dissimilation across the root edge:



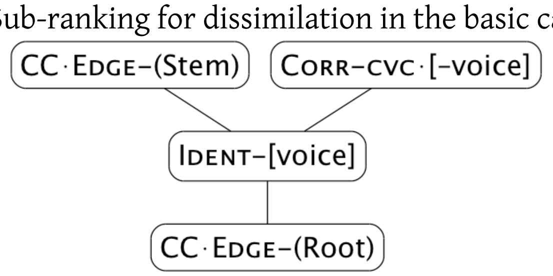
The outcome derived from this ranking is the combination of input-output mappings in (51). The patterns are identical to the basic case analyzed in §3.3 above, except that dissimilation occurs within the stem, across the root-suffix boundary (k). This reflects the occurrence of Dahl's Law before suffixes, exhibited by a handful of words like /ku-ɽit-uk-a/ → [ku⟨ɽid-uka⟩] 'to get uprooted' (*ku⟨ɽit-uka⟩).

(51) Alternative Input-Output mappings for Dahl's Law in suffixes:

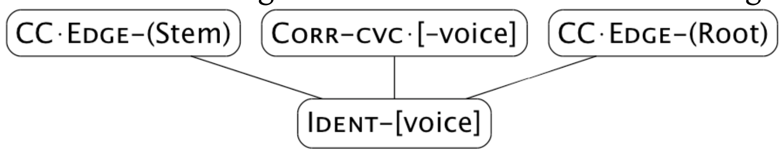
	Input form	Output form	SCorr Classes	Remarks
Sibilant retroflexion harmony				
a.	/-saʂ-i/ 'bed-maker'	-⟨ʂaʂi⟩	{ʂ ʂ}	Sibilant harmony for adjacent syllables within the root
b.	/-baaz-iiʂ-a/ 'cause to plane'	-⟨baaʐiiʂa⟩	{b}{ʐ ʂ}	Sibilant harmony for adjacent syllables in the stem
c.	/zi–saʐ-e/ 'it$_{CL10}$ became old (perf.)'	zi⟨ʂaʐe⟩	{z}{ʂ ʐ}	Sibilant harmony blocked at the left edge of the stem
d.	/ku–sas-iiʂ-a/ 'to cause to make the bed'	gu⟨ʂaʂiiʂa⟩	{g}{ʂ ʂ ʂ}	Sibilant harmony throughout a chain of 3 sibilants
e.	/-seɽuʐ-e/ 'provoke (perf.)'	-⟨seɽuʐe⟩	{s}{ɽ}{ʐ}	No harmony required between non-adjacent syllables
Dah's Law dissimilation				
f.	/ku–koɽa/ 'to work'	gu⟨koɽa⟩	{g}{k}{ɽ}	Dissimilation across left edge of stem
g.	/ba–kop-i-e/ 'they gave a loan (perf.)'	ba⟨kop^{j}e⟩	{b}{k p}	No dissimilation root-internally
h.	/tu-ki-bon-a/ 'we see it'	tuki⟨bona⟩	{t k}{b}	No dissimilation among prefixes
i.	/ba-ta-ɽaa–som-a/ 'haven't they read yet?'	bataɽaa⟨soma⟩	{b}{t}{ɽ}{s}{m}	[-voice] consonants in *non*-adjacent syllables don't dissimilate
j.	/tu-ki-som-a/ 'we read it'	tugi⟨soma⟩	{t}{g}{s}{m}	Dissimilation does not 'daisy chain' iteratively
k.	/ku-ɽit-uk-a/ 'to get uprooted'	ku⟨ɽ**iduk**a⟩	{k}{ɽ}**{d}{k}**	Dissimilation across the root edge (some lexical items only)

Where this ranking crucially differs of CC·EDGE-(Root). This is seen more clearly in comparing the sub-systems responsible for the dissimilation pattern in each case. The dissimilation sub-system from the basic case is repeated in (52); the alternative sub-system that produces Dahl's Law in suffixes is given in (53).

(52) Sub-ranking for dissimilation in the basic case (repeated from (23))



(53) Alternate sub-ranking for dissimilation across the stem edge:



In the basic case, Ident-[voice] is dominated by CC·Edge-(Stem), but not CC·Edge-(Root); the result is dissimilation across the stem edge, but not the root edge. If CC·Edge-(Root) also dominates Ident-[voice], then dissimilation does occur at the root edge – the boundary between the root and suffixes. This is shown in (54).

(54) CC·Edge-(Root) » Corr-cvc·[–voice]: Dahl's Law dissimilation at the root edge

Input: /ku-ɽit-u**k**-a/ Output: ku⟨ɽi**d**u**k**a⟩		CC·Edge- (Stem)	Corr-cvc· [–voice]	**CC·Edge -(Root)**	Ident- [voice]
☞ a.	k$_1$u.⟨ɽ$_2$i.**d**$_3$u.**k**$_4$a⟩ $\mathcal{R}$: {k}{ɽ}**{d}{k}**	(0)	(0)	(0)	(1)
~ b.	k$_1$u.⟨ɽ$_2$i.**t**$_3$u.**k**$_3$a⟩ $\mathcal{R}$: {k}{ɽ}**{t k}**			W (0~1)	L (1~0)
~ c.	k$_1$u.⟨ɽ$_2$i.**t**$_3$u.**k**$_4$a⟩ $\mathcal{R}$: {k}{ɽ}**{t}{k}**		W (0~1)		L (1~0)

If CC·Edge-(Root) and Corr-cvc·[–voice] both dominate Ident-[voice], then correspondence is both demanded and prohibited between a pair of syllable-adjacent voiceless consonants that straddle the root edge. The demand for correspondence rules out the possibility of faithful non-correspondence (c); the prohibition against correspondence rules out faithful correspondence (b). The result is that dissimilation (a) is favored. The interaction is precisely the same as in the basic analysis of Dahl's Law at the prefix-stem boundary, it is simply transposed to the root-suffix boundary.

The alternate sub-ranking that produces dissimilation in suffixes does not bear on the analysis of sibilant harmony. The two dissimilation systems in (52) & (53) differ only the ranking of CORR-cvc·[–voice] & IDENT-[voice] relative to CC·EDGE-(Root). This entails nothing about how CC·EDGE-(Root) relates to the constraints that drive sibilant harmony. There is only one surface correspondence relation; CC·EDGE-(Root) prohibits any correspondence across the root edge, irrespective of what feature that correspondence is based on. Whether this prohibition is respected on the surface is a matter of ranking, though. If CORR-CVC·[+sibilant] dominates CC·EDGE-(Root), correspondence between sibilants can hold across the root edge, even if correspondence between voiceless consonants cannot. This is shown in the tableau in (55) (NB: '–' within the stem domain marks the root-suffix boundary).

(55) Ranking for Dahl's Law in suffixes is still consistent sibilant harmony:
(NB: IDENT-[sibilant] & CORR-Stem·[+sibilant] omitted for space)

Input: /-mes-iiʂ-a/ Output: -⟨meʂ-eeʂa⟩		CC·EDGE-(Stem)	IDENT-[sibilant]	CC·IDENT-[retroflex]	CORR-CVC·[+sibilant]	CC·EDGE-(Root)	CORR-CVC·[–voice]	IDENT-[voice]	IDENT-[retroflex]
☞ a.	-⟨m$_1$eʂ$_2$-ee.ʂ$_2$a⟩ ℛ: {m}{ʂ ʂ}	(0)	(0)	(0)	(0)	(1)	(0)	(0)	(1)
~ b.	-⟨m$_1$es$_2$-ee.ʂ$_3$a⟩ ℛ: {m}{s}{ʂ}				W (0~1)	L (1~0)	W (0~1)		L (1~0)
~ c.	-⟨m$_1$ev$_2$-ee.ʂ$_3$a⟩ ℛ: {m}{v}{ʂ}		W (0~1)			L (1~0)		W (0~1)	L (1~0)
~ d.	-⟨m$_1$eẓ$_2$-ee.ʂ$_2$a⟩ ℛ: {m}{ẓ ʂ}					e (1~1)		W (0~1)	e (1~1)

In this tableau, the ranking that makes Dahl's Law dissimilation occur in suffixes (52) is combined with the ranking for sibilant harmony in the basic case (62). The input is /-mes-iiʂ-a/ 'cause to wash (cloth)', which surfaces as [-⟨meʂ-eeʂa⟩] (Mpiranya & Walker 2005:16), with harmony across the root edge. CC·EDGE-(Root) dominates IDENT-[voice], but this does not cause sibilant harmony in the stem to fail because CC·EDGE-

(Root) is in turn dominated by CORR-CVC·[+sibilant] (b) (as well as IDENT-[sibilant] (c)). The harmonically bounded loser in (d) illustrates the same pair of segments engaging in Dahl's Law and sibilant harmony at the same time: /...s-iiʂ.../ → [...ʐ-iiʂ...]. This is harmonically bounded: no constraints favor dissimilation between correspondents, or harmony between non-correspondents.

Because the alternate ranking that yields dissimilation in suffixes does not bear on the ranking of the CC·Edge constraints relative to the sibilant harmony constraints, the two sub-systems can vary independently. Both rankings for the dissimilation sub-system are consistent with different alternative rankings for the sibilant harmony sub-system. These explain the option of long-distance sibilant harmony, taken up in the following section.

3.4.2. The option of long-distance sibilant harmony

Walker, Byrd & Mpiranya (2008) report that sibilant harmony may optionally occur between sibilants in non-adjacent syllables within the stem (noted in passing in §3.2.1.3 above). This optional long-distance harmony depends on two things: the morpheme that induces the harmony, and the quality of the consonants in the intervening syllable(s).

3.4.2.1. Optional long-distance harmony: the generalizations

The causative suffix /-iiʂ/ causes harmony only between syllable-adjacent sibilants[22]. If another syllable with no sibilants intervenes between the /ʂ/ of the causative suffix and the nearest sibilant in the root, then no harmony occurs (56).

(56) Causative /-iiʂ/ does not trigger harmony in a non-adjacent syllable:
  a. /-som-iiʂ-a/ → -⟨so.mee.ʂa⟩ *-⟨ʂomeeʂa⟩ ‘cause to drink’
  b. /-soɽ-iiʂ-a/ → -⟨so.ɽee.ʂa⟩ *-⟨ʂoɽeeʂa⟩ ‘cause to pay tax’
  c. /-ásam-iiʂ-a/ → -⟨á.sa.mii.ʂa⟩ *-⟨áʂamiiʂa⟩ ‘cause to open mouth’
  d. /-anzik-iiʂ-a/ → -⟨a.nzi.kii.ʂa⟩ *-⟨aɳʐikiiʂa⟩ ‘make s.o. begin grinding’

Recall that the perfective suffix /-i-e/ systematically mutates a preceding sibilant into a retroflex one. Harmony induced by these retroflexes may optionally skip over an intervening syllable, to apply to a sibilant in a non-adjacent one. This is illustrated by the forms in (57), where the sibilants are separated by syllables containing only non-sibilants /ɽ m g k/. In these cases, harmony is possible, but not required: the sibilants optionally agree for retroflexion.

(57) Optional non-local harmony from perfective /-i-e/: (Walker et al. 2008:504)
  a. /-seɽuz- + i-e/ → -⟨**ʂ**eɽuʐe⟩ *or* -⟨**s**eɽuʐe⟩ ‘provoke, irritate (perf.)’
  b. /-ásamuz- + i-e/ → -⟨á**ʂ**amuʐe⟩ *or* -⟨á**s**amuʐe⟩ ‘open one’s mouth wide (perf.)’
  c. /-sakaaz- + i-e/ → -⟨**ʂ**akaʐe⟩ *or* -⟨**s**akaaʐe⟩ ‘cover (the roof) with (perf.)’
  d. /-zímagiz- + i-e/ → -⟨ʐímagiʐe⟩ *or* -⟨zímagiʐe⟩ ‘mislead (perf.)’

Two other affixes can induce retroflex assimilation: the agentive suffix /-i/, which causes the same consonant mutations as the perfective /-i-e/, and an allomorph[23] of the perfective, /-iʐe/, which contains the retroflex sibilant /ʐ/. There is

[22] Recall from §3.1.2.3 that this locality is local, not global: agreement triggered by /-iiʂ/ does hold throughout a chain of three or more sibilants in consecutive, adjacent, syllables, in words like [gu⟨**ʂ**a.**ʂ**ii.**ʂ**a⟩] ‘cause to make the bed’.

[23] See Walker et al. (2008:503), and Kimenyi (1979:51) for discussion of where the /-iʐe/ allomorph occurs.

much less data available to illustrate how these behave with regard to long-distance harmony. Walker et al. (2008) report that the perfective allomorph /-iʐ̪e/ can trigger optional long-distance harmony of the same sort as the usual /-i-e/ form, and the two examples in (58) seem to support this. All examples I found of harmony induced by the agentive nominal suffix /-i/ involved syllable-adjacent sibilants, where harmony is mandatory anyway.

(58) Long-distance harmony is optional for perfective allomorph /-iʐ̪e/?

a.	/n-suumb-i-iʐ̪e/	→ ɳ⟨ʂ̪uumb-iʐ̪e⟩ ~	'I surpass (s.th./s.o.) (perf.)'
		or n⟨suumb-iʐ̪e⟩	(Walker et al 2008:504)
b.	/ba-ɽa-seseɽ-i-iʐ̪e/	→ baɽa⟨ʂ̪eʂ̪eɽ-iʐ̪e⟩	'they just caused to miscut the nails'
		cf. baɽa⟨seseɽ-eza⟩	'they cause to miscut the nail'
			(Kimenyi 1979:111)

The optional long-distance harmony is subject to segmental blocking effects: harmony is possible across certain intervening consonants, but not others. The apparent generalization is that sibilants cannot agree when they are separated by a non-retroflex coronal. Analysis of this segmental blocking effect is taken up in §3.4.3 below. First, as a precursor, let us consider how the occurrence of harmony between non-adjacent syllables is derived by modifying the ranking of the basic case from §3.3.

3.4.2.2. Explaining long-distance sibilant harmony

The optionality of long-distance sibilant harmony is interpreted in this analysis as a choice between two alternative rankings, following the same approach used in previous spreading-based analyses (Mpiranya & Walker 2005, Walker & Mpiranya 2006). The central intuition is the same as well. The idea is that the long-distance version of sibilant harmony is essentially the same kind of interaction as the mandatory harmony, but extended to hold throughout the stem rather than just between adjacent syllables.

The long-distance variant of Kinyarwanda's sibilant harmony pattern is represented by the constellation of input-output mappings in the table in (59). They are identical to the sibilant harmony portion of the basic case, except for the treatment of inputs like (e) where there are two sibilants in non-adjacent syllables. In the basic case, inputs like /-seɽuz̢-e/ map to faithful, non-correspondent, outputs: [seɽuz̢e], {s}{ɽ}{z̢}. In the long-distance harmony pattern, the sibilants agree: /-seɽuz̢-e/ → [s̺eɽuz̢e]. This entails that they are in the same surface correspondence class, because CC·Ident constraints favor agreement only between correspondents. Note that [s̺]~[z̢] correspondence entails nothing about whether the intervening [ɽ] is also in their same correspondence class or not; both possibilities are viable. This is explored further in the treatment of the blocking effect in §3.4.3. For the moment, let us assume non-correspondence between the [ɽ] and the sibilants, as depicted in (e).

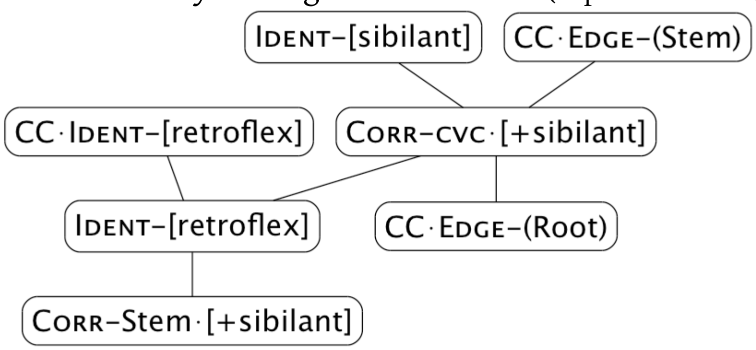
(59) Input-output mappings for long-distance sibilant harmony

	Input form	Output form	SCorr Classes	Remarks
Sibilant retroflexion harmony				
a.	/-sas̺-i/ 'bed-maker'	-⟨s̺as̺i⟩	{s̺ s̺}	Sibilant harmony for adjacent syllables within the root
b.	/-baaz-iis̺-a/ 'cause to plane'	-⟨baaz̢iis̺a⟩	{b}{z̢ s̺}	Sibilant harmony for adjacent syllables in the stem
c.	/zi–saz̢-e/ 'it$_{CL10}$ became old (perf.)'	zi⟨s̺az̢e⟩	{z}{s̺ z̢}	Sibilant harmony blocked at the left edge of the stem
d.	/ku–sas-iis̺-a/ 'to cause to make the bed'	gu⟨s̺as̺iis̺a⟩	{g}{s̺ s̺ s̺}	Sibilant harmony throughout a chain of 3 sibilants
e.	/-seɽuz̢-e/ 'provoke (perf.)'	-⟨s̺eɽuz̢e⟩	**{s̺ z̢}**{ɽ}	Harmony possible between non-adjacent syllables

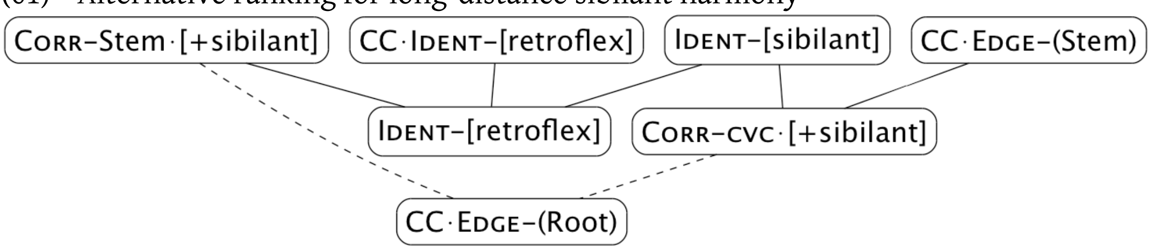
The ranking that derives this set of mappings is given in (61). The sub-ranking responsible for sibilant harmony in the basic case is repeated in (60) for comparison.

The crucial difference is a reversal of the ranking of Corr-Stem·[+sibilant] relative to Ident-[retroflex]. This has a minor reshuffling effect on various ranking conditions, but only the ranking Corr-Stem·[+sibilant] » Ident-[retroflex] is crucial to understanding the shift in the harmony pattern.

(60) Sibilant harmony ranking in the basic case (repeated from (37) above)



(61) Alternative ranking for long-distance sibilant harmony



(NB: dashed lines represent disjunctive ranking)[24]

In the basic case (60), it is only Corr-cvc·[+sibilant] that dominates Ident-[retroflex]; Corr-Stem·[+sibilant] does not. This means correspondence – and therefore

[24] The disjunctivity arises in (61) because none of the inputs in (59) have a sibilant in a suffix, which *isn't* syllable-adjacent to the sibilant in the stem. I have no clear examples like this; they are difficult to find. The /-iʐe/ form of the perfective has a restricted distribution, and the causative suffix /-iiʂ/ doesn't trigger the optional long-distance harmony, so constructing the pertinent /⟨ sV…CV…-…ʐ…⟩/ sequences is not straightforward.

harmony – is required only for sibilants in adjacent syllables. In the alternative long-distance harmony ranking in (61), CORR-Stem·[+sibilant] does dominate IDENT-[retroflex]. The effect is that CORR-Stem·[+sibilant] takes over the role that CORR-cvc·[+sibilant] played in the basic case. The result is that correspondence is demanded between all sibilants in the stem, rather than just sibilants in adjacent syllables. This means that retroflex harmony is applies throughout the stem domain, as shown in (62).

(62) **CORR-Stem·[+sibilant] » IDENT-[retroflex]:** sibilant harmony applies throughout the stem, regardless of syllable-adjacency.

Input: /-seɽuʐ-e/ Output: -⟨seɽuʐe⟩		CC·EDGE-(Stem)	CC·IDENT-[retroflex]	IDENT-[sibilant]	CORR-Stem·[+sibilant]	IDENT-[retroflex]	CORR-cvc·[+sibilant]	CC·EDGE-(Root)
☞ a.	-⟨ʂ$_1$e.ɽ$_2$u.ʐ$_1$e⟩ $\mathcal{R}$: {ʂ ʐ}{ɽ}	(0)	(0)	(0)	(0)	(1)	(0)	(0)
~ b.	-⟨s$_1$e.ɽ$_2$u.ʐ$_3$e⟩ $\mathcal{R}$: {s}{ɽ}{ʐ}				W (0~1)	L (1~0)		

So, the option of long-distance harmony is understood as an effect of CORR-Stem·[+sibilant]. In the ranking for the basic case, this constraint is dominated by faithfulness, and thus cannot force sibilants to harmonize. In the alternative ranking, it dominates faithfulness, which forces harmony to hold within the stem, irrespective of distance. The intuition runs parallel to earlier spreading-based proposals; the difference is that this account uses CORR constraints with different domains rather than constraints that demand different degrees of leftward spreading (Mpiranya & Walker 2005, Walker & Mpiranya 2006). It is a slight oversimplification of the Kinyarwanda pattern, however: the ranking in (61) doesn't account for the generalization that long-distance harmony is only possible across certain intervening consonants. We turn to this in the next section.

3.4.3. Segmental blocking effects in Sibilant Harmony

As mentioned above, Walker, Byrd & Mpiranya (2008) observe that the optional long-distance sibilant harmony exhibits segmental "opacity" or "blocking" effects – harmony is possible across labials, velars & [ɽ], but not possible across alveolar, non-retroflex, coronals. The examples above show that harmony may apply across intervening syllables that contain labials (63a-c), velars (63c-d), or the retroflex liquid [ɽ] (63e-f). But, harmony may not apply across the non-retroflex coronals [t ts d n ɲ j][25] (64) (examples from Walker et al. 2008:504, Walker & Mpiranya 2006:385).

(63) Optional long-distance sibilant harmony is possible across labials, velars, and [ɽ]:

a.	/-ásamuz-i-e/	→ -⟨áʂamuʐe⟩	'open one's mouth wide (perf.)'
b.	/n-suumb-i-iʐe/	→ ɳ⟨ʂuumb-iʐe⟩	'I surpass (s.th./s.o.) (perf.)'
c.	/-zímagiz-i-e/	→ -⟨ʐímagiʐe⟩	'mislead (perf.)'
d.	/-sakaaz-i-e/	→ -⟨ʂakaʐe⟩	'cover (the roof) with (perf.)'
e.	/-togoseɽez-i-e/	→ -⟨togoʂeɽeʐe⟩	'make boil for/at (perf.)'
f.	/-seɽuz-i-e/	→ -⟨ʂeɽuʐe⟩	'provoke, irritate (perf.)'

(64) Optional harmony is blocked by non-retroflex coronals:

a.	/-sí**t**aaz-i-e/	→ -⟨**s**í**t**aaʐe⟩	*-⟨**ʂ**í**t**aaʐe⟩	'make stub (perf)'
b.	/-se**ts**aguz-i-e/	→ -⟨**s**e**ts**guʐe⟩	*-⟨**ʂ**e**ts**guʐe⟩	'cause to carve up (perf)'
c.	/-zú**j**aaz-i-e/	→ -⟨**z**ú**j**aaʐe⟩	*-⟨**ʐ**ú**j**aaʐe⟩	'become warm (perf)'
d.	/-zíg-an-i-iʐe/	→ -⟨**z**ígaɲ-iʐe⟩	*-⟨**ʐ**ígaɲ-iʐe⟩	'economize (perf)'
e.	/-sódok-i-iʐe/	→ -⟨**s**ó**d**ook-eʐe⟩	*-⟨**ʂ**ó**d**ook-eʐe⟩	'make move slowly (perf.)'
f.	/-sú**n**uuk-iʐe/	→ -⟨**s**ú**n**uuk-iʐe⟩	*-⟨**ʂ**ú**n**uuk-iʐe⟩	'show furtively (perf)'
g.	/-sáá^{n}daaz-i-e/	→ -⟨**s**áá^{n}**d**aaʐ-e⟩	*-⟨**ʂ**áá^{n}**d**aaʐ-e⟩	'make explode (perf.)'

[25] No examples are available for the other non-retroflex coronals, [c ɟ ç]. Note that the form in (64g) has the /nd/ sequence that Walker et al. (2008) report as retroflexed.

Segmental blocking is a topic of considerable focus in the previous literature on surface correspondence. Early work in Agreement By Correspondence held that correspondence based on similarity could not derive blocking effects (Hansson 2001, Rose & Walker 2004; see also Walker 2000a, 2000b, 2001). Building on this idea, some previous work has suggested that segmental blocking effects are diagnostic of local spreading rather than correspondence (Mpiranya & Walker 2005, Walker & Mpiranya 2006; see also Hansson 2010b, Arsenault & Kochetov 2011). As it turns out, though, segmental blocking patterns actually *can* emerge from surface correspondence interactions (a point made previously by Hansson 2007; see also ch. 2 & ch. 8 of this dissertation). Previous work focused on blocking effects related to similarity of interveners; however, blocking effects can also arise from the influence of constraints on the locality of correspondents. The gist of the idea is that limiting the distance allowed between members of the same correspondence class can drive non-local consonants to include intervening material in their correspondence, to cut down the distance between one correspondent and its closest neighbor.

3.4.3.1. Interpretation: blocking by bridging

In the Surface Correspondence Theory advanced here, Kinyarwanda's blocking pattern is understood as an effect of the locality constraint CC·SYLLADJ (65).

(65) CC·SYLLADJ: 'Cs in the same correspondence class must inhabit a contiguous span of syllables' (≈ 'correspondence cannot skip across an inert intervening syllable')
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class,
b. X & Y are in distinct syllables, Σ_X & Σ_Y
c. there is some syllable Σ_Z that precedes Σ_Y, and is preceded by Σ_X
d. Σ_Z contains no members of the same surface correspondence class as X & Y

CC·SYLLADJ penalizes correspondence that 'skips over' an inert intervening syllable; it requires that each member of a correspondence class is at least syllable-adjacent to the next one. Requiring locality between correspondents in this way can have the somewhat unintuitive consequence of favoring correspondence that *isn't* required by CORR constraints, an interaction identified in chapter 2 as the 'bridging effect'.[26] When two consonants are separated by an intervening syllable, correspondence between them satisfies CC·SYLLADJ if and only if they *also* correspond with a consonant in the intermediate syllable. Thus, CC·SYLLADJ creates a pressure for consonants in non-adjacent syllables to correspond with consonants that intervene between them. This is 'excessive' correspondence: it is not required by CORR constraints on the basis of any shared feature. CC·SYLLADJ favors correspondence with interveners only because they are in the right place(s) to 'bridge' the distance between similar consonants that *are* required to correspond; the preference is based on locality, not on similarity (cf. Walker & Mpiranya 2006, f.n.7).

Because of the bridging effect, CC·SYLLADJ can make long-distance correspondence sensitive to intervening material. Candidates that satisfy CC·SYLLADJ by the 'bridging' type of correspondence structure are not harmonically bounded: they can be optimal. Whether they actually are optimal is something that can depend on the quality of the intervening consonants that get recruited into correspondence to "build the bridge". If correspondence with the intervening consonant doesn't incur any

[26] See chapter 2, §2.3.3.5.

violations of the relevant CC·Limiter constraints, then there is no reason *not* to include them in the same correspondence class with the similar Cs that do need to correspond. This is illustrated in the comparison in (66) below. (NB: the ranking shown here is an arbitrary one, chosen for illustrative purposes only).

(66) Illustration of Bridging: CC·SYLLADJ favors correspondence with intermediate Cs

		CC·SYLLADJ	CC·IDENT-[retroflex]	CORR-Stem·[+sibilant]	CC·EDGE-(σ)
☞ a.	-⟨$ʂ_1$e.$ɽ_1$u.$ʐ_1$e⟩ $\mathcal{R}$: {ʂ ɽ ʐ}	(0)	(0)	(0)	(3)
~ b.	-⟨$ʂ_1$e.$ɽ_2$u.$ʐ_1$e⟩ $\mathcal{R}$: {ʂ ʐ}{ɽ}	W (0~1)			L (3~1)
~ c.	-⟨s_1e.$ɽ_2$u.$ʐ_3$e⟩ $\mathcal{R}$: {s}{ɽ}{ʐ}			W (0~1)	L (3~0)

The winning candidate (a) is one with a bridged correspondence structure: it has two non-local sibilants that correspond not only with each other, but also with the [ɽ] of the intervening syllable [.ɽu.]. Including the intervening [ɽ] in the same correspondence class with the sibilants yields a structure where the non-local sibilants correspond, but the distance from one correspondent to the next is never more than one syllable – no syllables are skipped over. CC·SYLLADJ prefers this bridged correspondence structure over the alternative (b) with correspondence just between the sibilants. This also satisfies CORR-Stem·[+sibilant]: it requires that the sibilants correspond with each other, but doesn't prohibit them from corresponding with other non-sibilants as well. And, while correspondence between the sibilants and [ɽ] *does* violate some CC·Limiter constraints (such as CC·EDGE-(σ)), it *does not* violate CC·IDENT-

[retroflex]. Since [ɽ] is retroflex, the retroflex sibilants can correspond with it without incurring any penalty for disagreement.

Not all intervening consonants are so benign. The tableau in (66) shows a comparable situation, but with a different intervening consonant – a non-retroflex [t]. Here, correspondence between the sibilants and the intervening consonant *does* violate CC·IDENT-[retroflex], unlike in (66). The result, under the same ranking as above, is that the bridging candidate (a) loses to the faithful, non-correspondent, alternative (c).

(67) Bridging can be allowed with some interveners, but prohibited with others:

		CC·SYLLADJ	CC·IDENT-[retroflex]	CORR-Stem·[+sibilant]	CC·EDGE-(σ)
☹ a.	-⟨ʂ$_1$ e.t$_1$u. ʐ$_1$ e⟩ $\mathcal{R}$: {ʂ t ʐ}	(0)	(2)	(0)	(3)
~ b.	-⟨ʂ$_1$ e.t$_2$u. ʐ$_1$ e⟩ $\mathcal{R}$: {ʂ ʐ}{t}	W (0~1)	**L** (2~0)		**L** (3~1)
☞ c.	-⟨s$_1$ e.t$_2$u. z$_3$ e⟩ $\mathcal{R}$: {s}{t}{z}		**L!** (2~0)	W (0~1)	**L** (3~0)

So, in this simplified example, retroflex agreement between non-local sibilants depends on the [±retroflex] specification of the intervening consonant(s). This happens because CC·SYLLADJ allows the sibilants to correspond with each other only if they also correspond with the consonant of the intervening syllable, but CC·IDENT-[retroflex] allows correspondence with interveners only when it doesn't lead to a conflict for retroflexion agreement. Thus, consonants behave as "opaque" for harmony if recruiting them into correspondence with the sibilants leads to a violation of CC·IDENT-[retroflex]; otherwise, they are "transparent".

3.4.3.2. Explaining the blocking pattern in Kinyarwanda

The segmental blocking pattern in Kinyarwanda's retroflex harmony is represented by the set of input-output mappings in (68). The inputs (a)–(d) reflect the same mappings as in the simple long-distance system analyzed previously in §3.4.2. The crucial addition is the distinction between (e) & (f): harmony across "transparent" interveners like [ɽ], vs. failure of harmony across non-retroflex coronals like [t].[27]

(68) Input-output mappings for the long-distance harmony with blocking

	Input form	Output form	SCorr Classes	Remarks
Sibilant retroflexion harmony				
a.	/-saʂ̺-i/ 'bed-maker'	-⟨ʂ̺aʂ̺i⟩	{ʂ̺ ʂ̺}	Sibilant harmony for adjacent syllables within the root
b.	/-baaz-iiʂ̺-a/ 'cause to plane'	-⟨baaʐ̺iiʂ̺a⟩	{b}{ʐ̺ ʂ̺}	Sibilant harmony for adjacent syllables in the stem
c.	/zi–saʐ̺-e/ 'it$_{CL10}$ became old (perf.)'	zi⟨ʂ̺aʐ̺e⟩	{z}{ʂ̺ ʐ̺}	Sibilant harmony blocked at the left edge of the stem
d.	/ku–sas-iiʂ̺-a/ 'to cause to make the bed'	gu⟨ʂ̺aʂ̺iiʂ̺a⟩	{g}{ʂ̺ ʂ̺ ʂ̺}	Sibilant harmony throughout a chain of 3 sibilants
e.	/-seɽuʐ̺-e/ 'provoke (perf.)'	-⟨ʂ̺eɽuʐ̺e⟩	{ʂ̺ ɽ ʐ̺}	Harmony possible across retroflexes and non-coronals
f.	/-síítaaʐ̺-e/ 'make stub (perf.)'	-⟨sííttaaʐ̺e⟩	{s}{t}{ʐ̺}	No harmony possible across non-retroflex coronals

Accounting for the blocking pattern requires a constraint that differentiates between the sibilants, which undergo retroflexion agreement, and the non-retroflex coronals, which resist it. I will model this here with a specialized faithfulness constraint, IDENT-CorNonSib-[retroflex] (69), which holds only for non-sibilants. The specific form of this constraint is not crucial to the analysis; all that's necessary is that

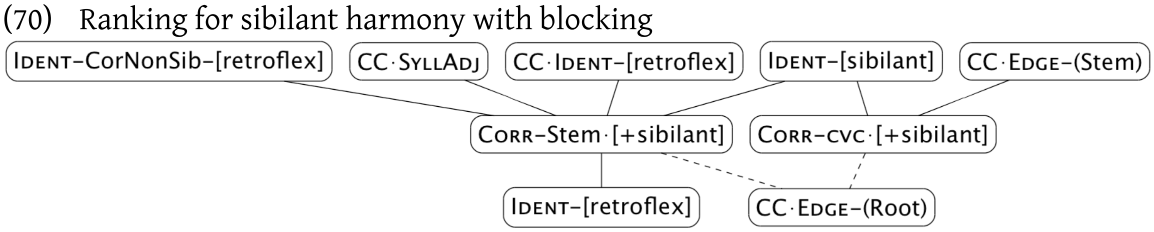
[27] The combination of mappings isn't the only one that produces the right set of segmental output forms to represent the blocking pattern. It would also be possible to map input (f) to the same output, but with the SCorr$\mathcal{R}$ {s t ʐ̺} – i.e. faithful non-correspondence across the board. The interaction that gives rise to it is parallel to Hansson's (2007) notion of "conditional opacity by preferential correspondence". The structure {s t ʐ̺} can be optimal because the [s] & [t] agree – both are [–retroflex]. I do not pursue this account here because this kind of blocking depends on there being an equal number of correspondents with each value of the agreeing feature – a "majority rules" type of situation.

some constraint allows sibilants to assimilate for retroflexion while not allowing other coronals to do the same. This is not unique to the SCTD; a constraint that makes this differentiation is also needed in a spreading analysis.[28]

(69) Ident-CorNonSib-[retroflex]: 'Don't change retroflexion of coronal non-sibilants'
Where X is an output segment, and X' is its correspondent in the input, assign a violation if:
a. X is [Coronal] *and*
b. X is [–sibilant] *and*
c. X & X' have different specifications for the feature [±retroflex]

The ranking that derives the blocking pattern – i.e. the set of mappings in (68) – is given in (70). It differs from the simple long-distance case (from §3.4.2 above) in two important ways: the addition of undominated CC·SyllAdj & Ident-CorNonSib-[retroflex], and the crucial domination of Corr-Stem·[+sibilant] by Ident-[sibilant] and CC·Ident-[retroflex]. The effect of this alternative ranking is that correspondence between sibilants in non-adjacent syllables must include all intervening consonants, and must yield perfect retroflexion agreement, without any assimilation by intervening consonants. When this combination of outcomes isn't possible, the correspondence sibilants fail to correspond, and therefore fail to agree.

(70) Ranking for sibilant harmony with blocking



[28] Walker & Mpiranya (2006) do this with markedness rather than faithfulness, using the constraints *[retroflex]/CorStop, *[retroflex]/Pal, and *[retroflex]/CorAffricate.

The tableau in (71) shows how this ranking derives the blocking effect seen with intervening non-retroflex coronals. The input here is /-síítaaʐ-e/ ‘make stub (perf.)’, a form with two sibilants separated by the non-retroflex [t]. (NB: CC·EDGE-(Stem) and CORR-cvc·[+sibilant] are omitted because it assigns no violations in this comparison).

(71) [t] blocks correspondence because it disagrees with [ʐ] in retroflexion:

Input: /-síítaaʐ-e/ Output: -⟨síítaaʐe⟩		CC·SYLLADJ	CC·IDENT-[retroflex]	IDENT-CorNonSib-[retroflex]	IDENT-[sibilant]	CORR-Stem·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)
☞ a.	-⟨s$_1$íí.t$_2$aa.ʐ$_3$e⟩ 𝓡: {s}{t}{ʐ}	(0)	(0)	(0)	(0)	(1)	(0)	(0)
~ b.	-⟨ʂ$_1$íí.t$_2$aa.ʐ$_1$e⟩ 𝓡: {ʂ ʐ}{t}	W (0~1)				L (1~0)	W (0~1)	
~ c.	-⟨ʂ$_1$íí.t$_1$aa.ʐ$_1$e⟩ 𝓡: {ʂ t ʐ}		W (0~2)			L (1~0)	W (0~1)	
~ d.	-⟨s$_1$íí.t$_1$aa.ʐ$_1$e⟩ 𝓡: {s t ʐ}		W (0~2)			L (1~0)		
~ e.	-⟨ʂ$_1$íí.ʈ$_1$aa.ʐ$_1$e⟩ 𝓡: {ʂ ʈ ʐ}			W (0~1)		L (1~0)	W (0~2)	
~ f.	-⟨ʃ$_1$íí.t$_2$aa.ʐ$_3$e⟩ 𝓡: {ʃ}{t}{ʐ}				W (0~1)	L (1~0)		

The winning candidate (a) is one where the sibilants in the stem do not correspond, and therefore don’t need to agree. It’s optimal because CC·SYLLADJ precludes correspondence between just the sibilants (b), and CC·IDENT-[retroflex] prohibits any correspondence between them and the intervening non-retroflex [t]. Whether the /s/ assimilates (c) or not (d), correspondence between [t] and [ʐ] violates CC·IDENT-[retroflex]. This disagreement could be avoided if the /t/ also undergoes assimilation (e), but this is ruled out by faithfulness for retroflexion in non-sibilants, IDENT-

NonCorSib-[retroflex]. IDENT-[sibilant] rules out sibilant dissimilation (f), exactly as in the basic case.

When the intervening consonant is [ɽ], a [+retroflex] consonant, the outcome is different: harmony does occur. This is shown in (72). CC·SYLLADJ precludes correspondence between just the sibilants (b), exactly as before. What's crucially different here is that recruiting the intervening [ɽ] into correspondence with the sibilants (a) does not violate CC·IDENT-[retroflex]. Since [ɽ] doesn't disagree with the sibilants in retroflexion, its inclusion in their correspondence class is benign.

(72) No blocking by [+retroflex] [ɽ] because it agrees in retroflexion with the sibilants:

Input: /-seɽuʐ-e/ Output: -⟨ʂeɽuʐe⟩		CC·SYLLADJ	CC·IDENT-[retroflex]	IDENT-CorNonSib-[retroflex]	IDENT-[sibilant]	CORR-Stem·[+sibilant]	IDENT-[retroflex]	CC·EDGE-(Root)
☞ a.	-⟨ʂ$_1$e.ɽ$_1$u.ʐ$_1$e⟩ $\mathcal{R}$: {ʂ ɽ ʐ}	(0)	(0)	(0)	(0)	(0)	(1)	(0)
~ b.	-⟨ʂ$_1$e.ɽ$_2$u.ʐ$_1$e⟩ $\mathcal{R}$: {ʂ ʐ}{ɽ}	W (0~1)					e (1~1)	
~ c.	-⟨s$_1$e.ɽ$_1$u.ʐ$_1$e⟩ $\mathcal{R}$: {s ɽ ʐ}		W (0~2)				L (1~0)	
~ d.	-⟨s$_1$e.ɽ$_2$u.ʐ$_3$e⟩ $\mathcal{R}$: {s}{ɽ}{ʐ}					W (0~1)	L (1~0)	
~ e.	-⟨f$_1$e.ɽ$_2$u.ʐ$_3$e⟩ $\mathcal{R}$: {f}{ɽ}{ʐ}				W (0~1)		L (1~0)	

The same analysis can be extended to the "transparent" labials and velars if we take them to be completely unspecified for [±retroflex]. The definition of CC·IDENT-[retroflex] (repeated in (73)) assigns violations when two consonants are in the same correspondence class, and one is [+retroflex], and the other is [–retroflex].

(73) CC·IDENT-[retroflex]: 'If two Cs correspond, then they agree for [±retroflex]'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is [+ retroflex], *and*
c. Y is [– retroflex]

If we assume that labials and velars, incapable of manifesting the retroflex distinction, are neither [+retroflex] nor [–retroflex], then it follows that they can never incur violations of CC·IDENT-[retroflex]. In other words, since they don't have any retroflex specification, they can't disagree with sibilants in retroflexion, so they behave like the [+retroflex] [ɽ]. As long as they are not [–retroflex], labials and velars are predicted to be as acceptable correspondents of [+retroflex] sibilants, and therefore to behave as transparent for the harmony.[29]

3.4.3.3. Summary of retroflex harmony blocking

The generalization we see in Kinyarwanda is that harmony is impossible across intervening non-retroflex coronals. This blocking pattern falls out when undominated CC·SYLLADJ is added to the ranking that generates the long-distance harmony pattern. This has the effect of making a pair of non-local sibilants opportunistically co-opt intervening consonants into their correspondence class, but *not* at the cost of disagreement for [±retroflex]. This outcome correctly predicts that the [–retroflex]

[29] Another possible interpretation of the facts is that the transparent labials and velars actually *undergo* retroflex assimilation. Walker et al. (2008) find that transparent [m]s and [k]s in forms with sibilant retroflexion harmony do actually have a retroflex tongue gesture. This finding is of considerable interest given that the analysis predicts that these transparent consonants both correspond and (perhaps trivially) agree with the harmonizing sibilants. It can also be understood to follow as a consequence of the particular formulation of IDENT-CorNonSib-[retroflex] posited here. The definition in (69) assigns violations only for retroflex assimilation by *coronal* non-sibilants; it doesn't necessarily penalize retroflex assimilation for labials, i.e. /-ásamuʐ-e/→ [-⟨áʂamuʐe⟩], where the output form has a retroflexed labial [m̢].

coronals should block the optional harmony, while the [+retroflex] coronals should support it.[30] The status of labials and velars as non-blockers is also explained, if we make the further assumption that these consonants are not specified as [–retroflex], and therefore do not lead to an extra CC·IDENT-[retroflex] violation when they correspond with [ʂ ʐ].

3.4.4. *Long vowels and blocking of Dahl's Law*

Kimenyi (1979:68-69) observes that Dahl's Law dissimilation fails to occur when a long vowel intervenes between two voiceless consonants (noted in passing in §3.2 above). In the basic case of Dahl's Law analyzed in §3.3, the dissimilating voiceless consonant is in the prefix that immediately precedes the root, such that the two underlying voiceless consonants are separated by just a short vowel. This basic case is re-illustrated in (74). When the intervening vowel is long, however, dissimilation does not happen; both consonants surface as voiceless (75).

(74) The basic case of Dahl's Law: dissimilation in /...CV-C.../ sequences

a.	/a-**t**u-**h**-a/	→ a.**du**.⟨**h**a⟩	*a.**tu**⟨**h**a⟩	'he gives us'
b.	/**k**i-**t**abo/	→ **g**i.⟨**t**a.bo⟩		'book'
c.	/a-**k**a-**s**ek-a/	→ a.**g**a.⟨**s**e.ka⟩		'and then he smiles'

[30] There are two minor caveats to note here. First, there is no data available to confirm the prediction for [ʈʂ], since it is rare in non-initial position. Second, this requires us to assume that /nd/ sequences which block harmony are [–retroflex], even if they have a retroflex articulation as Walker et al. (2008) report.

(75) No dissimilation across a long vowel: (Kimenyi 1979:68-69, except where noted)

a.	/u**t**u-**s**o/	→ ú**t**úu⟨**s**o⟩	'small eyes (cl. 13)'
		cf. *ú**d**úu⟨**s**o⟩	(Kimenyi 1979:24)
b.	/ka-a-**f**aʂ-a/	→ **k**aa⟨**f**aʂa⟩	'it would help'
c.	/ki-a-**p**im-i-e/	→ **k**ʲaa⟨**p**imʲe⟩	'it measured'
d.	/ku-**t**á-íi-**s**ek-a/	→ kú**t**íí⟨**s**eka⟩	'not to laugh at oneself'
e.	/**k**u-n-**ts**índ-a/	→ **k**uûn⟨**ts**íinda⟩	'to make me fail'
f.	/**k**i-a-**ʈ͡ʂ**u/	→ **k**ʲáa⟨**ʈ͡ʂ**u⟩	'our X (cl. 7)' (Kimenyi 1979:28)
g.	/mu**k**áa-(a)-**k**aβano/	→ mú**k**áa⟨**k**aβano⟩	'wife of Kabano'
h.	/**k**u-aa**k**-a/	→ **k**w⟨aa**k**a⟩	'to ask', 'to light' (Kimenyi 1979:9)
i.	/i**k**i-**h**e/	→ i**k**ii⟨**h**e⟩	'which (cl. 7)'

The failure of dissimilation across a long vowel (75) is straightforwardly explained if these long vowels are parsed as two syllables, as previously suggested by Davy & Nurse (1982:162) for other languages with Dahl's Law alternations. Recall from §3.2.2.2 that Dahl's Law is a strictly syllable-adjacent dissimilation pattern: voiceless consonants in non-adjacent syllables do not dissimilate (76).

(76) No dissimilation between non-adjacent syllables (see also data in §3.2.2.2)

a.	/u-**t**a-me**s**-a/	→ u.**t**a.⟨me.**s**a⟩	'who doesn't wash' (Kimenyi 1979:66)
		cf. *u.**d**a.⟨me.**s**a⟩	
b.	/a-**k**a-ndi**k**-a/	→ a.**k**a.⟨ndi.**k**a⟩	'and then he writes' (Kimenyi 1979:65)
c.	/**k**u-ɽá**s**-a/	→ **k**u.⟨ɽá.**s**a⟩	'to shoot' (Kimenyi 1979:45)

The analysis of this locality condition is that the CORR constraint which drives dissimilation, CORR-CVC·[−voice], only demands correspondence between voiceless consonants that are in adjacent syllables. So, if the long vowels in (75) are actually bisyllabic – if /ka-a-faʂ-a/ 'it would help' comes out as [**k**a.a.⟨**f**a.ʂa⟩] rather than [**k**aa.⟨**f**a.ʂa⟩] – then no voiceless dissimilation is expected. Interpreted in this way, the forms where dissimilation fails across a long vowel are not exceptions to the Dahl's Law pattern; they are just another illustrative case of its one-syllable locality condition.

This means Dahl's Law is not an example of segmental blocking of dissimilation, as sometimes reported (cf. Suzuki 1998:107). The failure of dissimilation happens for structural reasons (locality), and has nothing to do with the quality of the intervening segments (in contrast to the blocking effects in harmony, considered in §3.4.3 above).

3.4.2.1. Potential basis for pre-stem long vowels to be bisyllabic

The syllabification of the long vowels in (75) as [.CV.V.] sequences is non-standard, so let us consider possible justifications for it. First off, note that it's not necessary to treat *all* long vowels in Kinyarwanda as two syllables. The generalization evident in (75) is that Dahl's Law dissimilation does not occur across long vowels at the edge of the stem. Since there is no consistent dissimilation inside the stem domain, it is not clear that stem-internal long vowels behave in the same way; in fact, evidence from sibilant harmony suggests that stem-internal vowels are monosyllabic.[31] The crucial question is whether there is a basis for splitting those long vowels that occur at the stem edge apart from those that occur stem-internally, such that they should be syllabified in an atypical way.

Morpheme exponence is a potential basis for long vowels situated at the stem edge to have different syllabification than those inside the stem. Kimenyi points out that, in the cases where dissimilation fails in (75), vowel length is also confounded with the presence of an intervening morpheme: "Unfortunately, Kinyarwanda has no prefixes composed of short vowels coming directly before the verb stem to indicate whether it is the vowel length or the morpheme boundary that is responsible for [the

[31] Section 2.1.3 showed that retroflex agreement is obligatory only between sibilants in adjacent syllables. The causative suffix /-iiʂ/ induces mandatory harmony, so its long vowel clearly behaves like one syllable, not two.

non-dissimilation]. Both factors may be at work here, that is, the *vowel length prevents Dahl's law from taking place since it creates a pause, so to speak, between the two syllables*." (Kimenyi 1979:69, emphasis mine). My interpretation of these long vowels as two syllables is an extension of this intuition. The long vowels that disrupt dissimilation arise from hetero-morphemic /V+V/ sequences[32]. In this situation, the vowel length is often the sole output expression of a morpheme. For instance, the long vowel in (75a) [kaa⟨faʂa⟩] 'it would help' is the only clue in the surface form that the conditional prefix /-a-/ is present underlyingly in this word. So, the atypical syllabification posited for the long vowels in (75) might be attributed to the crucial role this vowel length plays in morphological exponence.

Davy & Nurse (1982:162) also present corroborating evidence from other languages with Dahl's Law. They point out that in Southern Gikuyu, dissimilation fails across an intervening /V-/ prefix, which can similarly be explained as hiatus that prevents such sequences from meeting the syllable-adjacency locality condition. Interestingly, they report that in Gikuyu, hiatus between pre-stem vowels tends to disappear in fast speech, and dissimilation does occur in this circumstance.

3.4.2.2. Theoretical ramifications of long vowels & Dahl's Law failure

Treating the dissimilation-blocking long vowels in (75) as bisyllabic accounts for these forms without any change to the analysis. Interpreting the data in this way also preserves the parallel treatment of the locality conditions in sibilant harmony and Dahl's Law dissimilation. In both cases, the one-syllable locality effects are explained

[32] A possible exception is the 'still tense' marker [-ɽakʲaa-]. However, this tense marker can be reanalyzed as a combination of the action-focus marker /ɽa-/, the 'not yet tense' prefix /ki-/, and the recent past prefix /a-/. The sense of 'still doing X' can accordingly be paraphrased as 'not yet finished doing X'.

by CORR constraints that have the same domain of scope, namely the CVC configuration. This account allows the CVC configuration to be defined in the same way for both patterns, i.e. as syllable-adjacent consonants.

We can envision an alternative treatment in which this is not the case: long vowels could conceivably render consonants non-local for Dahl's Law, but not for sibilant harmony. The CORR constraint responsible for Dahl's Law is CORR-CVC·[–voice], and the one that drives mandatory syllable-adjacent harmony is CORR-CVC·[sibilant]. These are two different constraints; it is not logically necessary for them to have the same domain of scope. Formally, CORR-CVC·[–voice] could be defined to require correspondence only between voiceless Cs separated by just a short vowel; CORR-CVC·[sibilant] could be defined to require correspondence between sibilants in adjacent syllables, regardless of what else comes between them.

Splitting up the CVC domain based on vowel length is unappealing for reasons of theoretical parsimony. CORR constraints all have a specific domain of scope; the inventory of these domains is fixed, and relatively small: it is {CVC, Root, Stem, Word} (see chapter 2, §2.3.2). Discriminating between CVC and CV:C as different domains embellishes the predictions of the surface correspondence theory universally. While Kinyarwanda can be construed as evidence for such a distinction – i.e. to have CORR-CVC·[–voice], but CORR-CV:C·[+sibilant] – there is little cross-linguistic evidence to support making this distinction universally.

3.5. Conclusion

3.5.1. Summary of proposal

The proposed for Kinyarwanda made in this chapter is summarized in (77).

(77) Premises of the analysis of Kinyarwanda
  a. Sibilant retroflexion harmony as Agreement By Correspondence
  b. Dahl's Law dissimilation as avoidance of penalized correspondence
  c. Dissimilation & harmony from the same Surface Correspondence Relation

Kinyarwanda's sibilant harmony is understood here as correspondence-based agreement, and analyzed as such. Harmony occurs because sibilants are required to correspond, and correspondents are required to agree in retroflexion. Variation in the domain of the harmony is explained as a variation between different rankings that enforce correspondence requirements with different domains of scope. Harmony between syllable-adjacent sibilants is driven by CORR-cvc·[+sibilant]; harmony over all sibilants in the stem is driven by CORR-Stem·[+sibilant].

The Dahl's Law voiceless dissimilation pattern is analyzed as the combined effect of constraints that require correspondence, and constraints that limit it. Voiceless consonants are required to correspond by CORR-cvc·[–voice], but correspondence across the stem edge is prohibited by CC·EDGE-(Stem). When two voiceless consonants are in adjacent syllables, but on opposite sides of the stem edge, they satisfy these constraints by dissimilating so that correspondence between them is not required. Dissimilation only happens across the stem edge, because correspondence is only penalized across the stem edge. The limited occurrence of dissimilation from suffixes to roots is explained by an alternate ranking where the same interaction happens across the edge of the root domain, where cross-edge correspondence is penalized by CC·EDGE-(Root) rather than CC·EDGE-(Stem).

The analysis proposed here explains Dahl's Law and Sibilant harmony as different effects caused by the same surface correspondence relation. Uniting these patterns as products of the same relation offers an explanation for the structural parallels between them. Since there is only one Surface Correspondence relation, factors that matter for surface correspondence can cut across different patterns driven by it. The complementary nature of sibilant harmony and Dahl's Law follows from CC·EDGE-(Stem) for this reason: CC·EDGE-(Stem) penalizes surface correspondence across the stem edge, regardless of which segments are involved or why correspondence between them is required. This limit on correspondence has a dual effect: it causes dissimilation to happen across the stem edge, and also prevents sibilant harmony from doing so.

3.5.2. Effects of the stem edge

Sibilant harmony and Dahl's Law in Kinyarwanda are both affected by the edge of the stem domain, but in opposite ways. Dissimilation *occurs* only across the stem edge; sibilant harmony systematically *fails* to occur across the stem edge. This follows from both being driven by the same correspondence relation; it is an instance of the 'Mismatch' property of the SCTD. Kinyarwanda prohibits correspondence across the stem edge – CC·EDGE-(Stem) is undominated. Sibilant harmony is based on having correspondence; prefix sibilants don't agree with sibilants in the stem, because they aren't permitted to correspond with them. Dissimilation is based on having *non*-correspondence – it represents the escape from a correspondence requirement where having correspondence incurs some penalty. Dissimilation occurs across the stem edge because CC·EDGE-(Stem) prohibits correspondence in that situation. Correspondence is permitted within the stem, and outside it, so no dissimilation occurs within the stem, or among prefixes.

3.5.3. Locality & Blocking effects

The dissimilation and harmony patterns in Kinyarwanda have parallel sensitivities to locality: dissimilation happens only between adjacent syllables, and harmony is mandatory only between adjacent syllables. This follows as a natural consequence of both being driven by surface correspondence. Correspondence between similar consonants is only required by constraints of the CORR-(D)·[αF] family. These constraints are differentiated on two parameters: the feature(s) they target, and their domain of scope. These parameters are independent, so the same domain of scope can recur in correspondence requirements based on different features.

It also follows that sibilant harmony and voiceless dissimilation operate differently in groups of three or more consonants. This result falls out automatically because surface correspondence is transitive, but non-correspondence is not. Sibilant harmony mandatorily extends through a chain of consecutively syllable-adjacent sibilants, in forms like [gu.⟨s̺a.s̺-ii.s̺a⟩] 'to cause to make the bed'. CORR-cvc·[+sibilant] requires the first sibilant to correspond with the second, and requires the second to correspond with the third. Satisfying these two requirements entails that all three sibilants are in the same correspondence class, so agreement therefore holds over the entire group. By contrast, voiceless dissimilation in Kinyarwanda does not "propagate" through one dissimilating consonant to affect another: /tu-ki-som-a/ 'we read it' surfaces as [tu.gi.⟨so.ma⟩], not *du.gi.⟨so.ma⟩. This follows because dissimilation is based on *non*-correspondence, and the lack of correspondence isn't transitive.[33]

Different kinds of blocking effects – the non-occurrence of regular alternations under certain circumstances – can also be observed in both sibilant harmony & Dahl's Law. Dahl's Law exhibits *structural* blocking. Dissimilation fails to happen across (pre-stem) long vowels; this is understood as a special case of the syllable-adjacency condition. CORR-cvc·[–voice] only requires correspondence between voiceless consonants if they are in adjacent syllables. If pre-stem long vowels are bisyllabic, then two voiceless consonants separated by a long vowel do not meet this structural condition, so no dissimilation is necessary. Sibilant harmony, in contrast to Dahl's Law, exhibits *segmental* blocking: harmony happens across certain intervening consonants, but fails when others intervene (see ch. 8 for more detailed characterization of segmental blocking). This blocking pattern falls out from the interaction of CC·SYLLADJ and CC·IDENT-[retroflex].

[33] Interestingly, in some other languages with Dahl's Law, dissimilation can "propagate" through prefixes in this way (Davy & Nurse 1982). These other cases must be analyzed in a different way – for instance, as assimilation among the prefixes, along the same lines proposed by Lombardi (1995).

3.5.4. The adequacy of a single surface correspondence relation

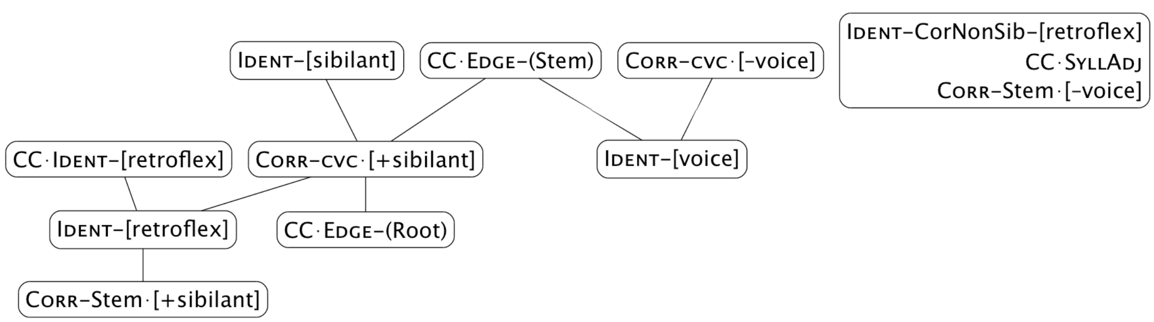
The analysis of Kinyarwanda demonstrates how one surface correspondence relation can produce multiple different correspondence-based interactions at the same time, in the same language. The CORR constraints are violable and freely ranked, so correspondence required on the basis of one feature does not necessarily lead to the same outcome as correspondence based on another. We see this in action in Kinyarwanda, where correspondence between sibilants leads to retroflex agreement within the stem, while correspondence between voiceless consonants leads to dissimilation across the stem edge. The two patterns are based on complementary assumptions about surface correspondence structure, so a single correspondence relation is sufficient to handle both at the same time.

3.6. Appendix: rankings for all four variations of Kinyarwanda

The analysis of the blocking effects in sibilant harmony employs CC·SYLLADJ and IDENT-CorNonSib-[retroflex], two constraints not posited in the treatment of the basic case in §3.3. The purpose of this appendix is to show that these constraints do not pose any problems for the basic analysis. Different rankings of the enhanced constraint set used in the analysis of the blocking effects (§3.4.3) can produce all four possible combinations of local vs. long-distance harmony, and dissimilation vs. faithfulness in suffixes. The sub-sections below give the ranking for each combination, and the Most Informative Basis (Brasoveanu & Prince 2011) that supports it (determined using OTWorkplace (Prince & Tesar 2011).

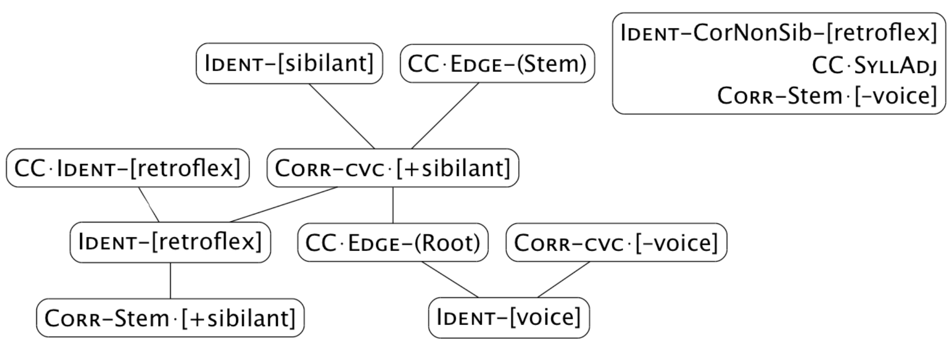
3.6.1. Syllable-adjacent harmony, no dissimilation in suffixes

Input	Winner	Loser	CC·IDENT-[retroflex]	CC·EDGE-(Stem)	CORR-CVC·[−voice]	CORR-Stem·[−voice]	IDENT-[sibilant]	CC·SYLLADJ	IDENT-CorNonSib-[retroflex]	CORR-CVC·[sibilant]	IDENT-[voice]	IDENT-[retroflex]	CC·EDGE-(Root)	CORR-Stem·[sibilant]
/-saʂ-i/	-⟨ṣaṣi⟩, ℛ:{ʂ ʂ}	-⟨saṣi⟩, ℛ:{s ʂ}	W									L		
/zi-saʐ-e/	zi⟨ṣaẓe⟩, ℛ:{z}{ʂ ʐ}	zi⟨saẓe⟩, ℛ:{z s z} (≈ ℛ:{ʐ ʂ ʐ})		W						L			W	
/ku-koɽ-a/	gu⟨koṛa⟩, ℛ:{g}{k}{ɽ}	ku⟨koṛa⟩, ℛ:{k}{k}{ɽ}		W							L		W	
/ku-koɽ-a/	gu⟨koṛa⟩, ℛ:{g}{k}{ɽ}	ku⟨koṛa⟩, ℛ:{k k}{ɽ}			W						L			
/zi-saʐ-e/	zi⟨ṣaẓe⟩, ℛ:{z}{ʂ ʐ}	zi⟨faẓe⟩, ℛ:{z}{f}{ʐ}					W			L		L		
/-baaz-iiʂ-a/	-⟨baaẓ-iiṣa⟩, ℛ:{b}{ʐ ʂ}	-⟨baaz-iiṣa⟩, ℛ:{b}{z}{ʂ}								W		L	L	W
/ku-rit-uk-a/	ku⟨ṛituka⟩, ℛ:{k}{ɽ}{t k}	ku⟨ṛiduka⟩, ℛ:{k}{ɽ}{d}{k}									W		L	
/-seruʐ-e/	-⟨seṛuẓe⟩, ℛ:{s}{ɽ}{ʐ} (≈ ℛ:{s}{ɽ ʐ})	-⟨ṣeṛuẓe⟩, ℛ:{ʂ ɽ ʐ}										W		L



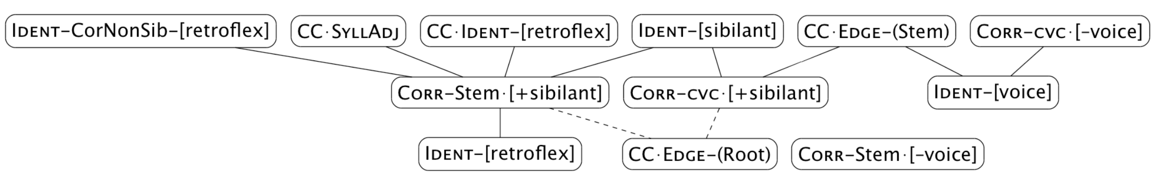
3.6.2. Syllable-adjacent harmony, with dissimilation in suffixes

Input	Winner	Loser	CC·Ident-[retroflex]	CC·Edge-(Stem)	Corr-cvc·[−voice]	Corr-Stem·[−voice]	Ident-[sibilant]	CC·SyllAdj	Ident-CorNonSib-[retroflex]	Corr-cvc·[sibilant]	Ident-[retroflex]	CC·Edge-(Root)	Corr-Stem·[sibilant]	Ident-[voice]
/-saʂ-i/	-⟨ʂaʂi⟩, ℛ:{ʂ ʂ}	-⟨saʂi⟩, ℛ:{s ʂ}	W								L			
/zi-saʐ-e/	zi⟨ʂaʐe⟩, ℛ:{z}{ʂ ʐ}	zi⟨saze⟩, ℛ:{z s z} (≈ ℛ:{ʐ ʂ ʐ})		W						L		W		
/ku-koɽ-a/	gu⟨koɽa⟩, ℛ:{g}{k}{ɽ}	ku⟨koɽa⟩, ℛ:{k}{k}{ɽ}			W									L
/zi-saʐ-e/	zi⟨ʂaʐe⟩, ℛ:{z}{ʂ ʐ}	zi⟨faʐe⟩, ℛ:{z}{f}{ʐ}					W			L	L			
/-baaz-iiʂ-a/	-⟨baaʐ-iiʂa⟩, ℛ:{b}{ʐ ʂ}	-⟨baaz-iiʂa⟩, ℛ:{b}{z}{ʂ}								W	L	L	W	
/-seruʐ-e/	-⟨seɽuʐe⟩, ℛ:{s}{ɽ}{ʐ} (≈ ℛ:{s}{ɽ ʐ})	-⟨ʂeɽuʐe⟩, ℛ:{ʂ ɽ ʐ}									W		L	
/ku-rit-uk-a/	ku⟨ɽiduka⟩, ℛ:{k}{ɽ}{d}{k}	ku⟨ɽituka⟩, ℛ:{k}{ɽ}{t k}										W		L



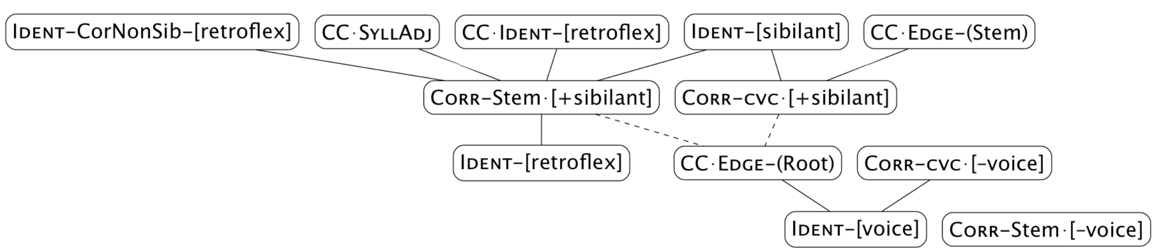
3.6.3. Long-distance harmony, no dissimilation in suffixes

Input	Winner	Loser	CC·Ident-[retroflex]	CC·Edge-(Stem)	Corr-cvc·[−voice]	Corr-Stem·[−voice]	Ident-[sibilant]	CC·SyllAdj	Ident-CorNonSib-[retroflex]	Corr-cvc·[sibilant]	Corr-Stem·[sibilant]	Ident-[voice]	Ident-[retroflex]	CC·Edge-(Root)
/-zujaaʐ-e/	-⟨zujaaʐe⟩ ℛ: {z}{j}{ʐ}	-⟨zujaaʐe⟩ ℛ: {z j ʐ}	W								L			
/zi-saʐ-e/	zi⟨ʂaʐe⟩, ℛ:{z}{ʂ ʐ}	zi⟨saze⟩, ℛ:{z s z} (≈ ℛ:{ʐ ʂ ʐ})		W						L				W
/ku-koɽ-a/	gu⟨koɽa⟩, ℛ:{g}{k}{ɽ}	ku⟨koɽa⟩, ℛ:{k k}{ɽ}		W								L		W
/ku-koɽ-a/	gu⟨koɽa⟩, ℛ:{g}{k}{ɽ}	ku⟨koɽa⟩, ℛ:{k}{k}{ɽ}			W							L		
/zi-saʐ-e/	zi⟨ʂaʐe⟩, ℛ:{z}{ʂ ʐ}	zi⟨faʐe⟩, ℛ:{z}{f}{ʐ}					W			L			L	
/-zujaaʐ-e/	-⟨zujaaʐe⟩ ℛ: {z}{j}{ʐ}	-⟨vujaaʐe⟩ ℛ: {v}{j}{ʐ}					W				L			
/-zujaaʐ-e/	-⟨zujaaʐe⟩ ℛ: {z}{j}{ʐ}	-⟨ʐujaaʐe⟩ ℛ: {ʐ ʐ}{j}						W			L		W	
/-zujaaʐ-e/	-⟨zujaaʐe⟩ ℛ: {z}{j}{ʐ}	-⟨ʐuɽaaʐe⟩ ℛ: {ʐ ɽ ʐ}							W		L		W	
/-baaz-iiʂ-a/	-⟨baaʐ-iiʂa⟩, ℛ:{b}{ʐ ʂ}	-⟨baaz-iiʂa⟩, ℛ:{b}{z}{ʂ}								W	W		L	L
/-seruʐ-e/	-⟨ʂeɽuʐe⟩, ℛ:{ʂ ɽ ʐ}	-⟨seɽuʐe⟩, ℛ:{s}{ɽ}{ʐ} (≈ ℛ:{s}{ɽ ʐ})									W		L	
/ku-rit-uk-a/	ku⟨ɽituka⟩, ℛ:{k}{ɽ}{t k}	ku⟨ɽiduka⟩, ℛ:{k}{ɽ}{d}{k}										W		L



3.6.4. Long-distance harmony, with dissimilation in suffixes

Input	Winner	Loser	CC·Ident-[retroflex]	CC·Edge-(Stem)	Corr-cvc·[–voice]	Corr-Stem·[–voice]	Ident-[sibilant]	CC·SyllAdj	Ident-CorNonSib-[retroflex]	Corr-cvc·[sibilant]	Corr-Stem·[sibilant]	Ident-[retroflex]	CC·Edge-(Root)	Ident-[voice]
/-zujaaʐ-e/	-⟨zujaaʐe⟩ $\mathcal{R}$: {z}{j}{ʐ}	-⟨zujaaʐe⟩ $\mathcal{R}$: {z j ʐ}	W								L			
/zi-saʐ-e/	zi⟨ʂaʐe⟩, $\mathcal{R}$:{z}{ʂ ʐ}	zi⟨saze⟩, $\mathcal{R}$:{z s z} (≈ $\mathcal{R}$:{ʐ ʂ ʐ})		W						L			W	
/ku-koɽ-a/	gu⟨koɽa⟩, $\mathcal{R}$:{g}{k}{ɽ}	ku⟨koɽa⟩, $\mathcal{R}$:{k}{k}{ɽ}			W									L
/zi-saʐ-e/	zi⟨ʂaʐe⟩, $\mathcal{R}$:{z}{ʂ ʐ}	zi⟨faʐe⟩, $\mathcal{R}$:{z}{f}{ʐ}					W			L		L		
/-zujaaʐ-e/	-⟨zujaaʐe⟩ $\mathcal{R}$: {z}{j}{ʐ}	-⟨vujaaʐe⟩ $\mathcal{R}$: {v}{j}{ʐ}					W				L			
/-zujaaʐ-e/	-⟨zujaaʐe⟩ $\mathcal{R}$: {z}{j}{ʐ}	-⟨ʐujaaʐe⟩ $\mathcal{R}$: {ʐ ʐ}{j}						W			L	W		
/-zujaaʐ-e/	-⟨zujaaʐe⟩ $\mathcal{R}$: {z}{j}{ʐ}	-⟨ʐuɽaaʐe⟩ $\mathcal{R}$: {ʐ ɽ ʐ}							W		L	W		
/-baaz-iiʂ-a/	-⟨baaʐ-iiʂa⟩, $\mathcal{R}$:{b}{ʐ ʂ}	-⟨baaz-iiʂa⟩, $\mathcal{R}$:{b}{z}{ʂ}								W	W	L	L	
/-seruʐ-e/	-⟨ʂeɽuʐe⟩, $\mathcal{R}$:{ʂ ɽ ʐ}	-⟨seɽuʐe⟩, $\mathcal{R}$:{s}{ɽ}{ʐ} (≈ $\mathcal{R}$:{s}{ɽ ʐ})									W	L		
/ku-rit-uk-a/	ku⟨ɽiduka⟩, $\mathcal{R}$:{k}{ɽ}{d}{k}	ku⟨ɽituka⟩, $\mathcal{R}$:{k}{ɽ}{t k}											W	L



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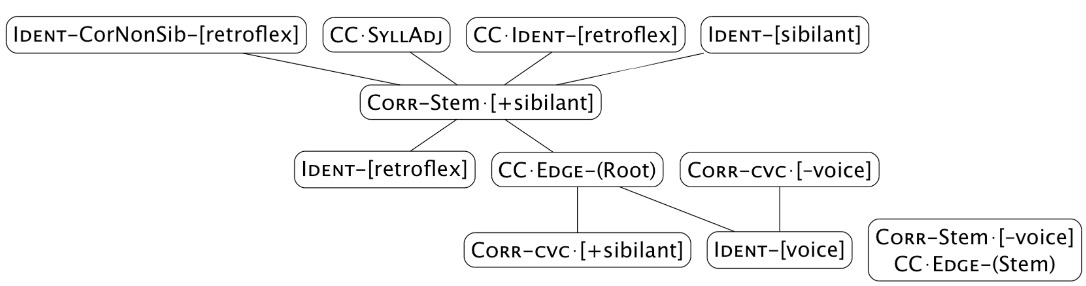

Chapter 4
Sundanese: complementary assimilation & dissimilation

4.1. Introduction

Sundanese has a plural[1] affix /ar/, which alternates between two surface forms – [ar] & [al][2]. This affix is a prefix before vowel-initial roots, and an infix following the first consonant of a consonant-initial root. Thus, the affix /ar/ combines with a root to yield stems of the two configurations illustrated in (1) & (2). This infix-prefix alternation is the normal behavior of /VC/ prefixes in Sundanese (Cohn 1992; see also Anderson 1972, McCarthy & Prince 1993)[3].

(1)	aR-vcvc	ar=ajɨm	'patient (pl.)'
(2)	c-aR-vcvc(v)	k=ar=usut	'messy (pl.)'

The /ar/ infix shows an [r]~[l] alternation, which arises in two distinct ways:

(3) **R-dissimilation**: /r/ dissimilates to [l], before another [r]
/ar/+/ŋumbara/ → [ŋ=al=umbara] 'go abroad (pl.)'
/ar/+/hormat/ → [h=al=ormat] 'respect (pl.)'

(4) **L-assimilation**: /r/ assimilates to [l], after a preceding [l]
/ar/+/lɨtik/ → [l=al=ɨtik] 'little (pl.)'

Both of these patterns are subject to conditions on syllabification & locality, as observed by Cohn (1992). These conditions (illustrated in further detail in §4.3) can be summarized approximately as follows.

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[1] According to Cohn (1992:fn.1), the /ar/ affix technically has distributed meaning rather than plural, but that's irrelevant for the purposes of this paper. Following Cohn, I will refer to it as 'plural' for expository convenience.
[2] Some other primary sources that have discussed the /ar/ affix include Rigg (1862), Eringa (1949), Robins (1957, 1959, 1965), Van Syoc (1959), Müller-Gotama (2001).
[3] This is shown by other infixes such as /um/, in pairs like [gəde] 'be big', [g=um=əde] 'be conceited', and [sarande] 'to lean', [s=um=arande] 'to depend on' (Robins 1959:356).

R-dissimilation occurs when there are two /r/s, *unless* they are the onsets of adjacent syllables. This is illustrated in (5): the roots /rahɨt/ and /curiga/ both contain /r/s, but the R-dissimilation pattern does not obtain because the /r/ in the root and the /r/ in the plural infix /ar/ are the onsets of two adjacent syllables.

(5) R-dissimilation fails to occur when two /r/s are the onsets of adjacent syllables

/ar-rahɨt/ → [r=ar=ahɨt], *[r=al=ahɨt]	'wounded (pl.)'	(cf. (3) above)
/ar-curiga/ → [c=ar=uriga], *[c=al=uriga]	'suspicious (pl.)'	

L-assimilation occurs only when the /ar/ morpheme is infixed following a root-initial /l/, producing a stem of the shape /L=aR=VCVC(V)/. This is illustrated by (6): roots like /gɨlis/ and /gətol/ contain /l/s in non-initial positions, and they do not cause the L-assimilation to happen.

(6) Only root-initial /l/s result in L-assimilation:

/ar-gɨlis/ → [g=ar=ɨlis], *[g=al=ɨlis]	'beautiful (pl.)'	(cf. (4) above)
/ar-gətol/ → [g=a.r=ə.tol], *[g=a.l=ə.tol]	'diligent (pl.)'	

These structural limitations on L-assimilation and R-dissimilation give rise to a nearly complementary relationship between the two patterns. L-assimilation only applies if both liquids are onsets of adjacent syllables; R-dissimilation fails to apply precisely when two /r/s are in this arrangement. If two liquids are in a configuration such that L-assimilation could apply to them, then R-dissimilation fails. Conversely, if two liquids are in a configuration such that R-dissimilation could apply, then L-assimilation does not occur. This inverse relationship suggests the two patterns are related in a deeper way than previous analyses have suggested (Cohn 1992; Holton 1995; Suzuki 1998, 1999; Hansson 2001/2010).

The analysis of the [r]~[l] alternation can be summarized as follows: In Sundanese, CORR constraints demand correspondence both (i) among rhotics ([r]s), and (ii) among liquids in general ([r]s & [l]s). Structural SCorr constraints restrict the configurations in which surface correspondence is permitted – this correspondence is allowed only for segments that are onsets of adjacent syllables. CC·IDENT constraints targeting [±lateral] require liquids that are in correspondence to agree for laterality. When /ar/ affixation creates an input that has both /l/ & /r/ in a configuration where they can (and must) be in surface correspondence, the affix /r/ becomes [l] to match its correspondent /l/ counterpart. L-assimilation is thus treated as a case of Agreement By Correspondence (in the sense of Rose & Walker 2004), which occurs only when /r/ and /l/ may correspond without violating the structural SCorr constraints. When /ar/ affixation creates an input that has two /r/s in a configuration where correspondence between them is *not* permitted, the affix /r/ becomes [l] to escape the need for the failed [r]~[r] correspondence. That is, R-dissimilation applies when /r/ & /r/ *cannot* correspond, as a means to avoid violations of the constraint CORR-Stem·[Rhotic] that penalizes lack of correspondence between them.

The chapter is organized in the following way. Section 2 lays out the surface correspondence analysis proposed for the Sundanese [r]~[l] alternation patterns. Section 3 presents the central empirical observations about Sundanese, and the data they are based on, in more detail. Section 4 shows how the surface correspondence analysis explains these generalizations. Section 5 gives some concluding discussion of this analysis.

4.2. The Proposal for Sundanese

The central thesis of this chapter is that both L-assimilation and R-dissimilation are the result of constraints that operate on surface correspondence relations. L-assimilation is agreement that occurs because the output realization of /r/ (in the /ar/ affix) is in correspondence with an /l/ in the root, and correspondent segments are required to agree for [±lateral]. R-dissimilation occurs when an input contains two /r/s, but they surface in a configuration where correspondence between them is prohibited. Both R-dissimilation & L-assimilation are subject to parallel structural conditions because constraints impose restrictions on the surface correspondence relation that both patterns are based on.

4.2.1. Representational assumptions

Sundanese has two liquid consonants, [l] & [r]. The exact phonetic realization of both segments varies somewhat: [r] may be realized as either a trill or a flap (Van Syoc 1959:53, Müller-Gotama 2001:7), and [l] may be retracted and/or velarized non-initially[4]. From the available data, this variation does not correlate with the phonological [r]~[l] alternation considered here, so these phonetic details are not represented in the transcriptions used here.

I assume that in Sundanese /r/ and /l/ are distinguished phonologically by a single binary feature. I will call this feature "[±lateral]"; thus, /l/ is [+lateral], and /r/ is [–lateral]. It is not crucial to conceive of this feature as [±lateral] rather than [±rhotic]; all that matters is that a feature like this makes crucial /r/ vs. /l/ distinction. For

[4] The 'darkening' of [l] is an impressionistic observation based on the speech of my consultant, and is not reported by Van Syoc or Müller-Gotama.

expository convenience, I will adopt the terms 'Rhotic' to refer to the [–lateral] liquid /r/, and will use the term 'Lateral' generically (with no value) to refer to the [+lateral] liquid /l/.

The proposed analysis of the [r]~[l] alternation presumes two morphological domains, which I will call the 'root' and the 'stem'. I take the root to be an un-affixed root, following the same use of this term as Cohn (1992), and Robins (1957, 1959, 1965). I will use the term 'stem' to refer to a domain that includes at least the root and infixing prefixes like the plural affix /ar/, as in (7).

(7) Stem = (infixing prefixes) + Root
$\langle_{\text{STEM}}$ k=ar=usut$\rangle$= /(-)ar-/$_{\text{AFX}}$+/kusut/$_{\text{ROOT}}$

This notion of stem is akin to a domain recognized under various names in previous work on Sundanese: 'plural base' for Van Syoc (1959), and 'extended root' for Robins (1959). It is not crucial that all other affixes are outside the stem, but I will assume so for concreteness; this issue is not central to the analysis of the [r]~[l] alternation.

Several independent points of evidence support the validity of the stem as formulated in (7) as a genuine morpho-phonological domain. These are summarized in (8)–(11) below.

(8) The stem is the domain of infixation: VC prefixes follow the first C of the stem, not the word (Van Syoc 1959:95-96, Robins 1959:344, Müller-Gotama 2001:20)

a. di-⟨g=ar=anti⟩ 'to be changed (passive) (pl.)' (Van Syoc 1959:95-96)
   di-⟨ganti⟩ 'to be changed (passive)'
   *d=ar=i-ganti; /ar/ infixed after first C of root, not first C of another prefix

b. maŋ-⟨g=ar=anti⟩-kɨn 'to change something for someone (pl.)'
   maŋ-⟨ganti⟩-kɨn 'to change something for someone'

c. ka-⟨d=ar=uga⟩ 'to be able (pl.)' (Robins 1959:344)
   ka-⟨duga⟩ 'to be able '

(9) Partial reduplication targets the stem as its base: CV reduplicants copy the initial CV of the stem, including the /ar/ infix (Robins 1959:344, Müller-Gotama 2001:17)

a. kolot 'to be old'
   pa-ko-⟨kolot⟩ 'to be of advanced age' (Robins 1959:362)
   *pa-pa-⟨kolot⟩; CV reduplicant copies initial CV sequence of stem

b. tɨlɨm 'sink'
   ti-ta-⟨t=ar=ɨlɨm⟩ 'sink (pl.)' (Müller-Gotama 2001:20)
   *ti-tɨ-⟨t=ar=ɨlɨm⟩; CV reduplicant copies from stem, including infixed [ar]

(10) The stem is the domain of full reduplication: full reduplication copies the stem, including the root *and* infixed prefixes (Robins 1959:368)

a. ⟨hajaŋ⟩-⟨hajaŋ⟩ 'to want very much' (full redup. of hajaŋ 'to want')

b. ⟨h=ar=ajaŋ⟩-⟨h=ar=ajaŋ⟩ 'to want very much (pl.)'
   *⟨hajaŋ⟩-⟨h=ar=ajaŋ⟩; entire stem copied, not just root

(11) The stem is the domain of R-dissimilation & L-assimilation: non-infixed prefixes containing /r/ do not exhibit these alternations (only liquids in the stem matter)[5]

a. pər-⟨ɟurɨt⟩ ~ pra-⟨ɟurɨt⟩ 'soldier' (cf. ɟurɨt 'war') (Robins 1959:352)
   *pəl-⟨ɟurɨt⟩, *pla-⟨ɟurɨt⟩; no R-dissimilation in prefix /pra-/ ~/pər-/

b. baraŋ-⟨dahar⟩ 'eat anything' (Van Syoc 1959:104)
   *balaŋ-⟨dahar⟩; no R-dissimilation in prefix /baraŋ-/

[5] I know of three exceptional forms where R-dissimilation happens in other morphemes (noted by Eringa 1949:95; also cited by Cohn 1992:213). Two of these examples involve a prefix, /baraŋ-/ 'thing', but this does not reflect the same systematic dissimilation seen with /ar/: this is clear from forms where /baraŋ-/ shows no dissimilation, cf. (11b) [baraŋ-dahar] 'eat anything' (Van Syoc 1959:104).

These generalizations suggest that the stem as defined in (7) is a real morphological domain in Sundanese. I will take this domain to be the domain of scope for the surface correspondence requirements that drive R-dissimilation and L-assimilation.

4.2.2. Constraints

Three CORR constraints are assumed, built from the template proposed in chapter 2. Since the [r]~[l] alternations in Sundanese depend only on liquids in the stem, I take the stem to be the domain of all three of these correspondence requirements.

(12) CORR-Stem·[+liquid]: "if two liquids are in the same stem, then they correspond"
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y both have the feature specification [+liquid] *and*
b. X & Y are both in the same instance of a stem domain, *and*
c. X & Y are not in the same surface correspondence class

(13) CORR-Stem·[Rhotic]: "if two rhotics are in the same stem, then they correspond"
(≈ CORR-Stem·[–lateral, +liquid])
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y both have the feature specification [–lateral, +liquid] *and*
b. X & Y are both in the same instance of a stem domain, *and*
c. X & Y are not in the same surface correspondence class

(14) CORR-Stem·[Lateral]: "if two laterals are in the same stem, then they correspond"
(≈ CORR-Stem·[+lateral, +liquid])
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y both have the feature specification [+lateral, +liquid] *and*
b. X & Y are both in the same instance of a stem domain, *and*
c. X & Y are not in the same surface correspondence class

The constraint CORR-Stem·[Lateral] is not crucial for the analysis, but is included here for completeness. It represents the existence of other CORR constraints beyond the two that are necessary for Sundanese. Including it in the ranking merely serves to demonstrate that the ranking of other CORR constraints is not crucial for the analysis of Sundanese.

Note that the CORR-Stem·[Rhotic] and CORR-Stem·[Lateral] are defined here such that they only assess surface correspondence between liquids. This aspect of the definition is included to abstract away from the tangential issue of whether other phonetically non-lateral segments like [b] or [k] should be treated as [Rhotic]. This point is not crucial, and might well be rendered moot by positing more complex representations – i.e. if there is a dependency between the rhotic/lateral feature and the liquid feature.

Two CC·IDENT constraints are necessary. Both require lateral agreement among correspondents – they penalize correspondence between [r]s & [l]s.

(15) CC·IDENT-[lateral]: "if two Cs correspond, then they agree in laterality"
For each distinct pair of output consonants X & Y, assign a violation if:
  a. X & Y are in the same surface correspondence class, *and*
  b. X is [+lateral], *and*
  c. Y is [−lateral]

(16) CC·IDENT-Initial-[lateral]: "if two Cs correspond, and one is root-initial, then they agree in laterality"
For each distinct pair of output consonants X & Y, assign a violation if:
  a. X & Y are in the same surface correspondence class, *and*
  b. X is [+lateral], *and*
  c. Y is [−lateral], *and*
  d. either X or Y is in the root-initial position

The general CC·IDENT-[lateral] constraint conforms to the general schema proposed by Rose & Walker (2004), and is independently motivated by other cases of lateral harmony in unrelated languages (Rose & Walker *ibid.*; Hansson 2001/2010). The more specialized CC·IDENT-Initial-[lateral] is simply a positional counterpart of the regular CC·IDENT constraint, in line with the general structure of positional faithfulness constraints (Beckman 1998). Its role in the analysis is to restrain L-assimilation so it happens only when there is a root-initial /l/, per (5) above.

Two structural surface correspondence constraints are also needed: CC·SYLLADJ & CC·SROLE. These were defined and in chapter 2, and are repeated below.

(17) CC·SYLLADJ: 'If Cs are in the same correspondence class, they are in a contiguous group of syllables (each is at least syllable-adjacent to the next)'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X & Y are in distinct syllables, Σx & Σy, *and*
c. another syllable, Σz, precedes Σy, and is preceded by Σx, *and*
d. Σz contains no members of the same correspondence class as X & Y

(18) CC·SROLE: "if two Cs correspond, then they have matching syllable roles"
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X has the syllable role SR(x), and Y has the syllable role SR(y) *and*
c. SR(x) ≠ SR(y)
...where SR(x), SR(y) ∈ {onset, head-of-onset, nucleus, coda}

As noted in chapter 2, both of these constraints are based on constraints proposed in earlier work by Rose & Walker (2004; see also Walker 2000b) to explain nasal consonant harmony patterns in Bantu languages (constraints called 'PROXIMITY' and 'SROLE-CC', respectively). Note also that CC·SROLE makes a distinction between two similar syllable roles: 'onset', and 'head-of-onset'. I take the head of an onset to be the least sonorous consonant contained in the onset; this means the [r] in the syllable [.ɾa.]

has the role 'head-of-onset', while the [r] in the syllable [.b**r**a.] has the role 'onset'. This distinction is empirically necessary for Sundanese: [Cr] onset clusters can induce R-dissimilation where solitary [r]s do not. Note that the specific definition of 'head-of-onset' as the least sonorous onset consonant is not central to the analysis: what's crucial is only that [r] has different syllable roles in [.**r**a.] vs. [.b**r**a.] – it doesn't matter what those roles are for the analysis.

The original intended purpose of these structural CC·Limiter constraints in harmony is to limit the circumstances under which correspondence is possible, thereby limiting the circumstances where long-distance assimilation occurs. However, by virtue of assigning violations when segments are in correspondence, they also have the effect of favoring dissimilation in those situations.

The last two constraints required in the analysis are standard input-output faithfulness constraints, of the IDENT family.

(19) IDENT-[lateral]: for any input segment X and its output correspondent X', assign a violation if:
  a. X is [α lateral], *and*
  b. X' is [β lateral]

(20) IDENT-Root-[lateral]: for any input segment X and its output correspondent X', assign a violation if:
  a. X is [α lateral], *and*
  b. X' is [β lateral], *and*
  c. X is a segment in a morphological root

These are basic faithfulness constraints that penalize deviation from the underlying specification of the Rhotic/Lateral feature that distinguishes [r] from [l]. IDENT-[lateral] penalizes changing /r/ to [l], or /l/ to [r]. IDENT-Root [±lateral] does the same, but only for segments contained in the root morpheme; it assigns no violations for /r/ [l] or /l/ [r] mappings in affixes. Note that they refer to both values of the feature; for the analysis of Sundanese, there is no need to split the faithfulness constraints into value-specific pieces (i.e. IDENT [Lateral] vs. IDENT [Rhotic]).

4.2.3. Inputs, outputs, and the candidate space

The analysis is based on consideration of 10 input forms representative of the key generalizations in the Sundanese r~l alternation. Of these 10 inputs, 9 are affixed forms which have the /r/ of the /ar/ infix in different positions relative to other /r/s and/or /l/s in the root. The remaining input is an un-affixed root containing both /l/ and /r/. The full list of inputs is given in the table in (21).

(21) List of inputs considered: (liquids in bold; liquids in the root also underlined)

Input	Output observed	Configuration	Remarks
/ar-lɨtik/	[**l**=a**l**=ɨtik] ‘little (pl.)’	/**L**-a**R**-vcvc/	L-assimilation
/ar-liren/	[**l**=a**l**=iren] ‘take a break (pl.)’	/**L**-a**R**-v**R**vc/	L-assimilation
/ar-gɨlis/	[g=a**r**=ɨ**l**is] ‘beautiful (pl.)’	/c-a**R**-v**L**vc/	faithful; no L-assimilation
/ar-hormat/	[h=a**l**=o**r**mat] ‘respect (pl.)’	/c-a**R**-v**R**cvc/	R-dissimilation
/ar-combrek/	[c=a**l**=omb**r**ek] ‘cold (pl.)’	/c-a**R**-vcc**R**vc/	R-dissimilation
/ar-ŋumbara/	[ŋ=a**l**=umba**r**a] ‘go abroad (pl.)’	/c-a**R**-vccv**R**v/	R-dissimilation
/ar-rahɨt/	[**r**=a**r**=ahɨt] ‘wounded (pl.)’	/**R**-a**R**-vcvc/	faithful; no R-dissimilation
/ar-curiga/	[c=a**r**=u**r**iga] ‘suspicious (pl.)’	/c-a**R**-v**R**vcv/	faithful; no R-dissimilation
/ar-kusut/	[k=a**r**=usut] ‘messy (pl.)’	/c-a**R**-vcvc/	faithful; no liquids in the root
/liren/	[**l**i**r**en] ‘take a break’	/**L**v**R**vc/	faithful; root-internal [l]~[r] allowed

For each of the affixed input forms, the space of candidates breaks down into two classes: candidates where the /ar/ affix surfaces as [=ar=] (faithfully), and candidates where the /ar/ affix surfaces as [=al=] (unfaithfully). Each of these classes contains a group of candidates which have the exact same string of segments, and differ only in their surface correspondence profiles. These candidates reflect all possible structures of the surface correspondence relation; that is, for each segmentally distinct output form, there is a group of candidates representing all of the different ways of partitioning the segments in that output string into equivalence classes. The candidates considered in this analysis reflect all possible correspondences involving the /r/ in the affix /ar/, and any liquids in the root. Candidates where the liquids correspond with other consonants in the root were omitted. The set of candidates considered for the input /ar-lɨtik/ is given below as an illustration.

(22) Candidates considered for input /ar-lɨtik/, 'small (pl.)'

	Output form	SCorr $\mathcal{R}$	Remarks
a.	.l$_1$=a.l$_1$=ɨ.t$_2$ik$_3$.	{l l}{t}{k}	/ar/ [al]; [l]s in correspondence
b.	.l$_1$=a.l$_2$=ɨ.t$_3$ik$_4$.	{l}{l}{t}{k}	/ar/ [al]; [l]s do not correspond
c.	.l$_1$=a.r$_1$=ɨ.t$_2$ik$_3$.	{l r}{t}{k}	/ar/ [ar]; [l] & [r] correspond
d.	.l$_1$=a.r$_2$=ɨ.t$_3$ik$_4$.	{l}{r}{t}{k}	/ar/ [ar]; [l] & [r] do not correspond

Since candidates with correspondence between liquids & non-liquids are excluded here, correspondence indices are suppressed for all non-liquids in subsequent examples and tableaus.

Candidates with changes to root-internal liquids were omitted for the inputs with the /ar/ affix. This is equivalent to positing that the root-specific faithfulness constraint IDENT-Root [±lateral] is undominated (as it filters out all such candidates).

The un-affixed input /liren/ 'take a break' is included merely to illustrate that the root faithfulness constraint is not crucially dominated in this analysis; it is never violated in the observed data. For this input, all possible changes to the underlying /l/ & /r/ were included as candidates, along with all possible surface correspondence structures for each segmental output.

4.2.4. Determining the optimal surface correspondences

Surface correspondence relationships between segments are not overtly visible. This makes it non-trivial to infer what the surface correspondence structure is for an observed form in the data. However, the theory of surface correspondence provides a means of interpreting surface correspondences from observable patterns of alternation.

When alternations (i.e. input-output disparities) occur, surface correspondence can be inferred from them, as noted previously in chapter 2. Long-distance assimilation is interpreted as Agreement By Correspondence. Consequently, when such assimilation is observed, the interacting segments must be in correspondence with each other. Conversely, dissimilation is interpreted as an effect of non-correspondence: dissimilating circumvents the need for correspondence under inauspicious circumstances. Therefore, when one segment dissimilates from another, they cannot be in surface correspondence with each other.

In the case of the Sundanese r~l alternations of interest to us, we can determine what the structure of the surface correspondence relation must be in all of the unfaithful inputs. When L-assimilation is observed, the /r/ of the plural infix /ar/ must be in correspondence with the /l/ in the root. Likewise, when R-dissimilation is observed, there cannot be correspondence between the (derived) [l] in the infix and the faithfully preserved [r] in the root.

In faithful output forms, when there are no alternations, the logic of the theory does not provide a basis to determine the structure correspondence relations present; however, in this case, the analysis of the pattern does still reveal us what the correspondences must be in these forms. For example, the input /ar/ + /gɨlis/ surfaces faithfully, as [g=ar=ɨlis] (23). This observed output form has two feasible surface correspondence structures, (24a) and (24b).

(23) /ar-gɨlis/ → [g=ar=ɨlis] ‘beautiful (pl.)’

(24) Two feasible surface correspondence structures for the output [g=ar=ɨlis]:

a. [g_1=a$\mathbf{r}_2$=ɨ$\mathbf{l}_2$is_3], SCorr $\mathcal{R}$ ={g}{r l}{s} ([r] and [l] correspond)

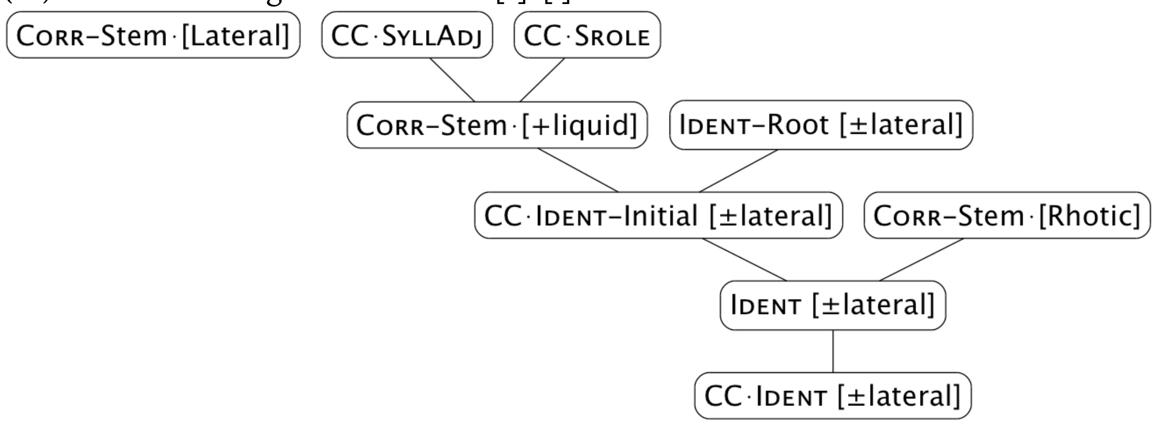
b. [g_1=a$\mathbf{r}_2$=ɨ$\mathbf{l}_3$is_4], SCorr $\mathcal{R}$ ={g}{r}{l}{s} (no [r]~[l] correspondence)

Neither R-dissimilation nor L-assimilation apply in this form. Since surface correspondence doesn’t force an unfaithful mapping here, the choice between the two correspondence representations isn’t crucial – at least on the basis of this datum alone. Nonetheless, the analysis of the rest of the pattern in Sundanese tells us that the representation of [g=ar=ɨlis] must be (24a), where the [r] & [l] are in correspondence. This is because the constraint rankings which produce the right combination of output forms for the cases where R-dissimilation or L-assimilation *do* apply all pick the representation in (24a) over (24b). In other words, there must be correspondence between the [r] & [l] in [g=ar=ɨlis] because this is the only possible interpretation which is consistent with the ranking conditions motivated by the rest of the pattern.

4.2.5. Ranking

The ranking for Sundanese is shown in the diagram in (25). This ranking was arrived at by considering all possible combinations of optima that yield the correct output forms, using OTWorkplace (Prince & Tesar 2011).

(25) Crucial rankings for Sundanese [r]~[l] alternation



Further justification for this ranking is given in §4.4.

4.3. Generalizations & data for Sundanese [ar] & [al]

The key generalizations of the Sundanese [r]~[l] alternation are repeated below. The point of this section is to show how the data supports these generalizations, and how they are interpreted in terms of surface correspondence.

(26) L-assimilation: the affix /ar/ assimilates to its alternate form [al] if the root begins with /l/, and the /ar/ is infixed after it (yielding [L-aR-v...])

(27) R-dissimilation: the affix /ar/ dissimilates to its alternate form [al] if the root contains a following /r/, *unless* the two /r/s are the onsets of adjacent syllables

(28) Complementarity of the two patterns
a. R-dissimilation happens *except* between syllable-adjacent onsets
b. L-assimilation happens *only* between syllable-adjacent onsets

The central thesis proposed here is that R-dissimilation and L-assimilation both arise from constraints on surface correspondence. Both patterns are driven by the same surface correspondence relation, and both are affected by constraints on that correspondence. This is the source of the complementarity of the two patterns.

The gist of the Surface Correspondence analysis is as follows. Sundanese requires correspondence in the stem between rhotics, and also between liquids. However, the language allows correspondence only for consonants that (i) are syllable-adjacent, and that (ii) have matching syllable roles. Lateral agreement is required only between consonants that correspond. The result of these correspondence requirements and limitations is that R-dissimilation occurs when two /r/s are in a configuration where correspondence is not permitted. When two /r/s are in a configuration where correspondence between them *is* permitted, R-dissimilation fails to occur. L-assimilation, on the other hand, *occurs* only if /r/ and /l/ are in a configuration where correspondence between them is permitted. Thus, dissimilation happens only where correspondence is not allowed, and assimilation happens only where correspondence *is* allowed; the same limits on correspondence cut across both patterns.

Supporting data for both facets of the [r]~[l] alternation is given below. All data comes from Cohn (1992), except where noted otherwise. Examples cited as 'own data' were elicited by the author, from a consultant who is a native Sundanese speaker.[6] Liquid consonants in example form are in bold, and liquids in the root are also underlined.

The focus of interest is the plural affix [ar]/[al]. The underlying form of this affix is /ar/ (with /r/, not /l/); the evidence for this is that [ar] is the form that appears for roots with no liquids, as in (29)[7].

(29) If a root contains no /l/s at all: no L-assimilation

a.	k=a.**r**=u.sut	'messy (pl.)'	
b.	p=a.**r**=o.ho	'forget (pl.)'	
c.	m=a.**r**=i.hak	'take sides (pl.)'	(Cohn 1990)

These examples shows that, all other things being equal, /ar/ normally surfaces faithfully, as [ar]. This is an uncontroversial – and perhaps obvious – conclusion, but one worth noting explicitly, since it is fundamental to the analysis.

4.3.1. R-dissimilation data

R-dissimilation occurs whenever the affix /r/ and an /r/ in the root have different syllable roles. Thus, we observe the dissimilation when one /r/ is an onset and the other is a coda; this is the case whether they are in different syllables (30), or are the onset & coda of the same syllable (31).

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[6] The consultant I worked with was a female, mid-20s in age, in New York City, who had lived in Indonesia until the age of 6, and spoke Sundanese in school and at home. Data was collected during an initial meeting in person in New York City, and in subsequent email contact.

[7] There are a small number of lexical exceptions, where [al] occurs spuriously. An example is [gəde] 'to be big', which has the exceptional plural form [g=al=əde] – with an [l] in the affix despite the lack of any /l/ or /r/ in the root. Robins (1959:344) suggests this is form is due to analogy with [lɨtik] 'to be small', with the completely regular plural form [l=al=ɨtik].

(30) Root /r/ is the coda of a σ following the affix /r/: R-dissimilation occurs.

a.	b=a.**l**=ɨŋ.ha**r**	‘rich (pl.)’	
b.	b=a.**l**=o.co**r**	‘leaking (pl.)’	
c.	ɲ=a.**l**=i.a**r**	‘seek (pl.)’	(Cohn 1990)
d.	n=a.**l**=u.hu**r**.-kɨn	‘dry (pl.)’	(Cohn 1990)
e.	(ʔ)=a.**l**=u.**l**u**r**	‘lower on a rope (pl.)’	(own data)[8]

(31) Root /r/ is the coda of the σ containing the affix /r/: R-dissimilation occurs.

a.	h=a.**l**=o**r**.mat	‘respect (pl.)’
b.	p=a.**l**=ə**r**.ce.ka	‘handsome (pl.)’

The Surface Correspondence interpretation of this data is that correspondence is not permitted between [r]s that have different syllable roles. R-dissimilation happens here because [r]s are required to correspond, but CC·SROLE prohibits them from doing so (because one is an onset and the other is a coda). Note that the syllable role effect cannot be reduced to a locality restriction. For instance, it is not the case that the /r/s in (30) are prohibited from corresponding because they are too far apart; the forms in (31) show that /r/s are also prohibited from corresponding when they are different parts of the same syllable, and no other consonants stand between them.

R-dissimilation also happens when one /r/ is an onset in its own right, and the other /r/ is part of a complex onset (42). In other words, an /r/ in a cluster behaves like an /r/ in a coda. This asymmetry between onset /r/s and /r/s in onset clusters is the motivation for CC·SROLE to distinguish between the roles ‘onset’ and ‘head-of-onset’. Taking the head of an onset to be its least sonorous consonant, the root /r/ in

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[8] Van Syoc (1959) reports that glottal stops occur before all post-pausal vowels in Sundanese – including word-initial ones. I did not observe a prominent glottal stop at the beginning of the word when the consultant I worked with pronounced it, but I include the glottal stop here for consistency with other examples.
Note that this example also shows that dissimilation occurs as normal across an intervening [l]; the [l] does not have the effect of “blocking” R-dissimilation.

(32a) [c=a.l=om.brek] has the syllable role 'onset', because it is in a cluster with the less-sonorous consonant [b]. The [l] in the plural infix, however, is the only segment in the onset of the syllable [.lom.], and so necessarily is the head of an onset.

(32) Root /r/ is inside a complex onset following affix /r/: R-dissimilation occurs.

a.	c=a.**l**=om.b**r**ek	'cold (pl.)'
b.	m=a.**l**=o.t**r**et	'take a picture (pl.)'

These forms are interpreted in the same way as the forms with coda [r]s above. The two /r/s receive different syllable roles; therefore, correspondence between them is prohibited, and R-dissimilation occurs.[9]

R-dissimilation also occurs when two /r/s are onsets, but in non-adjacent syllables, as shown in (33).

(33) Root /r/ is the onset of a σ *not* adjacent to affix /r/: R-dissimilation applies.

a.	ŋ=a.**l**=um.ba.**r**a	'go abroad (pl.)'
b.	s=a.**l**=i.du.**r**u	'sit by a fire (pl.)'

This shows that two [r]s may not correspond across an intervening syllable; one correspondent must be syllable-adjacent to the next.

R-dissimilation fails to occur an /r/ in the root and the /r/ of the plural affix are the onsets of two adjacent syllable roles; that is, no dissimilation happens for two /r/s that are syllable-adjacent and have matching syllable roles. This is shown below. When the root begins with /r/, the regular pattern of infixation leads to the two /r/s

[9] Following this interpretation, we would expect that dissimilation would not occur when two /r/s are both codas, e.g. in the configuration /C=aR=CVRCV/. Unfortunately, I have yet to find any roots that give rise to this situation. Based on my survey of Rigg's (1862) dictionary, Sundanese has few roots with initial /Cr/ or /Cl/ clusters; my consultant was unfamiliar with many of the ones Rigg gives, and identified nearly all of the rest as incompatible with the /ar/ plural affix. I elicited only one form with an initial /Cr/ cluster and /ar/: [bararesin] 'to sneeze (pl.) (cf. [bresin] 'to sneeze'. This form had an additional [a] inserted, which leaves the affix /r/ as an onset. So, it remains unclear what would happen if the affix /r/ were syllabified in other ways.

being the onsets of the first two syllables. In this situation, both surface faithfully, as [r]s (34).

(34) Root /r/ is initial (≈ onset of σ before affix /r/): R-dissimilation *doesn't* apply.

a.	**r**=a.**r**=a.hɨt	'wounded (pl.)'	
b.	**r**=a.**r**=ɨ.wat	'startled (pl.)'	
c.	**r**=a.**r**=u.ge.**l**-an	'do often (pl.)'	(own data)

A parallel situation obtains for some roots with medial /r/s. When the /ar/ affix is combined with a root of the shape /cvRvc(v)/, regular infixation produces a stem with the structure [c=aR=vRvc(v)]. Although neither /r/ is root-initial, they are still the onsets of two adjacent syllables, and both surface faithfully as [r]s (35).

(35) Root /r/ is onset of the σ following affix /r/: R-dissimilation *doesn't* apply.

a.	c=a.**r**=u.**r**i.ga	'suspicious (pl.)'
b.	di-.k=a.**r**=i.**r**im	'sent (pass., pl.)'

The surface correspondence interpretation of the data in (34) & (35) is that the /r/s in these forms are in structural configurations where correspondence between them is allowed. Since correspondence is permitted, dissimilation is not needed, and does not occur.

Finally, R-dissimilation does not occur root-internally. Roots may contain two /r/s, and both surface faithfully. R-dissimilation happens only to /r/s in the /ar/ affix, never to those in roots.[10]

[10] Cohn (1992:215) points out that words with multiple /r/s appear to be under-represented in the lexicon; however, this is a gradient effect, and therefore falls outside the scope of this dissertation. It is also not evidence for the same R-dissimilation process happening in roots: the existence of words like *radar* show that multiple /r/s do surface faithfully, they do not dissimilate. Furthermore, Cohn (1992:214) finds that /r/~/l/ co-occurrence is also under-represented; if R-dissimilation were happening in the lexicon, such sequences should be over-represented instead. The reader is referred to Cohn (1992) for more details on [r]~[l] co-occurrence in the Sundanese lexicon, and to chapter 9 for further discussion of why gradient under-representedness patterns do not constitute dissimilation as understood in this dissertation.

(36) Roots with two /r/s do not exhibit R-dissimilation

a.	r̲a.dar̲	'radar'	
b.	r̲es.to.r̲an	'restaurant'	
c.	r̲ag.r̲ag	'fall'	
d.	r̲o.r̲om.pok	'house'	(Van Syoc 1959)
e.	r̲e.r̲ab	'cook in fire'	(Rigg 1862)

The correspondence interpretation of these faithful, root-internal, /r…r/ sequences is uncertain. Since words like [radar] and [restoran] exhibit no alternation, the correspondence structure involving the [r]s is not clear. The analysis posited here allows these root-internal pairs of /r/s to correspond, or not; the constraint ranking responsible for the R-dissimilation & L-assimilation patterns do not decide between [$r_1ad_2ar_3$] & [$r_1ad_2ar_1$] as the output of /radar/ 'radar'.[11]

4.3.2. L-assimilation data

L-assimilation occurs applies the root has an initial /l/; this is shown in (37).

(37) Root has initial /l/: L-assimilation occurs

a.	l̲=a.l=ɨ.tik	'little (pl.)'
b.	l̲=a.l=ə.ga	'wide (pl.)'

Note that in this situation, the initial /l/ of the root and the /r/ of the affix /ar/ end up as the onsets of the first two syllables of the stem. They are therefore in a configuration where correspondence is permitted, as evidenced independently by the failure of R-dissimilation noted above. The data in (37) shows that lateral agreement is required only between liquids that are allowed to correspond.

[11] The correspondence outcome for root-internal /r…r/ sequences depends on the relative ranking of CORR-Stem· [Rhotic], IDENT-Root [±lateral], CC·SROLE, and CC·SYLLADJ. These are constraints that are not violated in the observable data, and are not crucially dominated. As such, their relative ranking is not determinable from the rest of the data, so it cannot be used as a basis to infer the winning correspondence structure, and will not be explored in more detail here.

If a root contains only a non-initial /l/, then L-assimilation does not occur, and the affix /ar/ surfaces as [ar]. As the examples in (38) below show, it makes no difference whether the root /l/ is an onset (38a–b), a coda (38d–e), or part of a complex onset (38f–g). It also doesn't matter if the root /l/ is in the syllable immediately following the affix /r/, or in a subsequent syllable; compare (38a) vs. (38c), for example. L-dissimilation is induced by only by /l/s in root-initial position.

(38) L-assimilation does not occur if root /l/ is not in initial position:

a.	g=a.**r**=ɨ.**l̲**is	'beautiful (pl.)'
b.	ŋ=a.**r**=u.**l̲**i.at	'stretch (pl.)'
c.	di-.v=a.**r**=i.su.a.**l̲**i.sa.si.-kɨn	'visualized (pass., pl.)'
d.	g=a.**r**=ə.to**l̲**	'diligent (pl.)'
e.	m=a.**r**=a.ha**l̲**	'expensive (pl.)'
f.	ŋ=a.**r**=o.p**l̲**ok	'flop down (pl.)'
g.	ŋ=a.**r**=a.j**l̲**əŋ	'jump (pl.)'

The surface correspondence interpretation of this data is that correspondents are required to agree in laterality only when one of them is root-initial. With the exception of (38a), these [r…l] sequences are not configurations where correspondence is allowed; as such, the lack of agreement is unsurprising.

If the root contains other liquids in addition to an initial /l/, L-assimilation operates the same way as in the plain /l/-initial roots, as shown in (39) below. This means that /l/s which do not otherwise cause L-assimilation do not prevent it from happening. Similarly, if an /l/-initial root contains an /r/ in a configuration that *permits* [r…r] co-occurrence, L-assimilation still occurs; the medial /r/ in (39e) [l=al=oreŋ] does not 'block' L-assimilation, for instance.

(39) L-assimilation occurs when there are root-initial and root-medial /l/s:

a.	l=a.l=əŋ.lə.ŋ-an	'dizzy (pl).'	(own data)
b.	l=a.l=a.lɨ.r-an	'covered in flies'	(own data)
c.	l=a.l=i.ren	'take a break (pl.)'	(own data)
d.	l=a.l=e.res	'correct (pl.)'	(own data)
e.	l=a.l=o.reŋ	'striped (pl.)'	(own data)

Finally, L-assimilation does not occur root-internally. Roots like those in (40) show that [LvR] and [RvL] sequences may occur in roots, and surface faithfully.

(40) L-assimilation does not occur root-internally

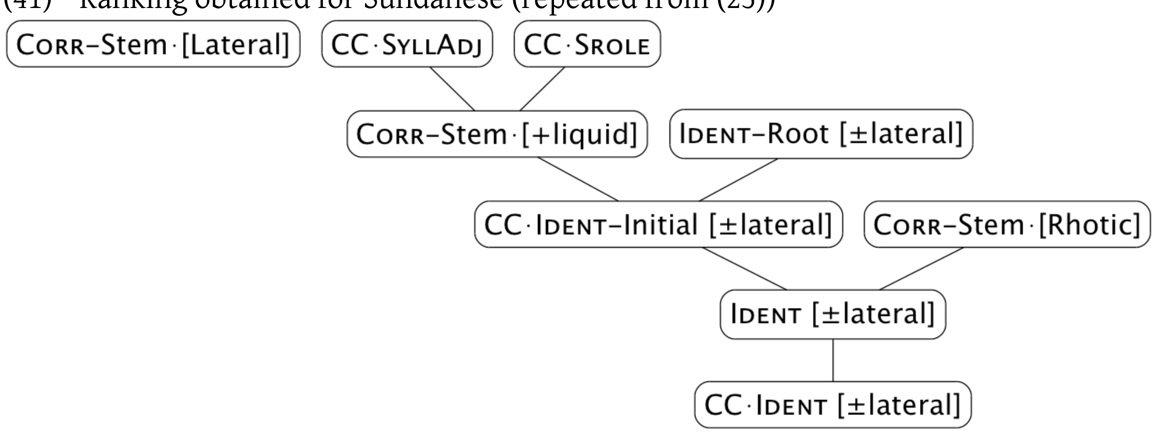
a.	li.ren	'take a break'	(Rigg 1862, own data)
b.	le.res	'correct'	(Rigg 1862, own data)
c.	lo.reŋ	'striped'	(Rigg 1862, own data)
d.	la.rap	'use'	(Rigg 1862, own data)
e.	la.rab	'arithmetic'	

This shows root liquids do not undergo L-assimilation, even where they are permitted to correspond, and where correspondents are otherwise required to agree in laterality.

4.4. The Surface Correspondence Analysis

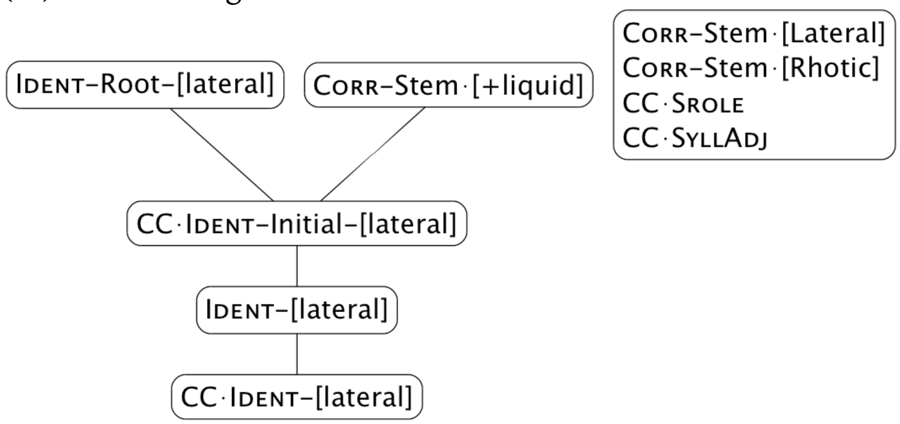
The proposed ranking is repeated below. The purpose of this section is to show how this ranking is motivated by the data, and how it produces the combination of patterns observed above in §4.3.

(41) Ranking obtained for Sundanese (repeated from (25))

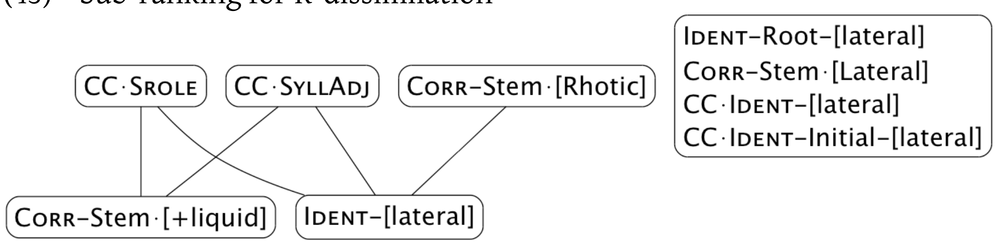


The portion of the ranking responsible for the L-assimilation pattern is shown in (42), and the ranking conditions responsible for R-dissimilation are given in (43).

(42) Sub-ranking for L-assimilation



(43) Sub-ranking for R-dissimilation



4.4.1. L-assimilation

L-assimilation is agreement for [lateral] among segments in correspondence: in order for this to occur, either CC·Ident-[lateral] or its position-specific relative CC·Ident-Initial-[lateral] must dominate faithfulness for lateral. This is shown in the tableau in (44); (candidates with no correspondence between the liquids are filtered out by the higher-ranked Corr constraints, and so are not shown here).

(44) L-assimilation means some CC·IDENT constraint must dominate IDENT-[lateral]

Input: /ar-lɨtik/ Output: [l=a.l=ɨ.tik]		CC·IDENt-Initial-[lateral]	CC·IDENT-[lateral]	IDENT-[lateral]
☞ a.	L_1=a.L_1=ɨ.tik ℛ:{l l}{t}{k}	(0)	(0)	(1)
~ b.	L_1=a.R_1=ɨ.tik ℛ:{l r}{t}{k}	**W** (0~1)	**W** (0~1)	L (1~0)

L-assimilation only happens with root-initial /l/s; root-medial /l/ does not induce the assimilation. This means it must be only the positional agreement constraint CC·IDENt-Initial-[lateral] that dominates IDENT-[lateral], and not its general counterpart CC·IDENT-[lateral]. If the general CC·IDENT-[lateral] constraint dominated faithfulness for laterality, then L-assimilation would also be triggered by word-medial /l/s. Since this isn't the case, IDENT-[lateral] must dominate CC·IDENT-[lateral], as (45) shows.

(45) No L-assimilation for non-initial /l/s: IDENT-[lateral] » CC·IDENT-[lateral]

Input: /ar-gɨlis/ Output: [g=a.r=ɨ.lis]		CC·IDENt-Initial-[lateral]	IDENT-[lateral]	CC·IDENT-[lateral]
☞ a.	g=a.R_2=ɨ.$L_2$is ℛ:{g}{r l}{s}	(0)	(0)	(1)
~ b.	g=a.L_2=ɨ.$L_2$is ℛ:{g}{l l}{s}		**W** (0~1)	L (1~0)

The result is a ranking structure where IDENT-[lateral] is ranked between the two CC·IDENT constraints, shown in (46). This ranking causes L-assimilation to occur with root-initial /l/s, but not when /l/s are in other positions in the root.

(46) Sub-ranking: lateral agreement only happens with root-initial /l/s

CC·Ident–Initial–[lateral]
|
Ident–[lateral]
|
CC·Ident–[lateral]

L-assimilation is agreement by correspondence. Therefore, when L-assimilation occurs, it must happen because the agreeing liquids are required to correspond with each other. Corr-Stem·[+liquid] is the constraint that demands this correspondence between [r]s & [l]s. So, this constraint must also dominate Ident-[lateral]. This is shown in (47), by the input /ar-lɨren/. The crucial comparison is (47a) vs. (47b): the assimilated output form (47a) [l$_1$=al$_1$=ɨr$_2$en], with correspondence among all three liquids, vs. the faithful alternative [l$_1$=ar$_2$=ɨr$_2$en] in (47b), with correspondence only between the two [r]s. Some other losing alternatives are included in (47c–e). The constraint CC·SyllAdj is omitted here as it does not play a crucial role in this comparison, but it is worth noting that all of the candidates in (47) satisfy it.[12]

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[12] The winner in (47a) incurs no CC·SyllAdj violations because each of the corresponding liquids is syllable-adjacent to the next. As noted previously (ch. 2), CC·SyllAdj only penalizes correspondence that skips over an inert intervening syllable. This is not the case in (47a) [$\mathbf{L}_1$=a.$\mathbf{L}_1$=i.$\mathbf{R}_1$en]; the root-initial [l] and the root-medial [r] are not in adjacent syllables, but the only syllable that stands between them also contains an [l] that is in their same correspondence class. So, the members of this correspondence class are all in a contiguous span of three consecutive syllables, which satisfies CC·SyllAdj.

(47) Correspondence between the infix /r/ and root-initial /l/ means CORR-Stem·[+liquid] » CC·IDENT-Initial-[lateral]:

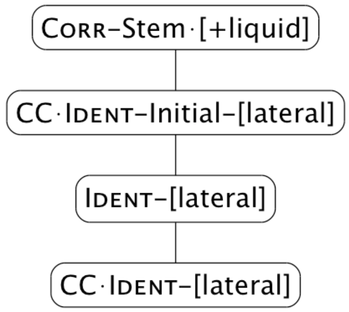
Input: /ar-liren/ Output: [l=a.l=i.ren]		CORR-Stem·[+liquid]	CC·IDENT-Initial-[lateral]	IDENT-[lateral]	CC·IDENT-[lateral]
☞ a.	L_1=a.L_1=i.R_1en ℛ:{l l r}{n}	(0)	(1)	(1)	(2)
~ b.	L_1=a.R_2=i.R_2en ℛ:{l}{r r}{n}	**W (0~2)**	**L (1~0)**	**L (1~0)**	**L (2~0)**
~ c.	L_1=a.L_1=i.R_2en ℛ:{l l}{r}{n}	W (0~2)	L (1~0)	e (1~1)	L (2~0)
~ d.	L_1=a.R_1=i.R_2en ℛ:{l r}{r}{n}	W (0~2)	e (1~1)	L (1~0)	L (2~0)
~ e.	L_1=a.R_2=i.R_3en ℛ:{l}{r}{r}{n}	W (0~3)	L (1~0)	L (1~0)	L (2~0)

Note that in order to force correspondence between the root-initial /l/ and the /r/ in the plural /ar/ affix, CORR-Stem·[+liquid] must crucially dominate not just IDENT-[lateral], but also both CC·IDENT constraints. Because /r/ and /l/ disagree for the feature [rhotic], the CC·IDENT constraints have the effect of penalizing the [l]~[r] correspondence. So, from the perspective of these constraints, the losing candidate in (47b) seems desirable: it has correspondence only between those liquids that agree in laterality, i.e. the two [r]s. Moreover, it faithfully preserves both of the /r/s as [r]s, thereby satisfying IDENT-[lateral] as well. This invites the possibility that L-assimilation could be "blocked" by an additional /r/ in the root[13]. Since this effect is *not* what we find in the data, Sundanese must enforce [l]~[r] correspondence even in this situation.

[13] The blocking interaction illustrated by (48b) is an example of Hansson's (2007) notion of blocking by "preferential correspondence" – the affixal /r/ in (48b) corresponds with the root-medial /r/ rather than corresponding with the root-initial /l/, or with both.

This requires the ranking Corr-Stem·[+liquid] » CC·Ident-Initial-[lateral] » Ident-[lateral] » CC·Ident-[lateral], shown in (48).

(48) Corr-Stem·[+liquid] dominates CC·Ident-Initial-[lateral], etc.



Finally, L-assimilation does not occur root-internally. Words like [liren] 'take a break' show that [l]~[r] co-occurrence is allowed in roots — even when the [l] is root-initial, and the two liquids are in a configuration where correspondence is allowed (i.e. they are adjacent-syllable onsets). This means that the root-specific faithfulness constraint Ident-Root [±lateral] is undominated, and crucially dominates the agreement constraint CC·Ident-Initial-[lateral]. This is shown in (49).

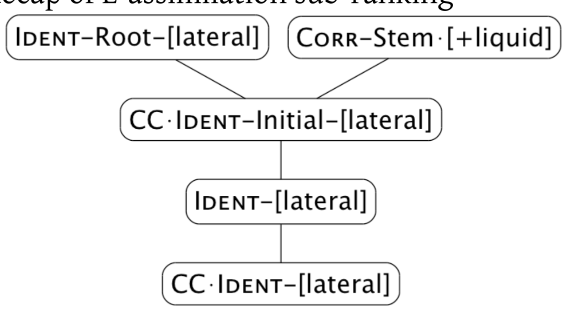
(49) Ident-Root [±lateral] is undominated, and dominates CC·Ident-Initial-[lateral]:

Input: /liren/ Output: [liren]		Ident-Root [±lateral]	Corr-Stem· [+liquid]	CC·Ident-Initial-[lateral]	Ident-[lateral]	CC·Ident-[lateral]
☞ a.	L_1i.R_1en $\mathcal{R}$:{l **r**}{n}	(0)	(0)	(1)	(0)	(1)
~ b.	L_1i.L_1en $\mathcal{R}$:{l l}{n}	**W** **(0~1)**		**L** **(1~0)**	W (0~1)	L (1~0)
~ c.	L_1i.R_2en $\mathcal{R}$:{l}{r}{n}		W (0~1)	L (1~0)		

Note that the relative ranking of Ident-Root [±lateral] does not play a role in selecting the faithful candidate with correspondence between the root liquids (49a) over the faithful non-correspondent alternative (49c). These two candidates differ only in their surface correspondence profiles, not their segmental content. Both are fully faithful, and incur no IDENT violations; therefore, input-output IDENT constraints cannot favor one over the other. The choice between them is determined by the ranking of CORR constraints, specifically CORR-Stem·[+liquid]. The ranking CORR-Stem·[+liquid] » CC·IDENt-Initial-[lateral], motivated in (48), dictates that the faithful and correspondent candidate (49a) must be the winner here. In order for the non-correspondent alternative in (49b) to win, the constraints would need to be ranked in a way that is inconsistent with the L-assimilation we observe elsewhere in the language.

The resulting ranking, with undominated IDENT-Root [±lateral], is recapped in (50).

(50) Recap of L-assimilation sub-ranking



4.4.2. R-dissimilation

R-dissimilation is the result of failed correspondence. It happens when two rhotics are required (by a Corr constraint) to correspond, but are prohibited from corresponding because this would violate another (CC·Limiter) constraint. The constraints that serve to penalize surface correspondence in this way are CC·SYLLADJ, and CC·SROLE.

R-dissimilation happens when two /r/s are in non-adjacent syllables; this means that surface correspondence is not permitted between segments in non-adjacent syllables. Consequently, CC·SYLLADJ must dominate CORR-Stem·[+liquid]. This is shown in (51) with the input /ar-ŋumbara/, which undergoes R-dissimilation, surfacing as [ŋ=a**l**=umbara]. The important comparison here is (51a) vs. (51b). Since having correspondence between the two /r/s (51b) satisfies CORR-Stem·[+liquid], and the CC·IDENT constraints, and faithfulness for [lateral], CORR-Stem·[+liquid] must be dominated by some constraint that penalizes faithful correspondence between the [r]s. Here, this constraint is CC·SYLLADJ: it penalizes correspondence between the [r]s in (51a) because such correspondence skips over the inert intervening syllable [.ba.]. CC·SYLLADJ therefore favors the non-correspondent and dissimilated winner in (51a). (Note that one significant candidate is omitted here: [ŋ=ar$_1$=umbar$_2$a] the faithful alternative with no correspondence between the [r]s. This candidate is ruled out by the higher-ranked constraint CORR-Stem·[Rhotic], which we turn to shortly.)

(51) R-dissimilation in non-adjacent syllables means CC·SYLLADJ » CORR-Stem·[+liquid]

Input: /ar-ŋumbara/ Output: [ŋ=a.**l**=um.ba.**r**a]		CC·SYLLADJ	CORR-Stem·[+liquid]	CC·IDENT-Initial-[lateral]	IDENT-[lateral]	CC·IDENT-[lateral]
☞ a.	ŋ=a.**L**$_2$=um.ba.**R**$_5$a ℛ:{ŋ}**{l}**{m}{b}**{r}**	(0)	(0)	(0)	(1)	(0)
~ b.	ŋ=a.**R**$_2$=um.ba.**R**$_2$a ℛ:{ŋ}**{r r}**{m}{b}	**W** (0~1)	L (1~0)		L (1~0)	
~ c.	ŋ=a.**L**$_2$=um.ba.**R**$_2$a ℛ:{ŋ}**{l r}**{m}{b}	**W** (0~1)	L (1~0)	W (0~1)		W (0~1)

A parallel situation obtains for R-dissimilation in cases where the two /r/s end up with mismatching syllable roles. This is illustrated in (52) for the input /ar-hormat/, which is realized as [h=al=ormat]. In this case, one liquid is an onset while the other is a coda. Since R-dissimilation happens in this context, correspondence must be prohibited. The constraint that prohibits it is CC·SROLE; it penalizes faithful [r]~[r] correspondence (56b) because the onset & coda [r]s have different syllable roles. This means CC·SROLE also dominates CORR-Stem·[+liquid].

(52) R-dissimilation between onsets & codas means CC·SROLE » CORR-Stem·[+liquid]

Input: /ar-hormat/ Output: [h=a.l=or.mat]		CC·SROLE	CC·SYLLADJ	CORR-Stem·[+liquid]	CC·IDENT-Initial-[lateral]	IDENT-[lateral]	CC·IDENT-[lateral]
☞ a.	h=a.L_2=oR_3.mat $\mathcal{R}$:{h}**{l}{r}**{m}{t}	(0)	(0)	(1)	(0)	(1)	(0)
~ b.	h=a.R_2=oR_2.mat $\mathcal{R}$:{h}**{r r}**{m}{t}	**W** (0~**1**)		L **(1~0)**		L (1~0)	
~ c.	h=a.L_2=oR_2.mat $\mathcal{R}$:{h}**{l r}**{m}{t}	W (0~1)		L **(1~0)**		e (1~1)	W (0~1)

CORR-Stem·[+liquid] by itself cannot force dissimilation from one liquid, /r/, to another liquid, [l]. It requires correspondence among *all* liquids in the stem; changing /r/ to [l] does not reduce a candidate's number of CORR-Stem·[+liquid] violations, it merely changes the quality of the consonants which incur those violations. To fully produce the correct pattern of R-dissimilation, a second CORR constraint is required, CORR-Stem·[Rhotic]. This constraint forces dissimilation by requiring correspondence between [r]s, even in those situations where having correspondence between them is prohibited by other constraints like CC·SROLE and CC·SYLLADJ. This is shown in (53) and (54); the crucial comparisons are (53a) vs. (53b), and (54a) vs. (54b). These show that the observed outputs with R-dissimilation beat the faithful alternatives with two non-corresponding [r]s, as long as CORR-Stem·[Rhotic] also dominates IDENT-[lateral].

(53) CORR-Stem·[Rhotic] » IDENT-[lateral], to force dissimilation for onset-coda /r/s:

Input: /ar-hormat/ Output: [h=a.l=or.mat]		CORR-Stem·[Rhotic]	CC·SROLE	CC·SYLLADJ	CORR-Stem·[+liquid]	CC·IDENT-Initial-[lateral]	IDENT-[lateral]	CC·IDENT-[lateral]
☞ a.	h=a.**L**$_2$=o**R**$_3$.mat $\mathcal{R}$:{h}**{l}**{**r**}{m}{t}	(0)	(0)	(0)	(1)	(0)	(1)	(0)
~ b.	h=a.**R**$_2$=o**R**$_3$.mat $\mathcal{R}$:{h}{**r**}{**r**}{m}{t}	**W** **(0~1)**			e (1~1)		**L** **(1~0)**	
~ c.	h=a.**R**$_2$=o**R**$_2$.mat $\mathcal{R}$:{h}{**r r**}{m}{t}		W (0~1)		L (1~0)		L (1~0)	

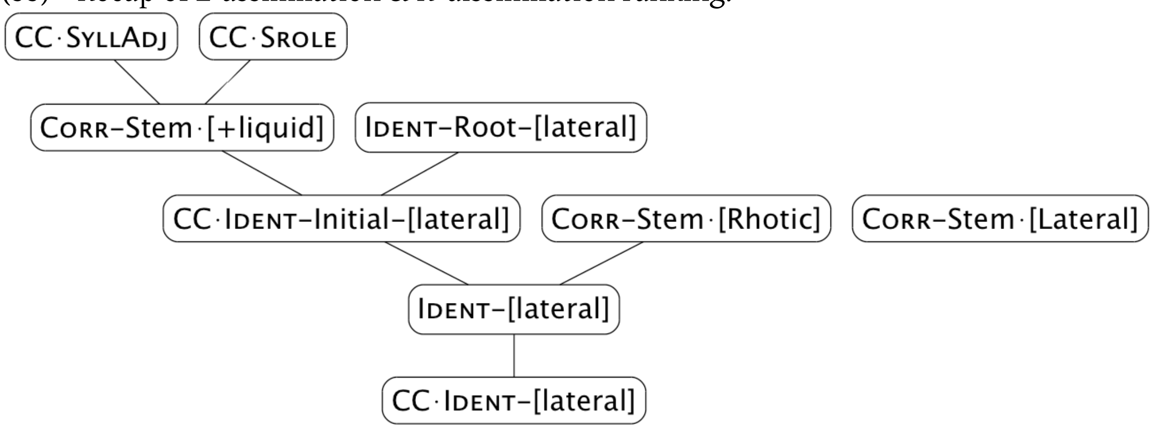
(54) CORR-Stem·[Rhotic] » IDENT-[lateral] also forces dissimilation for non-local /r/s:

Input: /ar-ŋumbara/ Output: [ŋ=a.**l**=um.ba.**r**a]		CORR-Stem·[Rhotic]	CC·SROLE	CC·SYLLADJ	CORR-Stem·[+liquid]	CC·IDENT-Initial-[lateral]	IDENT-[lateral]	CC·IDENT-[lateral]
☞ a.	ŋ=a.**L**$_2$=um.ba.**R**$_5$a $\mathcal{R}$:{ŋ}**{l}**{m}{b}{**r**}	(0)	(0)	(0)	(1)	(0)	(1)	(0)
~ b.	ŋ=a.**R**$_2$=um.ba.**R**$_5$a $\mathcal{R}$:{ŋ}{**r**}{m}{b}{**r**}	**W** **(0~1)**			e (1~1)		**L** **(1~0)**	
~ c.	ŋ=a.**R**$_2$=um.ba.**R**$_2$a $\mathcal{R}$:{ŋ}{**r r**}{m}{b}			W (0~1)	L (1~0)		L (1~0)	

These tableauxs show that the ranking CORR-Stem·[Rhotic] » IDENT-[lateral] is sufficient to favor dissimilation instead of faithful non-correspondence. The ranking of CORR-Stem·[Rhotic] relative to the correspondence-limiting constraints CC·SROLE and

CC·SyllAdj is not crucial: these constraints don't have any preference among the candidates that don't have any correspondence. The result is the ranking shown in (55). (Note that the ranking of Corr-Stem·[Lateral] is still irrelevant; Corr-Stem·[+liquid] is sufficient to drive [l]~[l] correspondence everywhere it is necessary.

(55) Recap of L-assimilation & R-dissimilation ranking:



If two /r/s are in a configuration where they are syllable-adjacent and have matching syllable roles – i.e. if they end up as the onsets of adjacent syllables – then R-dissimilation *does not* occur. This result emerges automatically from the ranking given above, as the tableau in (56) (following page) shows. When two [r]s are adjacent-syllable onsets, they can correspond without violating CC·SRole or CC·SyllAdj. Consequently, dissimilation is not optimal here; the dissimilating candidates lose to the alternatives which faithfully preserve both /r/s, with correspondence between them.

(56) R-dissimilation fails when /r/s are syllable-adjacent onsets

Input: /ar-rahɨt/ Output: [r=a.r=a.hɨt]		CORR-Stem• [Rhotic]	CC• SROLE	CC• SYLLADJ	CORR-Stem• [+liquid]	CC•IDENT-Initial-[lateral]	IDENT-[lateral]	CC•IDENT-[lateral]
☞ a.	**R**$_1$=a.**R**$_1$=a.hɨt ℛ:**{r r}**{h}{t}	(0)	(0)	(0)	(0)	(0)	(0)	(0)
~ b.	**R**$_1$=a.**R**$_2$=a.hɨt ℛ:**{r}{r}**{h}{t}	W (0~1)			W (0~1)			
~ c.	**R**$_1$=a.**L**$_2$=a.hɨt ℛ:**{r}{l}**{h}{t}				W (0~1)		W (0~1)	

While IDENT-Root [±lateral] is only crucially ranked for the L-assimilation pattern, it plays a minor role in the R-dissimilation pattern as well; it controls the direction of dissimilation. That is, IDENT-Root [±lateral] forces dissimilation to happen to the affix /r/, not /r/s in the root. This is shown in (57); two candidates that both dissimilate, but differ in which of the /r/s changes to [l]. The candidate in (57a) wins because it changes the affix /r/; this satisfies IDENT-Root [±lateral]. Changing the root /r/ to [l] (57b) incurs all the same violations as candidate (57a), plus a further violation of IDENT-Root [±lateral]. So, IDENT-Root [±lateral] favors root-to-affix dissimilation over affix-to-root dissimilation, irrespective of its ranking.

(57) IDENT-Root [±lateral] » CC•IDENt-Initial-[lateral]: dissimilation from root to affix

Input: /ar-hormat/ Output: [h=a.l=or.mat]		IDENT-Root [±lateral]	CORR-Stem• [Rhotic]	CC• SROLE	CC• SYLLADJ	CORR-Stem• [+liquid]	CC•IDENT-Initial-[lateral]	IDENT-[lateral]	CC•IDENT-[lateral]
☞ a.	h=a.**L**$_2$=o**R**$_3$.mat ℛ:{h}**{l}{r}**{m}{t}	(0)	(0)	(0)	(0)	(1)	(0)	(1)	(0)
~ b.	h=a.**R**$_2$=o**L**$_3$.mat ℛ:{h}**{r}{l}**{m}{t}	W (0~1)				e (1~1)		e (1~1)	

4.5. Conclusion

Sundanese exhibits a complex pattern of interlocking [r]~[l] alternations. One pattern, L-assimilation, turns /r/ in an infix into [l] when it follows a root-initial /l/. At the same time, another pattern, R-dissimilation, turns an infix /r/ into [l] when it precedes an /r/ in the root. These two patterns are subject to nearly opposite structural conditions: L-assimilation happens only if /r/ & /l/ are the onsets of two adjacent syllables, and R-dissimilation happens if and only if two /r/s are *not* onsets of adjacent syllables. The peculiarly complementary distribution of these two patterns is explained by an analysis based on surface correspondence. Sundanese permits surface correspondence between consonants only when they are in adjacent syllables, and have matching syllable roles. Where correspondence is possible, L-assimilation can arise by the well-understood mechanism of Agreement By Correspondence. Where correspondence is not possible, R-dissimilation happens to avoid having two [r]s that cannot correspond. This analysis also explains the failure of R-dissimilation for /r/s in adjacent-syllable onsets: correspondence between the two [r]s is allowed in this configuration, and dissimilation is optimal only when surface correspondence is prohibited. This analysis demonstrates the applicability of the surface correspondence framework not just for analyzing dissimilation, but also the interaction of dissimilation and long-distance assimilation patterns.

Chapter 5
Quechua and Obolo: the role of syllable edges

5.1. Introduction

The CC·Edge family of constraints penalize correspondence across domain edges. The analysis of Kinyarwanda in chapter 3 showed how one of these constraints, CC·EDGE-(Stem), has two related effects: both inhibiting harmony across the stem edge, and favoring dissimilation for consonants that straddle the stem edge. CC·Edge constraints can also refer to prosodic domains rather than morphological ones, like CC·EDGE-(σ).

(1) CC·EDGE-(σ): 'If two Cs correspond, they are contained in the same syllable'
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is inside some syllable Σ_i, *and*
c. Y is not inside the syllable Σ_i

CC·EDGE-(σ) can participate in both harmony and dissimilation systems. It therefore has consequences for both, summarized in (2).

(2) Effects of CC·EDGE-(σ) in harmony and dissimilation
a. Syllable-bounded harmony (example: Obolo)
b. Cross-syllable dissimilation (example: Cuzco Quechua)

Prohibiting correspondence across an edge both impedes harmony and causes dissimilation; these effects are complementary in the same way as the stem-bounded harmony and cross-edge dissimilation produced by CC·EDGE-(Stem), seen in chapter 3. Thus, in a harmony system, CC·EDGE-(σ) gives rise to syllable-bounding: harmony that holds only within the syllable, because consonants in different syllables may not correspond. In dissimilation, CC·EDGE-(σ) leads to cross-syllable effects: consonants are prohibited from corresponding only when they are separated by the edge of a syllable, so the result is dissimilation which occurs only for consonants in different syllables.

In this chapter, I show how analyses based on this constraint explain syllable-bounded nasal harmony in Obolo, and cross-syllable laryngeal dissimilation in Cuzco Quechua. These patterns involve interactions based on different features, but both of them feature the same limit on correspondence. Together, they show that both of the consequences of CC·EDGE-(σ) are attested. The analysis of Quechua is presented in §5.2, and the Obolo analysis in §5.3.

5.2. CC·EDGE-(σ) in dissimilation: Cuzco Quechua

The Cuzco variety of Quechua exhibits a pattern of laryngeal dissimilation involving epenthetic glottal stops, and glottalized consonants (ejectives), observed by Parker & Weber (1996; see also Parker 1969, Parker 1997, Mannheim 1991, MacEachern 1999, Gallagher 2011). Root-initial syllables in Cuzco Quechua always have an onset on the surface; roots that are underlyingly vowel-initial appear with an initial epenthetic consonant (Parker & Weber 1996[1]). Typically, the epenthetic consonant is a glottal stop (3). However, if a root contains an ejective, initial [h] is epenthesized instead of [ʔ] (4).

(3)	/asikuj/ →	[ʔasikuj]	'to laugh'	cf. *[asikuj]; [ʔ] epenthesized
(4)	/ajk'a/ →	[hajk'a]	'how many?'	cf. *[ʔajk'a]; [h] instead of [ʔ]

Parker & Weber (1996) note that these generalizations about the distribution of [h] and [ʔ] can be understood as dissimilation: the epenthetic consonant is [h] only

[1] See §5.2.2 for the justification that this is epenthesis.

where epenthesis of [ʔ] would result in two [+constricted glottis] in the same root. The treatment of [ʔ] and [h] as epenthetic is not crucial: the point of interest is that they alternate based on a principle of non-agreement with a [+constricted glottis] consonant in the root. This interpretation is supported by a corresponding static restriction against the co-occurrence of two ejectives in roots[2]. A parallel co-occurrence restriction also prohibits roots with two aspirated consonants; this is not relevant for the [ʔ] ~ [h] alternation, but can be explained in a parallel way, as dissimilation of [+spread glottis].

The glottalic dissimilation effects in Cuzco Quechua have previously been interpreted as dissimilation that holds indiscriminately throughout the root[3]; however, the dissimilation is *only* crucially evident as a restriction against glottalic consonants in different syllables. Co-occurrence of two glottalic Cs in the same syllable is independently ruled out by the basic distributional characteristics of these consonants. Glottal stops occur only word-initially, and ejectives occur only in simplex onsets (Parker & Weber 1996, Mannheim 1991). As such, there is no way that a licit Cuzco Quechua syllable can include two ejectives, or an ejective and a glottal stop. This means that the dissimilatory pattern traditionally interpreted as a ban on two glottalic consonants in the same root can be characterized – with equal accuracy – as a ban on two glottalic consonants in different syllables of the same root. Syllable-internal glottal co-occurrence is precluded by the basic phonotactics of the language: the analysis of the dissimilation pattern does not need to redundantly prohibit it.

[2] The glottal stop occurs only due to root-initial epenthesis; it doesn't occur root-internally. As such, it is prevented from co-occurring with ejectives or another glottal stop, for reasons independent of the dissimilation.

[3] See work by Carenko 1975, Parker & Weber 1996, Parker 1997, MacEachern 1999, Gallagher 2011, among others.

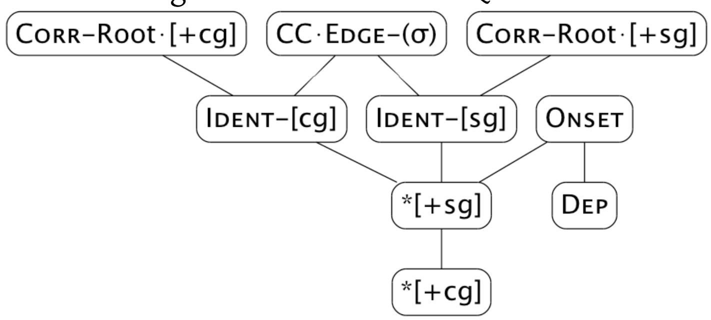
Consequently, the Cuzco Quechua pattern can be understood as one of cross-syllable dissimilation.

In the Surface Correspondence theory of Dissimilation advanced here, dissimilation occurs because of constraints that limit correspondence. In the case of Cuzco Quechua, the important correspondence requirement is based on [+constricted glottis] (henceforth [+cg]), the feature that characterizes ejectives and the glottal stop. The crucial limit on correspondence takes the form of an extreme locality restriction, imposed by CC·EDGE-(σ): correspondence may not span across the edge of a syllable.

A complete analysis of Quechua phonotactics is outside the scope of this work. The only significant point is that the general distribution properties of ejectives and the glottal stop in Cuzco Quechua entail that a syllable can never contain two glottalic consonants. This is because ejectives occur only as the onset of a syllable, and glottal stops only as a word-initial onset, and syllables have just one onset position. So, the nearest two glottalic consonants can be in Cuzco Quechua is in two adjacent syllables. This is not close enough for correspondence between them to satisfy CC·EDGE-(σ). The limit on correspondence is so strict that it cannot be met without breaching the rules of syllable shape in Quechua. The result is a generalized ban on *any* co-occurrence of glottalized consonants in the same root.

The ranking obtained for Cuzco Quechua is shown in (5). The ranking is composed of several cohesive sub-systems, each responsible for different portions of the Quechua pattern. The ranking ONSET » DEP is responsible for the occurrence of epenthesis in vowel-initial roots. The quality of the epenthetic consonant is determined by *[+sg] » *[+cg], favoring the [+cg] consonant [ʔ] as the usual choice for epenthesis. These general markedness constraints are dominated by Ident-[cg] & Ident-[sg], so that underlying aspirates and ejectives are generally allowed to occur in the language.

(5) Crucial ranking conditions for Cuzco Quechua:



The surface correspondence part of analysis works in the following way. Corr-Root·[+cg] demands correspondence within the root among the [+constricted glottis] segments, while CC·Edge-(σ) prohibits correspondence across syllable edges. Both of these constraints dominate faithfulness – Ident-[±cg]. The result is that two [+cg] consonants may not co-occur in different syllables in the output. Since Cuzco Quechua does not allow ejectives in codas, this derives the static prohibition against roots with multiple ejectives. The ban on roots with multiple aspirates is explained in the same manner: the constraints Corr-Root·[+sg] and Ident-[±sg] are ranked in the same configuration as their counterparts that refer to [+cg]. Since the Ident constraints dominate both *[+sg] & *[+cg], this entails that the correspondence-based restrictions also overrule the default choice of epenthetic consonant - they can reverse the typical preference for epenthetic [ʔ] over [h].

The structure of the argument is as follows. First, in §5.2.1, I lay out the specific Cuzco Quechua generalizations to be explained, and show how they are interpreted using the surface correspondence theory, based on the guiding idea that limiting correspondence favors dissimilation (the central theme of the dissertation). In §5.2.2, I present the data in more detail, and show how the facts support the generalizations that the proposal aims to capture. In §5.2.3, I show how the analysis derives these generalizations.

5.2.1. The Theory, as applied to Cuzco Quechua

5.2.1.1. Background: phonological overview of Cuzco Quechua

Cuzco Quechua is a Quechuan language spoken principally in Cuzco, Peru. The consonant inventory of the language is given in (6) (after Parker & Weber 1996:70). The [+constricted glottis] segments are {p' t' tʃ' k' q' ʔ} –the ejectives and the glottal stop. The [+spread glottis] segments are {p^h t^h tʃ^h k^h q^h h} – the aspirated consonants and the glottal fricative. All of these laryngeally-marked consonants occur only in onsets, never codas (Parker & Weber 1996:72; see also Rowe 1950, Carenko 1975, Mannheim 1991, MacEachern 1999, Gallagher 2011). they also occur only in roots, never in suffixes (Parker & Weber 1996:72, Mannheim 1991:177). The glottal stop occurs only word-initially, as the result of epenthesis (MacEachern 1999:31, Rowe 1950, Mannheim 1991, Parker & Weber 1996). Other segments in parentheses are marginal and/or have other distributional restrictions, noted below.

(6) Cuzco Quechua consonant inventory

	Bilabial	Alveolar	Palatal or Post-alveolar	Velar	Uvular	Glottal
Stop	p (b) p' pʰ	t (d) t' tʰ	tʃ tʃ' tʃʰ	k (g) k' kʰ	q q' qʰ	(ʔ)
Fricative	(ɸ)	s	ʃ	(x)	(χ)	h
Nasal	m	n	ɲ			
Liquid		l r	ʎ			
Glide	w		j			

Cuzco Quechua syllables are CV(C) in the native lexicon (MacEachern 1999:29); some Spanish loanwords also have CCV(C) syllables. The fricatives [ɸ x χ] arise from lenition of /p k q/ in codas (MacEachern 1999:32, Mannheim 1991); /t/ also lenites to [s] in codas, but not all instances of [s] are derived by this lenition. Voiced stops occur only in Spanish loanwords (Parker & Weber 1996:71fn.3). Roots are primarily CV(C)CV in shape on the surface (Gallagher 2011:283). The language has no prefixes (Parker & Weber 1996:72).

5.2.1.2. Target generalizations & crucial input-output mappings

The target generalizations for Cuzco Quechua are summarized in (7) (compiled from previous work by Parker 1969, Carenko 1975, Parker & Weber 1996, Parker 1997, Mannheim 1991, MacEachern 1999, Gallagher 2011). The generalizations in (7a-b) concern the alternation in epenthesis. The generalization in (7c) is about the static co-occurrence restrictions.

(7) Cuzco Quechua – Target generalizations:

a. [h] is epenthesized before initial vowels only if the root contains a [+cg] consonant
b. [ʔ] is epenthesized before initial vowels otherwise
c. A root may contain one [+cg] or [+sg] consonant, but not two of them
*[+cg]~[+cg], *[+sg]~[+sg], in either order

The scope of the analysis is these three generalizations: they comprise the dissimilation pattern observed. There are several other generalizations that are worth mentioning, but that the present analysis will not try to explain. As noted above, all of the spread glottis and constricted glottis consonants have distributional restrictions: they only occur in onsets, and the glottal stop is also limited to root-initial position. There is also an ordering restriction: ejectives and aspirates are always the leftmost stop/affricate in a root (Carenko 1975:10, Parker & Weber 1996:72, MacEachern 1999, Gallagher 2011). Thus, plain stops may occur after an ejective or aspirated consonant, but not before – ✓[p’ata] is a licit root, but *[tak’a] is not. The co-occurrence of an aspirate and an ejective in the same root is also prohibited (Parker & Weber 1996, MacEachern 1999, Gallagher 2011). This is not a generalization about all constricted glottis & spread glottis segments, though: roots may contain an ejective and [h], or an aspirate and [ʔ] (MacEachern 1999, Gallagher 2011, Rowe 1950, Carenko 1975, Parker & Weber 1996; see discussion in §5.2.2).

The target generalizations are illustrated in full by the five representative input-output mappings in the table in (8). These examples are from Parker & Weber (1996), and Parker (1997).

(8) Representative input-output mappings (boldface indicates notable Cs)

	Input	*Observed Output*	*Structural Configuration*	*Remarks*
a.	asi**k**uj 'to laugh'	**ʔ**asi**k**uj	**ʔ**-v(C)**C**v(CvC)	No ejectives or aspirates; Epenthesis of initial [ʔ]
b.	u**kʰ**u 'inner'	**ʔ**u**kʰ**u	**ʔ**-v(C)**Cʰ**v(CvC)	Aspirate, no ejectives; Epenthesis of initial [ʔ]
c.	aj**k'**a 'how many?'	**h**aj**k'**a	**h**-v(C)**C'**v(CvC)	Ejective, no aspirates; Epenthesis of [h], not [ʔ]
d.	**q'**a**t'**a (hypothetical)	**q'**a**t**a	**C'**v(C)**C**v(CvC)	MSC: roots with two or more ejectives are banned
e.	**qʰ**a**tʰ**a (hypothetical)	**qʰ**a**t**a	**Cʰ**v(C)**C**v(CvC)	MSC: roots with two or more aspirates are banned

The three vowel-initial inputs in (a)-(c) show the conditioning of epenthetic segments by the laryngeal specification of consonants in the root. Quechua roots may have no aspirates or ejectives (a); or one aspirated stop (b); or one ejective (c). The word-initial epenthetic consonant is [h] in the last case (c), but otherwise is [ʔ] (a,b).

The roots in (d) & (e) are hypothetical inputs; they represent gaps in the Quechua lexicon – there are no roots containing sequences of two ejectives [*C'...C'] or two aspirates [*Cʰ...Cʰ]. Since this is a static restriction, the observable data does not reveal how the grammar of Cuzco Quechua treats underlying forms like these. The output mappings shown in (d) & (e) are posited to guarantee that inputs with the illicit sequences are changed to licit surface forms. These specific output forms are the only outputs consistent with the constraint ranking needed to produce the (observably) correct output forms in (a)-(c). They are also the same mappings conventionally assumed in previous analyses of the Cuzco Quechua co-occurrence restrictions (see Parker 1997, MacEachern 1999, Gallagher 2011, among others).

5.2.1.2. SCorr representations & the candidate space

The Surface Correspondence theory posits that a correspondence relation holds over the output consonants in a form. For outputs with more than one consonant, this relation can be structured in multiple ways, yielding various different permutations of which consonants are in surface correspondence with each other. As such, some remarks are in order about the space of candidates considered in the analysis.

For the [ʔ]~[h] dissimilation in epenthesis, the space of relevant candidates included is defined by three dimensions: epenthetic consonant, laryngeal features in the root, and surface correspondence structure.

The choice of epenthetic consonant may be either [h] or [ʔ], or there can be no epenthesis at all. The epenthesis dimension thus splits the candidate space into three sections.

With respect to laryngeal features, there is another 3-way split: a consonant in the root may be either [+cg] (an ejective, like [k']), or [+sg] (an aspirated stop like [k^h]), or neither (e.g. a plain stop like [k]). An underlying stop in a root may map to any of these three possibilities; since multiple instances of [+cg] and/or [+sg] never co-occur in roots in Cuzco Quechua, these three classes of candidates exhaust the space of possible winners; other candidates could be considered, but they are guaranteed not to be the right outputs for this language.

Finally, surface correspondence adds a further binary split to the set of relevant candidates. Because the quality of the epenthetic segment is determined by the laryngeal features found in the root, and because at most one consonant is distinguished as being [+cg] or [+sg], we only need to consider correspondence between the epenthetic consonant and one consonant of the root. The sole 'laryngeally significant' consonant in the root is the one ejective or aspirated consonant in the root, or a plain stop if neither of those is present.

Characterizing the pattern as an interaction between two consonants reduces the space of possible surface correspondence structures to a binary split in the candidate set. The laryngeally significant consonant in the root and the epenthetic initial consonant either correspond with each other, or they do not. Other consonants in the root behave as inert in the pattern, and they are assumed not to correspond with the interacting pair.

Discerning these three relevant dimensions of the candidate space leads to a small and well-defined set of candidates for consideration. This is illustrated by the table in (9), which shows the space of considered candidates for the input /ajk'a/ 'how many?'. The ejective /k'/ in this root is the laryngeally significant consonant; it may surface as either [k'], [kʰ], or [k], represented by the three columns in the table. In each case, the epenthetic consonant may be [ʔ], [h], or [Ø] (no epenthesis). When there is an epenthetic consonant, it may or may not correspond with the stop in the root. The checkmarks (✓) denote candidates that match the output form for this word observed in the data. Candidates in shaded cells are harmonically bounded. Thus, there are 15 possible candidates, but only 7 of them are possible winners, and only one of those is consistent with the data.[4] The glide [j] is irrelevant, so it is omitted from the surface correspondence structures here.

(9) Space of candidates considered for the input /ajk'a/ 'how many?'

	Root [k']	Root [k]	Root [kʰ]
No Epenthesis (No correspondence)	aj.k'a {k'}	aj.ka {k}	aj.kʰa {kʰ}
Epenthetic [ʔ], no correspondence	ʔaj.k'a {ʔ}{k'}	ʔaj.ka {ʔ}{k}	ʔaj.kʰa {ʔ}{kʰ}
Epenthetic [ʔ], with correspondence	ʔaj.k'a {ʔ k'}	ʔaj.ka {ʔ k}	ʔaj.kʰa {ʔ kʰ}
Epenthetic [h], no correspondence	haj.k'a (✓) {h}{k'}	haj.ka {h}{k}	haj.kʰa {h}{kʰ}
Epenthetic [h], with correspondence	haj.k'a (✓) {h k'}	haj.ka {h k}	haj.kʰa {h kʰ}

The rightmost column represents mapping ejective /k'/ to aspirated [kʰ]; these candidates always lose because they are doubly marked & unfaithful. The constraint *[+cg] favors mapping ejectives to non-ejectives, but no constraint favors mapping them to aspirated stops (this violates both faithfulness for [±cg], and markedness in the form of *[+sg]). That is, the general markedness constraints favor reduction to the unmarked (i.e. to plain stops), not to another marked structure. The other harmonically bounded candidates are ruled out for reasons of surface correspondence: these candidates exhibit dissimilation, but with correspondence between the dissimilating consonants. Under the theory advanced here, this configuration is harmonically bounded in general: dissimilation happens in response to limits on correspondence, so it is favored only when it facilitates *non*-correspondence.

[4] There is a tangential – though highly significant – point to be made here about the candidate set in surface correspondence theory in general. Since candidates can differ only in their surface correspondence structure, the surface correspondence theory exponentially increases the number of candidates made available by GEN. However, the space of relevant candidates increases by much less. In this case, the space of candidates consistent with the data increases by just one, and the subset of those that are possible optima does not increase at all. The vast majority of candidates differing only in their surface correspondence structure are harmonically bounded.

Since the correspondence interaction is between two consonants, there are two candidates that are segmentally consistent with the output form observed (marked with (✓) in the table above). For the input /ajk'a/, both of these have the output form [hajk'a]; the only difference between them is whether there is [h]~[k'] correspondence or not. Determining which correspondence structure the output has is a matter of choosing between these two candidates; this is straightforward to do, because one of them is harmonically bounded. Since this output form exhibits dissimilation, and dissimilation is builds on non-correspondence, the winner must be the non-correspondent candidate.

5.2.2. Quechua data & generalizations[5]

This section presents the empirical support for the generalizations in §5.2.1 – how the data supports this characterization of the pattern. The data on the dissimilatory choice of epenthetic consonants is presented first (§5.2.2.1), followed by the evidence for the static co-occurrence restrictions (§5.2.2.2).

5.2.2.1. Supporting data for [ʔ]~[h] in epenthesis

Cuzco Quechua requires every syllable to have an onset, as noted above. For roots that are underlyingly and/or historically vowel-initial, this onset requirement results in the epenthesis of either [ʔ] or [h]. The choice between these options is the primary alternation of interest here, and the factual basis for it is presented below.

[5] My thanks to Peter Fabian for helpful and insightful conversation about the facts and generalizations of Cuzco Quechua presented in this section.

5.2.2.1.1. [ʔ]-epenthesis is the norm

The descriptive observation made by Parker & Weber (1996:71fn.6) is that "whenever a vowel-initial word is pronounced in isolation, it is preceded by a phonetic [ʔ]." This epenthesis is illustrated by the examples in (10), (11), and (12) below. In (10), we observe it before roots with no [+sg] or [+cg] segments; in (11), before roots containing an aspirated stop, and in (12) before roots containing /h/. All of these examples are single roots, so root boundaries are not explicitly marked in the transcriptions.

(10) Epenthesis of [ʔ] before vowel-initial roots with no ejectives or aspirates:

a.	/asikuj/	→ [ʔasikuj]	'to laugh'	Parker & Weber (1996)
b.	/eqo/	→ [ʔeqo]	'sickly child'	MacEachern (1999)
c.	/aknu/	→ [ʔaxnu][6]	'red-violet color'	MacEachern (1999)
d.	/oqʎu/	→ [ʔoqʎu]	'shapely, plump'	MacEachern (1999)
e.	/akʎaj/	→ [ʔakʎaj]	'choose'	(Rowe 1950)

(11) Epenthesis of [ʔ] before vowel-initial roots containing an aspirated stop:

a.	/ukʰu/	→ [ʔukʰu]	'inner'	(MacEachern 1999)
b.	/aqʰa/	→ [ʔaqʰa]	'Andean corn liquor'	(MacEachern 1999)
c.	/askʰa/	→ [ʔaskʰa]	'enough'	(Rowe 1950)
d.	/uskʰu/	→ [ʔuskʰu]	'cotton'	(Rowe 1950)

(12) Epenthesis of [ʔ] before vowel-initial roots containing an [h]:

a.	/ahoja/	→ [ʔahoja]	'wild duck'	(MacEachern 1999)
b.	/uhu/	→ [ʔuhu]	'cough'	(MacEachern 1999)

The basis for positing vowel-initial underlying forms in all of these cases is that no epenthesis occurs phrase-medially (Parker & Weber 1996:80), when these words are not in isolation.

[6] Coda stops regularly spirantize to fricatives (MacEachern 1999:31), hence the /k/→[x] in (19c).

5.2.2.1.2. [h]-epenthesis is conditioned by ejectives

The base-level descriptive observation that Parker & Weber (1996:72) make is the following: "Words containing glottalized stops always begin with a consonant. Whenever an ejective occurs in a reflex of a Proto-Quechua root that began with a vowel, in Cuzco Quechua the word begins instead with [h]."

The epenthesis of [h] is illustrated by forms like those in (13): these roots were historically vowel-initial, but the modern surface forms systematically have an initial [h]. This is not the case for all historical vowel-initial roots (cf. §5.3.2.1), only those containing ejectives. Note also that Cuzco Quechua does have roots with non-epenthetic (i.e. underlying) [h]. The examples of epenthesis here are those given by Parker & Weber (1996:72-73) as words where the [h] is known to be epenthetic on historical grounds (and comparable examples from Mannheim 1991).

(13) Historical evidence for epenthesis of [h] before V-initial roots with ejectives:

a.	/ajk'a/	→ [hajk'a]	'how many?'	(< PQ **ajka*) (P&W 1996)
b.	/isp'a/	→ [hisp'a]	'urinate'	(< PQ **išpa*) (P&W 1996)
c.	/asp'i/	→ [hasp'i]	'scratch the earth'	(< PQ **aspij*) (Mannheim 1991)
d.	/amawt'a/	→ [hamawt'a]	'learned person'	(< PQ **amawta*) (Mannheim 1991)
e.	/anuk'a/	→ [hanuk'a]	'to wean'	(cf. Ayac. *anuka*) (Parker 1969)[7]
f.	/uk'utʃa/	→ [huk'utʃa]	'mouse'	(cf. Ayac. *ukuča*) (Parker 1969)
g.	/uq'u/	→ [huq'u]	'wet'	(cf. Ayac. *uqu*) (Parker 1969)

The same insertion of [h] is also found in vowel-initial Spanish loanwords that contain ejectives (14). This is significant (as pointed out by Carenko 1975:12, Parker & Weber 1996) because the Spanish source words are known to have initial vowels, irrespective of the history of Quechua. We can be certain that the initial [h]s in the

[7] The comparable forms given by Parker (1969) are from Ayacucho Quechua; these forms are given as evidence that the [h] in the Cuzco forms was not there historically.

words in (13) were added in Cuzco Quechua, and were not there originally. In other words, the epenthesis pattern does not hang on any assumptions about the historical reconstruction of Proto-Quechua.

(14) [h]-epenthesis in vowel-initial Spanish borrowings with ejectives:

a.	/asut'i/	→ [hasut'i]	'whip'	(< Spanish *azote*) (P&W 1996)
b.	/atʃ'a/	→ [hatʃ'a]	'axe'	(< Spanish *hacha*) (P&W 1996)

Variation provides evidence that the [h]-epenthesis pattern is synchronically real in Modern Cuzco Quechua (as noted by Parker & Weber 1996:79). Some words have variation between ejectives and non-glottalized consonants. The examples in (15) show that this ejective ~ non-ejective variation is gives rise to predictable variation between initial [h] and [ʔ]. The quality of the initial epenthetic consonant is predictable from the presence or absence of an ejective in the root, even for roots that vary between ejective and non-ejective forms. The right member of each pair in (15) is the variant with no ejective; these all have initial [ʔ], the expected result of epenthesis before a vowel-initial root with no ejectives. In the variants that do have an ejective, we find initial [h] instead of [ʔ] – the expected result of epenthesis before a vowel-initial root that does contain an ejective. Carenko (1975:11) also provides numerous examples of the same pattern observed as variation between Cuzco Quechua and Bolivian Quechua, e.g. Cuzco [hank'u] ~ Bolivian [anku] 'tendon'.

(15) Correlation between initial [h]-epenthesis and ejectives in synchronic variation:

a.	[haʎp’a]	~ [ʔaʎpa]	‘dirt, ground, land’[8]	(P&W 1996)
b.	[husut’a]	~ [ʔusuta]	‘sandal (sp. type)’	(P&W 1996)
c.	[hirq’i]	~ [ʔirqi]	‘child’	(Mannheim 1991)
d.	[hatʃ’ij]	~ [ʔatʃʰiw]	‘(to) sneeze’	(Mannheim 1991)
e.	[hutʃ’uj]	~ [ʔutʃuj]	‘small’	(Carenko 1975)[9]
f.	[hiʎap’a]	~ [ʔiʎapa]	‘lightning’	(Carenko 1975)

The occurrence of [h] is not contingent on the presence of an ejective (Carenko 1975:11, Parker & Weber 1996:73), as illustrated in (16). This means variation between [h] & [ʔ] in (15) is predictable from variation between ejectives and non-ejectives, and not the other way around. It is not the case, for instance, that the presence of an initial [h] somehow causes a plain stop in the root to become an ejective. If it were, the form in (26a) would be [hutʃ’a] rather than the observed [hutʃa].

(16) Examples of [h] in roots with no ejectives

a.	/hutʃa/	→ [hutʃa]	‘guilt, sin’	(P&W 1996)
b.	/huk/	→ [huχ]	‘one’	(Rowe 1950)
c.	/hatun/	→ [hatun]	‘big, large’	(Carenko 1975)
d.	/hiti/	→ [hiti]	‘retreat’	(Carenko 1975)
e.	/sehe/	→ [sehe]	‘barn, grain loft’	(P&W 1996)
f.	/muhu/	→ [muhu]	‘seed’	(P&W 1996)

The point is that the distribution of [h] is not predictable except in roots with ejectives. It is the presence of an ejective that conditions insertion of a root-initial [h], not the other way around – insertion of [h] does not condition glottalization of a following consonant. This means that the synchronic variation in (15) represents variation in the ejective, and the determination of the epenthetic consonant is

[8] Parker & Weber do not include an initial [ʔ] in their transcriptions of the non-ejective variants of the words in (a) & (b); I have included one based on their description of the distribution of [ʔ].

[9] Carenko (1975) does not include glottal stops in her transcriptions for any examples; I’ve added them to these transcriptions, per Parker & Weber’s (1996) assertion that there are glottal stops before all word-initial vowels.

predictable based on that. On this interpretation, the variation in (15) shows [h]-epenthesis occurring in the synchronic grammar.

5.2.2.1.3. The synchronic nature of the [ʔ]~[h] alternation

There is some disagreement in previous work regarding what sort of epenthesis is involved with [h] & [ʔ], so some discussion of this issue is in order. Parker (1969) regards the insertion of [h] as a diachronic change. On the other hand, Parker & Weber (1996) & Parker (1997) treat it as synchronic epenthesis: they posit the vowel-initial forms as underlying, not just historical.

The epenthesis of [ʔ] is demonstrably synchronic: it is observed from synchronic alternations. Parker & Weber (1996) report that the underlying roots analyzed as vowel-initial appear with an inserted [ʔ] when they are phrase-initial or in isolation, but not when phrase-medial. This means the underlying vowel-initial forms can be observed synchronically, when roots are in phrase-medial contexts.

Epenthesis of [h] is not directly observed synchronically as a systematic alternation; the epenthetic /Ø…C'/→[h…C'] mapping is posited on the basis of Richness Of The Base (Prince & Smolensky 1993). Parker & Weber (1996:80) note that the insertion of [h] is *not* limited to phrase-initial position, unlike the insertion of [ʔ]. Because it is not possible to observe the expected [Ø]~[h] alternation synchronically, the data offers no way to show that the underlying form of the word [hajk'a] is vowel-initial /ajk'a/ and not /h/-initial /hajk'a/. But, on the surface, Cuzco Quechua has no vowel-initial roots that contain ejectives: there is a ban against roots of the form [V…C']. Following ROTB, this gap in the output is taken to mean that the grammar maps /V…C'/ inputs to some other output structure, one that *is* observed in the language. While we cannot prove that the initial [h] is epenthetic in [hajk'a] and all the other relevant examples, treating [h]-epenthesis as a synchronic mapping is key to capturing the generalization that forms like [ajk'a] are banned on the surface.

There is also a wealth of extremely clear circumstantial evidence that supports the interpretation of [h]-epenthesis as a synchronic input-output mapping. The insertion of [h] was initially proposed only as a historical change (Parker 1969). The relevant observation is that Proto-Quechua vowel-initial roots with ejectives have an initial [h] in modern Cuzco Quechua, as in (13a): reconstructed PQ */ajk'a/ > CQ [hajk'a] 'how many'. However, the same [h]-insertion is also observed in vowel-initial Spanish borrowings like (14a) Span. *azote* 'whip' > CQ [hasut'i], (not [asut'i]). This means the insertion of [h] in Cuzco Quechua cannot be dismissed as merely a historical change that happened at some stage in the history of Quechua: the diachronic change reflects a synchronic restriction that was also imposed on loanwords. Additionally, the same [h]~[Ø] alternation is observed in modern-day synchronic variation like (15a) [haʎp'a]~[ʔaʎpa] 'dirt, ground, land'. Here, variation between an ejective and a plain stop conditions variation between the usual epenthetic consonant [ʔ] and an initial [h]. This co-variation suggests that forms like this really are vowel-initial underlyingly, and therefore that the insertion of [h] is indeed a synchronic process.

Following the approach taken by Parker (1997) and others, I will regard the onsetless, vowel-initial roots as underlying forms, and will treat the insertion of both [ʔ] & [h] at the same level of analysis – as synchronic epenthesis. This is not absolutely crucial to the analysis. Even if the initial [ʔ] & [h] are regarded as underlying instead of epenthetic, in defiance of the evidence noted above, the account of the [ʔ]~[h] dissimilation still holds in the same way.

5.2.2.2. Static Co-Occurrence Restrictions

Previous literature has identified static co-occurrence restrictions on ejectives & aspirates (Mannheim 1991, Parker & Weber 1996, Parker 1997, MacEachern 1999, Gallagher 2011), and their correlation with the glottals [h] & [ʔ]. These restrictions are summarized in (17). First, ejectives and aspirates may occur only once per root: no root may contain two ejectives (17a), or two aspirated consonants (17b). Additionally, [h] never occurs with aspirated consonants (17c). The co-occurrence of two [h]s is limited to only two, possibly onomatopoeic, examples (MacEachern 1999:31). [ʔ] also may not co-occur with an ejective or another [ʔ], but these observations are somewhat trivial - they are entailed by [ʔ] arising only from root-initial epenthesis in roots with no ejectives.

It is also the case that roots may not contain both an ejective and an aspirated consonant (17d). As noted above, I make no attempt to explain this here. The focus of the analysis is on dissimilatory patterns like (17a–c); the ejective-aspirate ban (17d) is obviously not dissimilatory in nature, as ejectives and aspirates share no laryngeal features (though cf. Gallagher (2011) for a different view based on a feature [long VOT], posited to characterize aspirates and some ejectives). Note also that (17d) holds only for ejectives and aspirates: there is crucially not an absolute ban on [+sg]~[+cg] co-occurrence, because [h] is [+sg] and *does* co-occur with ejectives (which are [+cg]). The analysis also does not aim to explain the generalization that an ejective or aspirate is always the leftmost stop or affricate in a root (17e).

(17) Cuzco Quechua Co-occurrence restrictions:

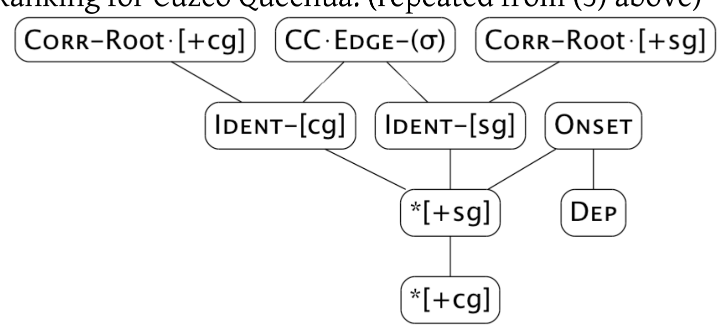
a.	Only one ejective per word:	✓q’ata	*q’at’a, etc.
b.	Only one aspirated stop:	✓q^{h}ata	*q^{h}at^{h}a, etc.
c.	[h] & aspirates do not co-occur:	✓hapa	*hap^{h}a, etc.
d.	No roots have C^h *and* C’:	✓hap’a	*t^{h}ap’a, etc.
e.	Plain stops never precede C’ or C^h: (not targeted for explanation)	✓t’apa	*tap’a, etc.

These restrictions are observed as gaps in the lexicon. They are identified based on surveys of Quechua dictionaries conducted by previous authors (see Parker & Weber (1996) and MacEachern (1999) for dictionary citations)[10]. All of the static restrictions in (17) hold at the level of the root: compounds may contain multiple ejectives or aspirates (one in each root) (Parker & Weber 1996:74, MacEachern 1999:32).

5.2.3. Analysis

The ranking obtained for the Quechua dissimilation patterns is repeated in (18) below. The formal definitions of these constraints are given in §5.2.3.1.

(18) Ranking for Cuzco Quechua: (repeated from (5) above)



Justification for the Cuzco Quechua ranking is presented in the rest of this section, proceeding roughly from the bottom upwards, divided by the sub-systems

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[10] The ban on roots with two ejectives (17a) is also evident in some borrowings from Aymara, e.g. Ay [p’amp’aj] > CQ [p’ampaj] ‘to bury’ (Mannheim 1991:206). The ‘leftmost’ generalization (17e) may not hold in these loanwords: Mannheim notes a 17th-century source that gives both [p’ampa-] and [pamp’a-].

within the ranking. Section §5.2.3.2 presents the basis for the sub-ranking responsible for the default pattern of [ʔ]-epenthesis before initial vowels: this sub-system consists of ONSET, DEP, *[+sg], *[+cg], and both Ident constraints. §5.2.3.3 gives the support for the [ʔ]~[h] alternation, which arises from the interaction of CORR-Root·[+cg] and CC·EDGE-(σ) with the faithfulness constraints in the basic epenthesis sub-ranking. §5.2.3.4 shows how the ranking also explains the static co-occurrence restrictions.

5.2.3.1. Constraints

Three surface correspondence constraints come into play for Cuzco Quechua. The first two are members of the CORR family: one for [+constricted glottis] (19), and one for [+spread glottis] (20). Both CORR constraints have the root as their domain of scope, because the alternation happens at the level of the root (as pointed out by Carenko 1975, Parker & Weber 1996, MacEachern 1999, among others).

(19) CORR-Root·[+cg]: 'If two Cs in the same root are [+cg], then they correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are both [+constricted glottis], *and*
b. X & Y are in the same morphological root, *and*
c. X & Y are not in the same correspondence class

(20) CORR-Root·[+sg]: 'If two [+sg] Cs are in the same root, then they correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X & Y are both [+spread glottis], *and*
b. X & Y are in the same morphological root, *and*
c. X & Y are not in the same correspondence class

The remaining surface correspondence constraint is the Limiter CC·EDGE-(σ), repeated in (21). This constraint requires that correspondent consonants be in the same syllable. It assigns violations whenever a consonant in one syllable is in surface correspondence with a consonant in another syllable.

(21) CC·EDGE-(σ): 'If two Cs correspond, they are contained in the same syllable'
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is inside some syllable Σ_i, *and*
c. Y is not inside the syllable Σ_i

The role of the correspondence constraints in the analysis is to favor dissimilation by simultaneously requiring and prohibiting correspondence. Thus, the CORR constraints refer to the features involved in the dissimilation. The dissimilatory [ʔ]~[h] alternation is interpreted as the avoidance of penalized correspondence. The Limiter constraint CC·EDGE-(σ) imposes this penalty by limiting correspondence to the confines of a domain, the syllable, which is always smaller than where dissimilation is evident. The result is that CC·EDGE-(σ) prohibits correspondence everywhere that dissimilation is evident in Cuzco Quechua.

The remaining constraints in the analysis are general markedness and faithfulness constraints. First, there are input-output faithfulness constraints of the Ident family; one each for [±constricted glottis] (22), and [±spread glottis] (23).

(22) IDENT-[cg]: Faithfulness for [±constricted glottis]
For each distinct pair of a consonant X in the input, and its correspondent X' in the output, assign a violation if:
a. if X is [α constricted glottis], *and*
b. X' is *not* [α constricted glottis]

(23) IDENT-[sg]: Faithfulness for [±spread glottis]
For each distinct pair of a consonant X in the input, and its correspondent X’ in the output, assign a violation if:
a. if X is [α spread glottis], *and*
b. X’ is *not* [α spread glottis]

Next, there are general markedness constraints, also one each for [+constricted glottis] (24) and for [+spread glottis] (25). The role these constraints play in the analysis is controlling the choice of the epenthetic consonant in contexts where dissimilation does not come into play.

(24) *[+sg]: “No aspirates or [h]s”
Assign 1 violation for each segment in the output which is [+spread glottis]

(25) *[+cg]: “No ejectives or [ʔ]s”
Assign 1 violation for each segment in the output which is [+constricted glottis]

Finally, there are two constraints responsible for the occurrence of epenthesis. The insertion of an epenthetic consonant (irrespective of which consonant it is) before vowel-initial roots is the result of ONSET (26) dominating DEP (27): onsets are required, at the cost of inserting an extra consonant.

(26) ONSET: “Have onsets”
Assign 1 violation for each syllable that does not have an onset

(27) DEP: “Don’t epenthesize”
Assign 1 violation for each segment in the output that does not have a correspondent in the input

5.2.3.2. Rankings for general [ʔ]-epenthesis

The general epenthesis of [ʔ] before vowel-initial roots does not involve the surface correspondence mechanism; it reflects the interaction of general markedness and faithfulness constraints. Because the surface correspondence constraints don't matter for the rankings presented in this section, they are not shown in the tableauxs here. Surface correspondence structures are not shown explicitly for these candidates, since they don't bear on these comparisons.

The tableau in (28) shows the input /asikuj/ 'to laugh' mapping to the output [ʔasikuj], with an epenthesized [ʔ]; this reveals two ranking arguments. First, ONSET must dominate DEP; this ranking is what causes epenthesis to occur (a). Second, *[+sg] must dominate *[+cg]; this is what favors [ʔ] as the default epenthetic segment rather than [h] (b). ONSET must also dominate *[+cg] (a), since epenthesizing [ʔ] incurs an additional violation of *[+cg] (a).

(28) Epenthesis of [ʔ] in onsetless syllables: Onset » Dep; *[+sg] » *[+cg]

	Input: asikuj Output: ʔasikuj	IDENT-[cg]	IDENT-[sg]	ONSET	DEP	*[+sg]	*[+cg]
☞ a.	ʔa.si.kuj	(0)	(0)	(0)	(1)	(0)	(1)
~ b.	a.si.kuj			W (0~1)	L (1~0)		L (1~0)
~ c.	ha.si.kuj					W (0~1)	L (1~0)

The constraints *[+cg] and *[+sg] that determine the quality of the epenthetic consonant in (28) are general markedness constraints that penalize all instances of [+constricted glottis] and [+spread glottis]. Since aspirated and ejective consonants are not forbidden altogether in Cuzco Quechua, these constraints are crucially dominated by faithfulness for these features. The rankings IDENT-[cg] » *[+cg] (29) and IDENT-[sg] » *[+sg] (30) are thus necessary. This explains why roots with an underlying ejective or aspirate emerge with that consonant intact, and not reduced to a plain stop to satisfy *[+cg] or *[+sg]. The tableau in (29) shows faithful realization of ejectives in words like [naq'o] 'dented', and the one in (30) shows faithful realization of aspirates in words like [leq^{h}e] 'rotten' (these examples from Parker & Weber 1996:73-74).

(29) [+cg] consonants (ejectives) are permitted in general: Ident-[cg] » *[+cg]

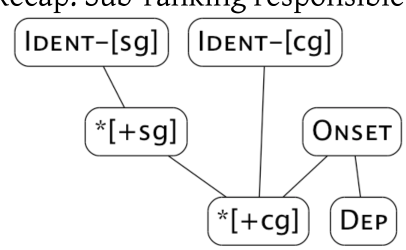
Input: naq'o Output: naq'o		Ident-[cg]	Ident-[sg]	Onset	Dep	*[+sg]	*[+cg]
☞ a.	na.q'o	(0)	(0)	(0)	(0)	(0)	(1)
~ b.	na.qo	W (0~1)					L (1~0)

(30) [+sg] (aspirated) consonants are permitted in general: Ident-[sg] » *[+sg]

Input: leq^{h}e Output: leq^{h}e		Ident-[cg]	Ident-[sg]	Onset	Dep	*[+sg]	*[+cg]
☞ a.	le.q^{h}e	(0)	(0)	(0)	(0)	(0)	(0)
~ b.	le.qe		W (0~1)			L (1~0)	

The partial ranking that explains the general epenthesis of [ʔ] is shown in (31). This ranking makes [ʔ] the preferred epenthetic consonant, and inserts it as needed to provide onsets. It does not have any effect on underlying [+cg] or [+sg] segments.

(31) Recap: Sub-ranking responsible for [ʔ]-epenthesis



5.2.3.3. Rankings for (dissimilatory) [h]-epenthesis

Recall from §5.2.1 the basic generalization of dissimilatory [h]-epenthesis in Cuzco Quechua: [h] is epenthesized instead of [ʔ] when a vowel-initial root contains an ejective consonant. In other words, the quality of the epenthetic consonant is determined by a restriction on the surface form of roots. A [+spread glottis] epenthetic is chosen only when doing so avoids the co-occurrence of two [+constricted glottis] consonants, i.e. [ʔ] and an ejective.

The dissimilatory [ʔ]~[h] alternation is understood, in the theory developed here, as happening because correspondence is required (by a CORR constraint), but also penalized (by a Limiter constraint). The relevant CORR constraint is CORR-Root·[+cg], which demands correspondence among [+cg] consonants in the same root. The relevant limiter constraint is CC·EDGE-(σ), which forbids correspondence across syllable edges.

The epenthesis of [h] in roots with ejectives is explained by the ranking CC·EDGE-(σ), CORR-Root·[+cg] » *[+sg]. This is shown in (32), with the input /ajk'a/ 'how many?'. The winning candidate (a) has an initial epenthetic [h], and no correspondence between that [h] and the root-medial [k'][11]. This candidate is optimal because the alternatives with epenthetic [ʔ] are ruled out on grounds of correspondence. CORR-Root·[+cg] rules out the candidate where there is an epenthetic [ʔ] that does not correspond with the [k'] in the root (b); CC·EDGE-(σ) rules out the alternative in (c), where there is correspondence between [ʔ] & [k'], because this correspondence spans across a syllable boundary. The remaining candidates in (d) & (e) show that ONSET and IDENT-[cg] must also dominate *[+sg]. The ranking ONSET » *[+sg] forces epenthesis to happen even when the preferred epenthetic consonant, [ʔ], is not a viable option. It is

[11] The alternative candidate where the epenthetic [h] does correspond with the root-medial [k'] is harmonically bounded; see (9).

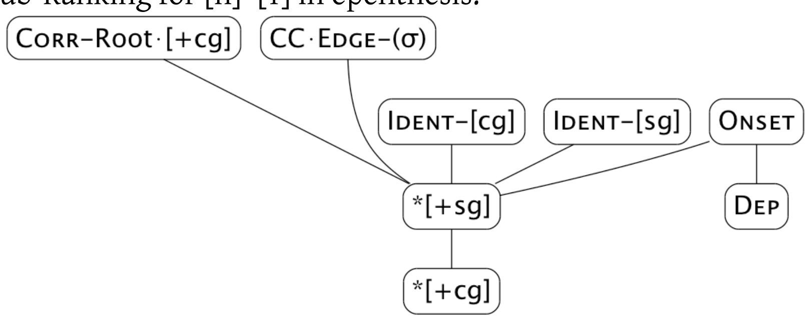
why the dissimilatory prohibition against [ʔ...k’] sequences leads to epenthesis of a different segment, rather than non-epenthesis (d). The ranking Ident-[cg] » *[+sg] rules out the option of neutralizing the ejective in the root in order to have the preferred epenthetic consonant [ʔ] rather than [h], shown in (e).

(32) Dissimilatory epenthesis of [h] over [ʔ]: CC·Edge-(σ), Corr-Root·[+cg] » *[+sg]

Input: ajk’a Output: haj.k’a		CC·Edge-(σ)	Corr-Root·[+cg]	Ident-[cg]	Ident-[sg]	Onset	Dep	*[+sg]	*[+cg]
☞ a.	h$_1$aj$_2$.k’$_3$a $\mathcal{R}$:{h}{j}{k’}	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)
~ b.	ʔ$_1$aj$_2$.k’$_3$a $\mathcal{R}$:{ʔ}{j}{k’}		W (0~1)				e$_{(1\sim1)}$	L (1~0)	W (1~2)
~ c.	ʔ$_1$aj$_2$.k’$_1$a $\mathcal{R}$:{ʔ k’}{j}	W (0~1)					e$_{(1\sim1)}$	L (1~0)	W (1~2)
~ d.	aj$_1$.k’$_2$a $\mathcal{R}$:{j}{k’}					W (0~1)	L (1~0)	L (1~0)	e$_{(1\sim1)}$
~ e.	ʔ$_1$aj$_2$.k$_3$a $\mathcal{R}$:{ʔ}{j}{k}			W (0~1)			e$_{(1\sim1)}$	L (1~0)	e$_{(1\sim1)}$

The ranking conditions developed so far are recapped in (33).

(33) Sub-Ranking for [h]~[ʔ] in epenthesis:



This ranking explains the dissimilatory [h]~[ʔ] alternation as the result of a requirement that [+constricted glottis] consonants correspond, together with an impossibly severe locality condition on that correspondence. Epenthesis of [ʔ] in roots with ejectives is forbidden because Cuzco Quechua demands that the [+constricted glottis] consonants in a root correspond with each other, but prohibits any correspondence across the edge of a syllable. Consequently, two [+cg] segments cannot co-occur in different syllables of the root.

This ban on [+cg] segments in different syllables interacts with the phonotactics of Cuzco Quechua to yield an absolute ban on the co-occurrence of [ʔ] and an ejective. Because ejectives in occur only in onset positions, epenthesis of an initial [ʔ] (in any licit root that contains an ejective) would yield a pair of [+cg] consonants in different syllables, exactly the configuration that is disallowed. This requirement overrules the usual preferences for epenthetic consonants, leading in the dissimilatory choice of [h] instead of [ʔ] for epenthesis in those situations. This holds regardless of the distance between the two segments. Since ejectives cannot be codas, roots with the shape /VC'CV(C)/ are impossible: the ejective in a vowel-initial root must be an onset, so it cannot be in the first syllable. This means that epenthesis of an initial [ʔ] in any root with an ejective will always result in two [+cg] consonants that are not in the same syllable, so correspondence between them is always prohibited by CC·EDGE-(σ).

5.2.3.4. Rankings for Static Restrictions

In the ranking responsible for the alternation of epenthetic [ʔ] and [h] (33), the constraints on surface correspondence are not crucially ranked with respect to the faithfulness constraints IDENT-[cg] and IDENT-[sg]. The static co-occurrence restrictions are explained by specifying the relative ranking of these two groups of constraints.

When the constraints on surface correspondence in (33) also dominate the Ident constraints, the prohibition against multiple [+cg] consonants in (different syllables of) the root is extended hold for underlying consonants, not just epenthetic ones. This is illustrated below with the hypothetical root /q'at'a/. This root represents one of the gaps in the Cuzco Quechua lexicon, since it has two ejectives. By hypothesis, and following Parker 1997, this input form would surface with one ejective reduced to a plain stop, i.e. as [q'ata]. This is explained by the ranking CC·EDGE-(σ), CORR-Root·[+cg] » IDENT-[cg], shown in (34). (NB: ONSET & DEP are omitted in this tableau, since they assign no violations for any of these candidates).

(34) No co-occurrence of ejectives: CC·EDGE-(σ), CORR-Root·[+cg] » IDENT-[cg] » *[+cg]

Input: q'at'a Output: q'a.ta		CC·EDGE-(σ)	CORR-Root·[+cg]	IDENT-[cg]	IDENT-[sg]	*[+sg]	*[+cg]
☞ a.	$q'_1a.t_2a$ ℛ:{q'}{t}	(0)	(0)	(1)	(0)	(0)	(1)
~ b.	$q'_1a.t'_1a$ ℛ:{q' t'}	W (0~1)		L (1~0)			W (1~2)
~ c.	$q'_1a.t'_2a$ ℛ:{q'}{t'}		W (0~1)	L (1~0)			W (1~2)

The interaction in this case is essentially the same as with the [ʔ]~[h] alternation shown in (32). The root contains two [+cg] segments, in different syllables. They are faced with a choice of correspondence or non-correspondence; the former violates CC·EDGE-(σ), and the latter violates CORR-Root·[+cg]. When both of these violate IDENT-[cg], dissimilation of one ejective is favored, in the same way that [h] is favored over [ʔ] in the epenthesis case.

A similar analysis explains the non-co-occurrence of multiple aspirated stops, and of aspirated stops with [h]. This is shown below in (35), where the hypothetical root /qʰatʰa/, with two [+sg] consonants, maps to the output form [qʰa.ta], with only one aspirate preserved. In this case, the correspondence operates over the [+sg] consonants rather than the [+cg] ones. Consequently, the relevant CORR constraint is CORR-Root·[+sg] instead of CORR-Root·[+cg]; the relevant limiter constraint CC·EDGE-(σ) remains the same. The tableau in (35) below shows how dissimilation of one aspirated stop to a plain stop arises from the ranking CC·EDGE-(σ), CORR-Root·[+sg] » IDENT-[sg] – parallel to CC·EDGE-(σ), CORR-Root·[+cg] » IDENT-[cg] in (34) above.

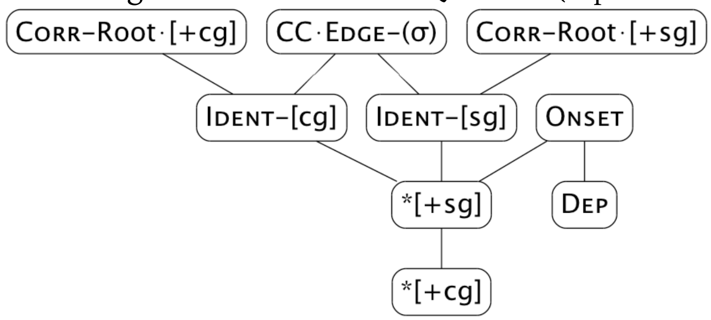
(35) No co-occurrence of aspirates: CC·EDGE-(σ), CORR-Root·[+sg] » IDENT-[sg] » *[+sg]

Input: q^hat^ha Output: $q^ha.ta$		CC·EDGE-(σ)	CORR-Root·[+cg]	CORR-Root·[+sg]	IDENT-[cg]	IDENT-[sg]	*[+sg]	*[+cg]
☞ a.	$q^h{}_1a.t_2a$ ℛ:{q^h}{t}	(0)	(0)	(0)	(0)	(1)	(1)	(0)
~ b.	$q^h{}_1a.t^h{}_1a$ ℛ:{q^h t^h}	W (0~1)				L (1~0)	W (1~2)	
~ c.	$q^h{}_1a.t^h{}_2a$ ℛ:{q^h}{t^h}			W (0~1)		L (1~0)	W (1~2)	

This ranking also explains the non-co-occurrence of [h] with aspirates, noted in (26c). [h] is [+spread glottis], just like all of the aspirated consonants, so this ranking treats them the same way. As such, a root containing /h/ and an aspirate (e.g. a hypothetical form like /hapʰa/) is subjected to neutralization exactly as in (35). (This also predicts, redundantly, that vowel-initial roots with aspirated consonants should have epenthetic [ʔ] rather than [h].)

Incorporating this ranking condition with those motivated above yields the full ranking obtained under the analysis proposed here. This ranking is repeated for reference in (36) below.

(36) Full ranking conditions for Cuzco Quechua: (repeated from (18) above)



5.2.4. Quechua: Summary & conclusions

The analysis proposed in this section shows that the dissimilatory alternation of [h] & [ʔ] in Cuzco Quechua is explained by the mechanism of surface correspondence. Key to the explanation is a requirement, imposed by Corr-Root·[+cg], for correspondence among any and all [+constricted glottis] consonants in a root. The limiter constraint CC·Edge-(σ) requires that correspondents be in the same syllable. This favors dissimilation for any pair of [+cg] consonants in different syllables, which is responsible for both the dissimilatory [ʔ]~[h] alternation seen in epenthesis, and the static ban on roots with two or more ejectives. The prohibition against roots with multiple [+spread glottis] consonants is explained in a parallel way by CC·Edge-(σ) and Corr-Root·[+sg].

The syllable-based characterization derived here is absolutely sufficient to explain the dissimilation patterns observed in Cuzco Quechua. This language bans ejectives and [ʔ]s in coda positions, for reasons independent of dissimilation. As such, the dissimilatory effects are only really supported in the data for consonants in different syllables. An input like /t’ak’/, with two ejectives in the onset & coda of a single syllable, would reduce to [t’ak] anyway, irrespective of its potential surface correspondence structure. The analysis does not *need* to produce dissimilation for onset-coda pairs, since dissimilation in this situation is not evident from the facts.

The analysis of the Cuzco Quechua dissimilation pattern illustrates an important point about the generalizability of the surface correspondence theory of dissimilation. The surface correspondence theory doesn't posit constraints that indiscriminately penalize similar consonants: dissimilation is favored only where correspondence is penalized, and none of the Limiter constraints blindly penalize correspondence in all cases. Nonetheless, the theory can explain dissimilation patterns that hold in an 'across the board' manner.

The dissimilation effects in Quechua appear to hold indiscriminately within the root: multiple [+cg] or [+sg] consonants do not co-occur on the surface, regardless of their positions or the distance between them. Previous analyses explain this using OCP constraints that indiscriminately penalize any and all co-occurrence of [+cg] and [+sg] segments (Gallagher 2011; see also Parker 1997, MacEachern 1999, and Suzuki 1998). The analysis proposed here takes a different approach: instead of stipulating a constraint that blindly prohibits all co-occurrences of similar segments, it derives this effect from the combination of the basic phonotactic restrictions of the language with CC·EDGE-(σ), a constraint on the locality of correspondents. This constraint is *not* an ad hoc stipulation devised to extend the theory to this case; it is independently motivated by evidence from consonant harmony, as the analysis of syllable-bounded nasal harmony in Obolo in §5.3 shows. Explaining 'indiscriminate' dissimilation does not necessitate an indiscriminate anti-similarity constraint.

The analysis of Cuzco Quechua illustrates one other noteworthy point about the surface correspondence theory of dissimilation: dissimilation is not contingent on consonant harmony. No portion of the proposal rests on any suppositions about Cuzco Quechua exhibiting harmony for [+cg], nor among [+cg] segments. The cases of dissimilation in Sundanese & Kinyarwanda analyzed in previous chapters both involved the interaction of dissimilation and harmony. In such cases, we can observe the dovetailing of surface correspondence requirements in two distinct processes that derive from it, which is compelling evidence for the correspondence approach vs. other theories of dissimilation. But, this theory is perfectly applicable to cases where dissimilation happens by itself, in the absence of harmony.

5.3. CC·EDGE-(σ) in harmony: Obolo

Obolo exhibits a static pattern of nasal agreement between nasals & stops in the same syllable: if a CVC syllable has a nasal onset, the coda must be nasal as well (Faraclas 1984, Rowland-Oke 2003). Thus, Obolo has CVC syllables with all combinations of nasal vs. oral consonants, except for those that combine a nasal onset with an oral coda. This is illustrated below (examples from Faraclas 1984).

(37) Obolo CVC syllable inventory (T = oral consonant, N = nasal consonant)

	Oral coda	Nasal coda
Oral onset	✓ $[\text{TVT}]_\sigma$	✓ $[\text{TVN}]_\sigma$
Nasal onset	* $[\textbf{NVT}]_\sigma$	✓ $[\text{NVN}]_\sigma$

(38) Licit CVC syllables in Obolo:

a.	✓[fùk]	'read'	✓$[\text{TVT}]_\sigma$
b.	✓[bén]	'carry'	✓$[\text{TVN}]_\sigma$
c.	✓[ɲám]	'sell'	✓$[\text{NVN}]_\sigma$

(39) Impossible CVC syllables:
 a. *[nap] (unattested) * $[NVT]_{\sigma}$

The Obolo pattern is analyzed as the result of CC·EDGE-(σ) operating as a limiter constraint in harmony; in this role, CC·EDGE-(σ) has the effect of bounding harmony to hold only syllable-internally. The ban on NVT syllables is interpreted as a consequence of nasal agreement: [.NVT.] syllables are absent on the surface because the language maps problematic /NVT/ inputs to agreeing [NVN] syllables. The reason this harmony is strictly syllable-internal is because agreement is required only between correspondents, and CC·EDGE-(σ) prohibits consonants in different syllables from corresponding with each other.

5.3.1. The Theory, as applied to Obolo

5.3.1.1. The nasal agreement generalization and supporting facts

The central generalization about nasal agreement was initially observed by Faraclas, who characterized it (40) in terms of a dependency between consonants in onset & coda positions. A later and more extensive grammar of Obolo also describes CVC syllables as having exactly this restriction Rowland-Oke (2003:38).

(40) "If the initial consonant is a nasal consonant, the final consonant must also be nasal." (Faraclas 1984:xvi)

Codas in Obolo are always non-continuant: the only consonants allowed in coda positions are the voiceless stops [p t k] and the nasals [m n ŋ].[12] Syllables are maximally CVːC in size, and minimally V or N̩. Consonant clusters do not occur in codas, and onset clusters are limited to the sequences Cw, Cj, Cr. The full consonant inventory is given in (41). Consonants in parentheses are marginal.[13]

(41) Obolo consonant inventory (following Rowland-Oke 2003:22)

	Labial & Labio-velar	Alveolar	Palatal	Velar	Glottal
Stop	p b k͡p g͡ɓ	t d	c ɟ	k g kʷ gʷ	(ʔ)
Fricative	f	s (z)			(h)
Nasal	m	n	ɲ	ŋ ŋʷ	
Approximant		l r	j	w	

Obolo admits syllables with nasal onsets (42), and syllables with oral codas (43). But, there are no syllables that have both a nasal onset and a nasal coda: the syllables in (44) may not occur.

(42) Syllables with a nasal onset: ✓[NV...]σ

a. má 'like'
b. nɔ́ 'hear'
c. ɲí 'give'
d. mɔ̀.ŋɔ̀ 'take'

(43) Syllables with an oral coda: ✓[...T]σ

a. lép 'buy'
b. tʃít 'close'
c. bɔ́ːk 'be wide open'

[12] Rowland-Oke (2003:30) notes that some ideophones have final [s] & [j], but these never occur in codas in the regular lexicon. Both Faraclas and Rowland-Oke also note that CVːC syllables, with a long vowel, can only have [k ŋ] as the coda.

[13] [h] occurs only as a variant of /s/, [z] is a variant of [ɟ], and [ʔ] is a variant of [k] (Rowland-Oke 2003:22, Faraclas 1984:xv)

(44) Gap: Syllables with nasal onset & oral coda: *[NVT]σ
a. * map, *mat, *mak
b. *nap, *nat, *nak
c. *ɲap, *ɲat, *ɲak
d. *ŋap, *ŋat, *ŋak

The disagreeing NVT syllables in (44) are the only prohibited combination. If a closed syllable has a nasal onset, then its coda must also be nasal. However, this dependency only goes in one direction, as the examples below show. The nasality of the onset does not depend on the nasality of the coda: if the coda is nasal, then the onset can be nasal (45) or non-nasal (46).

(45) Syllables with nasal onset and nasal coda: ✓[NVN]σ

a.	ímɔ̂m	'laugh'
b.	íŋʷɔ̂m	'nose'
c.	mǎn	'birth'
d.	nán	'be rare'
e.	níŋ	'extinguish'
f.	ɲɔ̌ːŋ	'crawl'

(46) Syllables with oral onset & nasal coda: ✓[TVN]σ

a.	bén	'carry'
b.	róm	'make a charm'
c.	tʃím	'sew'
d.	gʷén	'call'
e.	kán	'be ripe'
f.	lǎːŋ	'rinse'
g.	fìːŋ	'last (in time)'
h.	gbáŋ	'listen'

Obolo nasal agreement is a syllable-bounded pattern. There is no nasal agreement required between consonants in different syllables. The agreement generalization is about the form of licit syllables, not about all CVC sequences. This is shown by the examples in (47) (Faraclas 1984): [...NVT...] sequences do occur in the language, when the nasal and oral consonant are in different syllables. The two consonants are not required to agree for nasality in this situation, because they are not in the same syllable.

(47) Nasal agreement does not hold across the edge of a syllable

a.	tú.mù.kâ	'instead of'	(*tu.**m**u.**ŋ**a, *tu.**b**u.ka)
b.	nì.ná.lék	'complain'	(*ni.**n**a.**n**ek, *ni.**l**a.**l**ek)
c.	í.mù.mè.tʃjèŋ	'love'	(*i.mu.**m**e.**ɲ**jeŋ)
d.	ú.má.nè.bót	'she-goat'	(*u.ma.**n**e.**m**ot)
e.	à.náǹ.ɟìn	'fly'	(*a.nan.**ɲ**in)
f.	ṇ́.tɔ́ŋ	'ash'	(*ṇ.**n**ɔŋ)
g.	ì.ɲàǹ.tɔ́t	'species of fruit'	(*i.ɲan.**n**ɔ**n**)
h.	ɔ̀.fɔ́ǹ.tì	'clothing'	(*ɔfɔ**r**.ti)
i.	mâ-sì	'1.sg.fut + go'	(***m**a.**n**i, ***b**a.**s**i)

Though there are no regular alternations that show nasal agreement happening, the *[NVT]$_\sigma$ generalization is quite robust. In my search of Faraclas's (1984) grammar, I found no exceptions or counter-examples. Faraclas (1982) observes a number of morpheme-boundary processes which can alter syllabification and/or nasality (such as vowel deletion, metathesis, and consonant alternations), but his data includes no examples of these processes deriving a disharmonic [NVT] syllable. I also found no counter-examples in my examination of the data from other sources on Obolo (Rowland-Oke 2003, Aaron 1996/1997a,b).

Obolo nasal agreement is based on a dependency between non-adjacent consonants; agreement between an onset & a coda is not mediated by the vowel that intervenes between them. Both Faraclas (1984) & Rowland-Oke (2003) note that vowels are nasalized when they precede a nasal consonant; neither reports nasalization of a vowel when it follows a nasal consonant. Thus, Faraclas (1982) gives the narrow transcription of /ámà + î-wa/ 'many towns' as [ã̂mêwà], not *[ãmẽwa]: the vowel preceding [m] is nasalized, but the vowel after it is not. Similarly, the surface form of

/î-dʒɔ̀ŋɔ + érè/ 'it is far away' is given as [îdʒɔ̃ŋɔ́rè], not *[idʒɔ̃ŋɔ̃re]. These facts support treating the nasal agreement as a long-distance consonant-to-consonant interaction. The generalization cannot be characterized as [+nasal] spreading locally from one consonant to the adjacent vowel, and then subsequently from the vowel to the following consonant. (This is significant for alternative spreading-based analyses, considered in §5.3.3).

5.3.1.2. Surface Correspondence interpretation of the pattern

Obolo nasal agreement exhibits a consonant-to-consonant dependency, despite the presence of an intervening segment – a vowel. This 'action-at-a-distance' character is a hallmark of Agreement By Correspondence interactions (Rose & Walker 2004, Hansson 2001/2010); the proposed analysis treats it in this way.

The input-output mappings posited for Obolo are given in the table in (48). Representative examples are from Faraclas (1984).

(48) Obolo input-output mappings (T used for oral consonants, N for nasal ones)[14]

	Input	*Output, SCorr classes*		*Remarks*
a.	/NV**T**/ nap (hypothetical)	[NV**N**], [na**m**],	{N **N**} {n **m**}	Disagreeing NVT syllables are forced to harmonize (to NVN)
b.	/NVTV/ tumuka 'instead of'	[NV.TV], [tu.**m**u.**k**a],	{N}{T} {t}**{m}{k}**	Across syllable edges there is no correspondence & no agreement
c.	/TVN/ ben 'carry'	[TVN], [**b**an],	{T N} {**b n**}	Disagreeing TVN syllables have correspondence, no agreement
d.	/TVT/ lep 'buy'	[TVT], [**l**e**p**],	{T T} {**l p**}	Agreeing syllables surface faithfully, with correspondence
e.	/NVN/ man 'birth'	[NVN], [**m**a**n**],	{N N} {**m n**}	

The lack of [NVT] syllables in Obolo is interpreted as a consequence of nasal harmony: syllables with nasal onsets and oral codas do not occur because they are

[14] I have omitted tone markings on the examples in this table

forced to agree. This agreement is obtained by picking the [+nasal] value, like in other well-known cases of nasal harmony (e.g. Kikongo & Ndonga, as noted in chapter 2; see also Rose & Walker 2004, Hansson 2001/2010). Thus, an NVT input like /nap/ (a) surfaces as [nam], with the oral coda assimilating to the nasality of the onset.[15]

The syllable-bounding effect is illustrated by the input in (b): agreement does not happen across syllable edges. Thus, when the consonants of a disagreeing /...NVT.../ sequence are parsed into different syllables, they surface faithfully as in /tumuka/→[tu.mu.ka] 'instead of'.

The input /TVN/ in (c) is a disharmonic syllable with an oral onset and a nasal coda; [TVN] syllables like this are permitted (see examples in (46) above). Since these disagreeing syllables surface faithfully, the correspondence structure cannot be fully determined from the data – unfaithful mappings are what disambiguate between correspondent and non-correspondent candidates. Thus, a faithful output like [bén] 'carry' could have no [b]~[n] correspondence, or it could have correspondence with no agreement between the correspondence and no agreement. For concreteness, I will treat it as the latter, though this is not crucial; see §5.3.2.3 for discussion.

The inputs /TVT/ (d) & /NVN/ (e) have onsets and codas that agree in the input. They surface faithfully, with correspondence between the agreeing non-continuants. Since they agree and occur in the same syllable, none of the constraints in the analysis penalizes correspondence between them. In these cases, the

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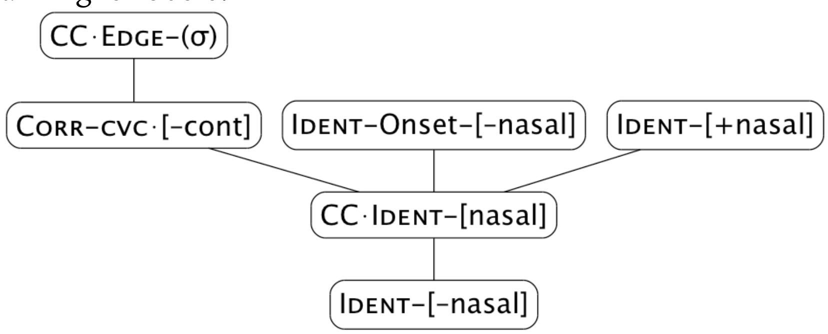
[15] There is an alternative possibility worth noting: agreement could be achieved by picking the [–nasal] value, and mapping problematic NVT inputs to [TVT] – i.e. /nap/ → [tap]. This is a matter of how the agreement is resolved, an issue distinct from the agreement requirement itself. How agreement is resolved depends crucially on the relative ranking of faithfulness constraints. Under the ranking conditions necessary for faithfulness in /TVN/ inputs, /NVT/ must map to [NVN]. See §5.3.2.3 for the explanation of this.

correspondence structure is determined based on applying the theory to the data – it's based on the set of constraints considered here.

5.3.1.3. Ranking

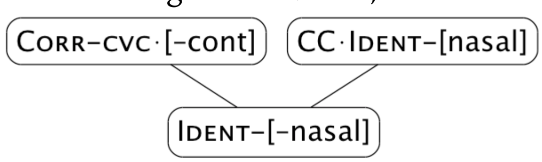
The ranking obtained for Obolo is presented in (49) below. Formal definitions of the constraints are given in §5.3.1.4 below. This ranking consists of three essential components, depicted in (50).

(49) Ranking for Obolo:

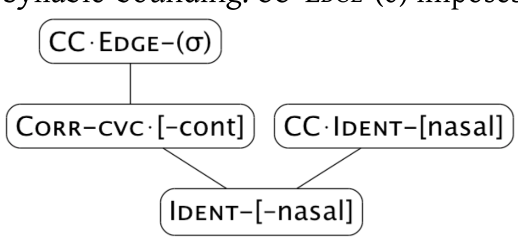


(50) Obolo ranking decomposed into sub-systems

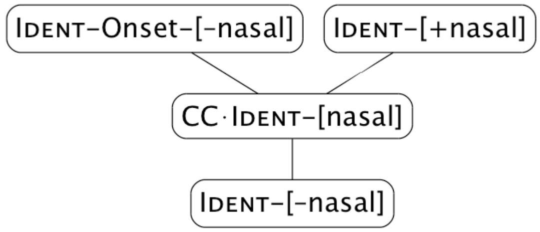
a. Basic nasal agreement: Corr, CC·Ident » Ident



b. Syllable-bounding: CC·Edge-(σ) imposes a limit on the agreement sub-system



c. Directionality: IDENT-Onset-[−nasal], IDENT-[+nasal] » CC·IDENT-[nasal]



The basic pattern of nasal agreement is a standard Agreement By Correspondence interaction: agreement is mandated in CVC sequences by the ranking of CORR-CVC·[−continuant] & CC·IDENT-[nasal] over (IO)·IDENT-[−nasal], as shown in (50a). Codas in Obolo are always nasals or stops, so CORR-CVC·[−continuant] effectively requires correspondence between the onset and coda of any syllable with the shape NVT. This correspondence is the basis for nasal agreement, required by the constraint CC·IDENT-[nasal].

The syllable-bounding behavior comes from CC·EDGE-(σ) limiting the basic agreement system; this is illustrated in (50b). No agreement holds for CVC sequences that span syllable edges, because correspondence in this circumstance is prohibited by CC·EDGE-(σ), which dominates CORR-CVC·[−continuant]. The effect of this ranking is that non-continuants are required to correspond, as long as this doesn't create a situation where two correspondents are in different syllables.

Finally, the ranking of the three I-O faithfulness constraints (50c) is what determines the directionality of the agreement. These constraints split faithfulness for nasality into faithfulness for specific values, IDENT-[−nasal] & IDENT-[+nasal]. The relative ranking of these split-value constraints leads to a value-dominance interaction. The relative ranking of IDENT-[−nasal] and its positional cousin IDENT-Onset-[−nasal] also leads to a position-control effect. Because IDENT-Onset-[−nasal] & IDENT-[+nasal] dominate CC·IDENT-[nasal], assimilation only changes non-nasal codas to match nasal onsets; this is why [NVT] syllables are forced to assimilate to [NVN], but [TVN] syllables surface faithfully. (See §5.3.2.3 for further discussion of the directionality issue).

5.3.1.4. Constraints

The constraint responsible for demanding correspondence in Obolo is CORR-CVC·[−continuant] (51). This constraint requires correspondence between stops and nasals – i.e. between non-continuants – when they occur in a CVC configuration.

(51) CORR-CVC·[−continuant]: 'if two non-continuants are in a CVC domain, they correspond'
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y are in the configuration ...CVC...
b. X & Y both have the feature specification [−continuant]
c. X & Y are not in the same surface correspondence class

Since Obolo allows only stops and nasals in coda positions, any licit CVC syllable in the language must have a non-continuant coda. As such, this constraint effectively requires correspondence between the onset & coda of all possible syllables where the agreement pattern is observed.

Agreement among correspondents is enforced by CC·IDENT-[nasal] (52).

(52) CC·IDENT-[nasal]: 'If two consonants correspond, then they agree for [±nasal]'
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X & Y have different specifications for [±nasal]

Correspondence between a nasal and a non-nasal violates this constraint; it is satisfied only when both correspondents are [+nasal], or when both are [−nasal].

Together, CORR-CVC·[−continuant] & CC·IDENT-[nasal] favor nasal agreement for non-continuants in any CVC sequence. The role of CC·EDGE-(σ) in the analysis is to restrict the extent of this agreement, which is how the syllable-bounding effect arises. By limiting correspondence to syllable-internal pairs of consonants, CC·EDGE-(σ) allows nasal harmony to hold within syllables, but not across syllable edges. (The definition is repeated below for reference.)

(53) CC·EDGE-(σ): 'If two Cs correspond, then they are contained in the same syllable'
For each distinct pair of output consonants, X & Y, assign a violation if:
a. X & Y are in the same surface correspondence class, *and*
b. X is inside some syllable Σ_i, *and*
c. Y is not inside the syllable Σ_i

The remaining constraints are normal members of the Ident family of input-output faithfulness constraints. These general Ident constraints penalize deviation from the underlying [±nasal] specification of a segment. Following Pater (1999), Ident is split here into different constraints for each value of the feature [±nasal]. IDENT-[+nasal] penalizes mapping a nasal to a non-nasal (de-nasalization); IDENT-[−nasal] penalizes mapping a non-nasal to a nasal (nasalization).

(54) IDENT-[+nasal]: "Don't change from [+nasal] to [−nasal]"
For each distinct pair of one output segment X, and its input correspondent X',
assign a violation if:
a. X' is [+nasal], *and*
b. X is [−nasal]

(55) IDENT-[−nasal] "Don't change from [−nasal] to [+nasal]"
For each distinct pair of one output segment X, and its input correspondent X',
assign a violation if:
a. X' is [−nasal], *and*
b. X is [+nasal]

The Obolo pattern has an asymmetry between two types of disharmonic syllables: NVT syllables are prohibited, while TVN syllables are allowed. This is explained by the constraint IDENT-Onset-[−nasal], a positional variant of IDENT-[−nasal] (Beckman 1998).

(56) IDENT-Onset-[−nasal]: "Don't change onsets from [−nasal] to [+nasal]"
For each distinct pair of one output segment X, and its input correspondent X',
assign a violation if:
a. X is the onset of some syllable, *and*
b. X' is [−nasal], *and*
c. X is [+nasal]

Nasal disagreement is tolerated in TVN syllables because nasalizing the onset (i.e. mapping /TVN/ to [NVN]) violates IDENT-Onset-[−nasal]. By contrast, mapping an input /NVT/ sequence to [NVN] (nasalizing a coda to avoid an NVT syllable) incurs no violation of this constraint.[16]

[16] We can imagine a parallel constraint, IDENT-Onset-[+nasal], the equivalent positional relative of IDENT-[+nasal] in (51). This constraint is not necessary for the analysis, as its effects are eclipsed by its non-positional counterpart IDENT-[+nasal].

5.3.2. Analysis

This section shows how the ranking obtained in §5.3.1.3 above derives the agreement pattern in Obolo.

5.3.2.1. Requiring Nasal agreement

Nasal agreement is mandated by the ranking of CC·IDENT-[nasal] and CORR-CVC·[–continuant] over faithfulness for nasality. This is shown in the tableau below, in (57). The hypothetical input /nap/ has two [–continuant] consonants that disagree for nasality; CORR-CVC·[–continuant] and CC·IDENT-[nasal] conspire to favor an agreeing form like candidate (a) over the fully faithful – and disagreeing – alternatives in (b) & (c).

(57) Agreement in CVC sequences: CORR-CVC·[–continuant], CC·IDENT-[nasal] » IDENT-[–nasal]

Input: nap Output: nam, *nap		CORR-CVC· [–continuant]	CC·IDENT- [nasal]	IDENT- [–nasal]
☞ a.	[nam], $\mathcal{R}$:{n m}	(0)	(0)	(1)
~ b.	[nap], $\mathcal{R}$:{n}{p}	W (0~1)		L (1~0)
~ c.	[nap], $\mathcal{R}$:{n p}		W (0~1)	L (1~0)
(☞?) d.	[tap], $\mathcal{R}$:{t p}			L (1~0)

Note that the need for nasal agreement entails nothing about how that agreement is achieved; this is illustrated by candidate (d), which satisfies both CORR-CVC·[–continuant] and CC·IDENT-[nasal] equally as well as the winner in (a). The point here is that when these two surface correspondence constraints dominate faithfulness for nasality, the result is a grammar that prefers nasal agreement over faithful preservation of a disharmonic syllable.

In the absence of visible alternations, we cannot determine from just the Obolo data exactly how the grammar “repairs” unacceptable NVT syllables like /nap/. The agreeing candidates (a) & (d) are equally acceptable on this sub-ranking, and both are preferable to allowing /nap/ to surface with disagreement. The choice between them comes down to the relative ranking of faithfulness constraints, considered in §5.3.2.3; (a) wins over (d) because of IDENT-[+nasal], not shown here.

5.3.2.2. Syllable-bounding

Recall that Obolo’s nasal agreement is syllable-bounded: agreement holds only for two consonants occur within the same syllable. NVT sequences are not required to agree when the consonants are heterosyllabic. The syllable bounding is an effect of the ranking CC·EDGE-(σ) » CORR-CVC·[−continuant]; this is shown in (58), with an input /muka/, a truncated representation of the form [túmùkâ] ‘instead of’ from (48b)[17].

(58) Agreement is confined within the syllable: CC·EDGE-(σ) » CORR-CVC·[−continuant]

Input: ...muka Output: ...mu.ka		CC·EDGE-(σ)	CORR-CVC·[−continuant]	CC·IDENT-[nasal]	IDENT-[−nasal]
☞ a.	[mu.ka], 𝓡:{m}{k}	(0)	(1)	(0)	(0)
~ b.	[bu.ka], 𝓡:{b k}	W (0~1)	L (1~0)		
~ c.	[mu.ŋa], 𝓡:{m ŋ}	W (0~1)	L (1~0)		W (0~1)
~ d.	[mu.ka], 𝓡:{m k}	W (0~1)	L (1~0)	W (0~1)	

[17] CC·EDGE-(σ) can also drive dissimilation, as in the analysis of Quechua in §5.2. Dissimilating candidates are omitted here for simplicity; this is logically equivalent to adding an undominated faithfulness constraint IDENT-[−continuant] to the ranking in (49).

The optimal candidate in (a) is the faithful output which partitions the two consonants into different surface correspondence classes. This non-correspondence incurs a violation of CORR-CVC·[–continuant], but it satisfies CC·EDGE-(σ) because no consonant corresponds with one in another syllable. Non-correspondence between [m] & [k] also satisfies CC·IDENT-[nasal], because that constraint requires agreement only between consonants in the same correspondence class. The alternative candidates (b), (c) & (d) are ruled out by undominated CC·EDGE-(σ), as all of them involve a correspondence structure where one class contains two consonants in different syllables (e.g. [b] & [k] in (b)).

5.3.2.3. Resolving nasal agreement

Two final issues still require explanation: the treatment of TVN syllables, and the directionality of the agreement. These two issues amount to a question of how the requirement for nasal agreement gets resolved – determined by how the sub-system constraints that requires agreement interacts with other faithfulness constraints.

Obolo allows syllables of the shape [TVN]; the language tolerates nasal disagreement within a syllable only when the onset is [–nasal] and the coda is [+nasal]. This is explained by a combination of two faithfulness constraints: the general IDENT-[+nasal], and the positional IDENT-Onset-[–nasal]; both of these constraints crucially dominate CC·IDENT-[nasal], as shown in (59).

(59) TVN syllables are allowed: IDENT-Onset-[−nasal], IDENT-[+nasal] » CC·IDENT-[nasal]

Input: ben Output: ben		IDENT-Onset-[−nasal]	IDENT-[+nasal]	CORR-CVC·[−continuant]	CC·IDENT-[nasal]	IDENT-[−nasal]
☞ a.	[ben], ℛ:{b n}	(0)	(0)	(0)	(1)	(0)
~ b.	[men], ℛ:{m n}	W (0~1)			L (1~0)	W (0~1)
~ c.	[bet], ℛ:{b t}		W (0~1)		L (1~0)	
~ d.	[ben], ℛ:{b}{n}			W (0~1)	L (1~0)	

The word [ben] 'carry' is allowed to surface faithfully, even though it is a syllable where the onset & coda fail to agree for nasality. The faithfulness constraints IDENT-[+nasal] and IDENT-Onset-[−nasal] ensure this faithfulness – and therefore disagreement – because they rule out the agreeing candidates (b) & (c). Candidate (b) maps /ben/ to an NVN syllable; it loses because mapping of /b/ to [m] violates IDENT-Onset-[−nasal]. The other harmonized candidate in (c) maps /ben/ to a CVC syllable; it loses because mapping /n/ to [t] violates IDENT-[+nasal].[18]

The nasal disagreement in [ben] results in a violation of either CORR-CVC·[−continuant] or CC·IDENT-[nasal], depending on whether the [b] & [n] are in correspondence or not. This is reflected by the two faithful candidates in (a) & (d). The choice between them depends on the relative ranking of CORR-CVC·[−continuant] &

[18] This interaction is analogous to 'control' phenomena in agreement (Baković 2000; see also Lombardi 1999, Hansson 2001/2010): in Obolo, nasal agreement is "controlled" by consonants in onset positions. Onsets never undergo assimilation, but they can "trigger" assimilation in a coda, e.g. in /nap/ → [nam].

CC•IDENT-[nasal]; the faithful and correspondent candidate (a) wins under the ranking CORR-CVC•[–continuant] » CC•IDENT-[nasal].

The relative ranking of faithfulness constraints also has the effect of determining the "featural direction" of agreement – why agreement works by picking the value [+nasal] instead of [–nasal]. The faithful mapping of TVN inputs requires the ranking IDENT-[+nasal] » CC•IDENT-[nasal], as shown in (59) above. Since the basic agreement sub-ranking requires CC•IDENT-[–nasal] » IDENT-[–nasal][19], this entails IDENT-[+nasal] » IDENT-[–nasal]. This ranking forces the banned /NVT/ inputs map to [NVN] rather than [CVC]: it leads to nasal agreement being achieved by "nasalization", rather than "de-nasalization". This is shown in (60) below.

(60) Agreement by assimilation to nasal, not oral: IDENT-[+nasal] » IDENT-[–nasal]

Input: nap Output: nam		IDENT-Onset-[–nasal]	IDENT-[+nasal]	CORR-CVC•[–continuant]	CC•IDENT-[nasal]	IDENT-[–nasal]
☞ a.	[na**m**], $\mathcal{R}$:{**n m**}	(0)	(0)	(0)	(0)	(1)
~ b.	[**t**ap], $\mathcal{R}$:{**t p**}	W (0~1)	W (0~1)			L (1~0)
~ c.	[nap], $\mathcal{R}$:{n}{p}			W (0~1)		L (1~0)
~ d.	[nap], $\mathcal{R}$:{n p}				W (0~1)	L (1~0)

The ranking of IDENT-[+nasal] removes the indeterminacy between the two agreeing candidates seen earlier in (57). The fully-nasal agreeing candidate in (a) is better on IDENT-[+nasal] than the oral agreement alternative in (b). This mapping is not

[19] This ranking is shown in (57) above

crucial to explain the Obolo agreement generalization, but it is a necessary consequence of the analysis of faithfulness in TVN syllables.

The result of the IDENT-[+nasal] » IDENT-[–nasal] ranking is that Obolo is effectively a dominant-recessive system (in the sense of Baković 2000), with [+nasal] as the dominant value. Thus, agreement operates by choosing the [+nasal] value when it is present, and assimilating [–nasal] consonants to match. The directionality in this case is explained as a value-dominance effect, without reference to linear order. Note that this derives a system where harmony is strictly left-to-right, but in an epiphenomenal way: it's a consequence of harmony picking [+nasal] as the output value, and onsets being invariably faithful.

One final matter is the status of TVN syllables which have a non-continuant onset, such as (46g): [fiːŋ] 'last (in time)'. In this situation, correspondence between the onset and coda is not required: CORR-CVC·[–continuant] only penalizes non-continuants that fail to correspond; it doesn't require the [–continuant] [ŋ] to correspond with the [+continuant] [f]. Syllables with continuant onsets therefore surface faithfully, violating neither CORR-CVC·[–continuant] nor CC·IDENT-[nasal] in the process. This is fully in accordance with the data: the generalization is that agreement is only necessary when the onset is a nasal (not the coda).

5.3.3. Local spreading is not a viable alternative for Obolo

A typical hallmark of Agreement By Correspondence patterns is their long-distance nature: the surface correspondence relation is not defined in terms of linearity, and intervening material is therefore freely ignored. Since Obolo nasal agreement is syllable-bounded, this long-distance aspect is less blatantly obvious than in classic cases like Kikongo (Ao 1991, Rose & Walker 2004), where agreement can be seen to hold across a large number of intervening segments. It is therefore reasonable to ask whether the Obolo pattern could be analyzed as local spreading, without the need for surface correspondence. This section shows that it cannot, because it makes the wrong predictions about vowel nasality in Obolo.

5.3.3.1. SPREAD-R([+nasal],σ): a local spreading analysis

The idea of the spreading analysis can be sketched out as follows. Nasal agreement between onsets & codas is not the result of correspondence, but rather the result of spreading a [+nasal] feature from the onset to the coda in a local, segment-by-segment fashion. The constraint that favors such spreading is SPREAD-R([+nasal],σ) (Walker 1998), defined as in (61).

(61) SPREAD-R([+nasal],σ): "Spread [+nasal] rightward within the syllable"[20]
For each distinct pair of two output segments, X & Y, assign a violation if:
a. X & Y are in the same syllable, σ
b. X precedes Y
c. X is associated to an instance, F, of the feature [+nasal]
d. Y is not associated to F (i.e. to the same instance of [+nasal]

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[20] This definition is adapted to the same format used in the constraint definitions in §5.2. A more direct adaptation of Walker's (1998:40) definition to apply within the syllable as its domain would be the following:
SPREAD-R([+nasal],σ): 'Let f be a variable ranging over occurrences of a feature specification F, and S be the ordered set of segments $s_1 \ldots s_k$ in a domain, σ. Let Assoc(f,s_i) mean that f is associated to s_i, where $s_i \in S$.'
SPREAD-R([+nasal],σ) holds iff:
$(\forall s_i \in S)[[\exists f\,(\text{Assoc}(f,s_i))] \rightarrow [(\forall s_j \in S)\ [j>i \dashrightarrow (\text{Assoc}(f,s_j)]]]]$ where $1 \leq i,j \leq k$.
For each feature occurrence f associated to some segment in σ, a violation is incurred for every $s_j \in S$ for which (a) is false.

This SPREAD constraint assigns violations whenever [+nasal] is associated to one segment in a syllable, but is not also linked to any following segments in the same syllable.

SPREAD-R([+nasal],σ) favors nasal spreading to the right; when ranked above IDENT-[−nasal], it can therefore cause unacceptable NVT inputs to surface as NVN syllables. This is shown in the tableau below (compare to (60), where the surface correspondence analysis yields the same output form).

(62) Rightward Local Spreading can turn /nap/→[nam]

Input: nap		IDENT-[+nasal]	SPREAD-R([+nasal], σ)	IDENT-[−nasal]
☞ a.	[nãm] |/ [+N]	(0)	(0)	(2)
~ b.	[nap] / | [+N] [-N]		W (0~2)	L (2~0)
~ c.	[nãp] |/ \ [+N] [-N]		W (0~1)	L (2~1)
~ d.	[tap] |/ [−N]	W (0~1)		L (2~0)

The SPREAD constraint rules out the fully faithful candidate in (b), where nasality does not spread to the right. This leaves candidate (a) as optimal, with nasality spread from the onset to the rest of the syllable. (Note that, like CC·IDENT-[nasal], it is equally well-satisfied by assimilation to [+nasal] or to [−nasal] – the candidate in (d) deletes the [+nasal] feature instead of spreading, and this must be ruled out by some other constraint, like IDENT-[+nasal], just as in the surface correspondence ranking).

The assimilation produced by the SPREAD constraint is strictly local; it involves vowel nasalization as well. This constraint doesn't just demand that the onset and coda match for nasality, it demands that everything between them is also associated to the same [+nasal] autosegment. Consequently, fully satisfying Spread-R([+nasal],σ) entails nasalization not only of a coda consonant, but also of the intervening vowel – compare candidates (a) & (c) in tableau (62) above. In syllables with a nasal coda, this is a correct result: both Faraclas (1982, 1984) & Rowland-Oke (2003) report that vowels in NVN syllables are indeed nasalized. In open syllables, however, it is the wrong result.

5.3.3.2. Spread-R([+nasal],σ) over-predicts

The point where the spreading analysis fails is the treatment of vowels in open syllables. The primary source descriptions of Obolo report that vowels are nasalized before a nasal consonant, not after one (Faraclas 1984:xix). Spread-R([+nasal],σ) predicts the opposite: this constraint requires spreading nasality from a nasal onset, regardless of whether there is a coda or not. This is shown in (63): the word /ama/ 'town' should, based on Faraclas's description & phonetic transcriptions,[21] surface as [ã.ma] (a). However, the ranking Spread-R([+nasal],σ) » Ident-[–nasal] causes this candidate to lose to the incorrect form [ã.mã] in (b), where nasality is spread from the [m] to the following [a].[22]

(63) Spread-R([+nasal],σ) wrongly leads to nasal spreading in open syllables:

Input: ama		Ident-[+nasal]	Spread-R([+nasal],σ)	Ident-[–nasal]
(☞) a.	[ã. ma] / | \ [+N] [+N][-N]	(0)	(1)	(0)
☹ b.	[ã. mã] | \\| [+N] [+N]		L (1~0)	W (0~1)

[21] The only Obolo data I found where vowel nasality is consistently transcribed are examples of compounds given by Faraclas (1982). I've pulled out the first part of the compound here, [ã̂mêwà] 'many towns' (< /ámà/ 'town' + /î-wa/ '3.sbj-exist').

[22] Per Faraclas (1982:72), the vowel preceding the [m] in /ama/ is nasalized. Neither the spreading constraint nor the surface correspondence analysis explain why this is.

The ranking SPREAD-R([+nasal],σ) » IDENT-[−nasal] is crucial for spreading to obtain the correct generalization about onset-coda agreement (cf. 62). Trying to use the SPREAD constraint in place of the surface correspondence constraints does not allow the correct vowel nasalization facts to be captured under one consistent ranking.

The root of the problem, for a spreading account, is that the nasal agreement generalization is about consonants matching other consonants. There is a dependency between onsets and codas in Obolo: a nasal onset implies a nasal coda. There is also a dependency between vowels and codas: a nasal coda implies a nasal vowel before it. But, the data does not show evidence for a dependency between onsets and vowels: a nasal onset does not imply a nasal vowel after it. This means that the implication between onsets & codas is a dependency between non-adjacent consonants, to the exclusion of the intervening vowel. This falls out automatically from Surface Correspondence, but cannot be straightforwardly explained by a spreading account.

5.3.4. Obolo: Summary & Conclusions

Obolo exhibits static nasal agreement between the onset and coda of a syllable. This agreement can be analyzed using the theory of Agreement By Correspondence, as shown above. Obolo's agreement pattern is not a strictly local interaction: it cannot be explained by local spreading alone, without a non-linear consonant-to-consonant relation like surface correspondence. This is because the vowel nasalization facts reported by Faraclas (1982, 1984) indicate that nasality does not "spread" from a consonant to a following vowel without another consonant after it: the consonant-consonant interaction is crucial for the correct characterization of the pattern.

The syllable-bounding behavior in Obolo's harmony provides support for the constraint CC·EDGE-(σ), the same limiter constraint at the heart of the analysis of dissimilation in Cuzco Quechua. This constraint is not an ad hoc stipulation that happens to fit the Quechua data. It is a well-defined member of the CC·Edge family of limiter constraints, and the Obolo analysis shows that it's a constraint supported by evidence from harmony as well as dissimilation.

Obolo also demonstrates how the surface correspondence theory advanced here can be used to approach directionality effects. The nasal harmony in Obolo holds in a strictly left-to-right fashion: disagreement is prohibited in NVT syllables, but permitted for the reverse order TVN. The analysis derives this asymmetry using a symmetric correspondence relation. The direction of assimilation is not determined by the constraints that demand agreement, CC·IDENT-[nasal] and CORR-CVC·[–continuant]. Instead, the directionality comes from the relative ranking of positional and value-specific Ident constraints. By requiring only one correspondent to be faithful, these constraints 'tip the balance' in the interaction. For positional Ident constraints, this leads to 'control' patterns: IDENT-Onset-[–nasal] produces onset-controlled harmony. For value-specific Ident constraints, it leads to dominant-recessive patterns: IDENT-[+nasal] produces harmony with [+nasal] as the dominant value. The combination of these interactions leads to directional harmony as an epiphenomenon. Harmony in Obolo is always left-to-right because assimilation is induced only (i) from an onset to a coda, and (ii) from a [+nasal] consonant to a [–nasal] one.

5.4. Conclusions

Taken together, Obolo & Quechua illustrate four key points about the generalizability of the surface correspondence theory. First, they show that the theory can explain dissimilation in languages with no consonant harmony like Quechua, and can explain harmony in languages with no dissimilation like Obolo. Both phenomena arise from the same surface correspondence relation, but they are not logically dependent on each other.

Second, these cases are explained by the interaction of surface correspondence constraints with other limits on phonotactics. In Cuzco Quechua, the rules about well-formed syllables preclude two [+constricted glottis] consonants from co-occurring in the same syllable; the dissimilation driven by CC·EDGE-(σ) explains the ban on [+cg] co-occurrence everywhere else. In Obolo, restrictions on codas dictate that they are always [–continuant]; it follows from this that the onset & coda of any NVT syllable always share a feature, since nasals are [–continuant]. This shared feature is the basis for correspondence in CVC syllables, which in turn is the basis for the nasal agreement. In both languages, the interaction between surface correspondence and other phonological factors explains generalizations that don't follow from either one on its own.

Third, Obolo shows one way that the surface correspondence theory can be extended to directional asymmetries. Directionality is an unsolved issue in surface correspondence theory, as discussed in chapter 2: the theory does not offer a simple mechanism responsible for all directionality patterns in harmony or dissimilation. The analysis of Obolo explains a one-directional harmony pattern without positing any constraints that refer to directionality in correspondence, or agreement. Instead, it derives the right-to-left directionality from the interaction of faithfulness constraints. These produce a combination of control and dominance interactions, of the same type encountered in other non-correspondence theories of agreement (Lombardi 1999, Baković 2000). While this is not a general explanation for directionality, the same approach could be extended on a case-by-case basis to directional harmony in other languages, as well as directionality in dissimilation.

Fourth, Quechua shows that even though the SCTD does not posit constraints that indiscriminately penalize *all* correspondence, the theory can produce dissimilation that holds indiscriminately for any and all [+cg] consonants in the same root. Unlike the dissimilation patterns in Kinyarwanda & Sundanese analyzed in previous chapters, dissimilation in Quechua holds absolutely on the surface: there are no situations where two [+cg] consonants in a root fail to dissimilate. Previous accounts of Quechua treat this as the result of an OCP constraint that blindly prohibits any pair of [+cg] consonants (MacEachern 1999, Gallagher 2011, a.o.).

The Surface Correspondence theory of dissimilation differs markedly from the previous OCP approaches: dissimilation is favored by constraints that *limit* correspondence, not constraints that blindly prohibit it – there are no true anti-correspondence constraints like '*CORR' (cf. Krämer's (1998, 1999) *S-IDENT constraints). The analysis derives the appearance of absolute dissimilation as an epiphenomenon of extremely severe limits on correspondent consonants. The dissimilatory restriction on constricted glottis consonants in Cuzco Quechua is analyzed as the result of CC·EDGE-(σ) – a constraint that limits correspondence based on locality, rather than penalizing correspondence in all cases. This limit is so extreme that it cannot be achieved without violating the basic phonotactics of the language. It's not possible to have two constricted glottis consonants in the same syllable, because ejectives and glottal stops are restricted to onset position. And, it's not possible to have two of them in different syllables, because correspondence across syllable edges is prohibited by CC·EDGE-(σ). So, the limiter constraint CC·EDGE-(σ) approximates the effect of an indiscriminate prohibition against all correspondence by interacting with other, correspondence-independent, phonotactic restrictions[23]. The point is that the theory generalizes to cases where dissimilation holds indiscriminately, and where successful, faithful, correspondence is never observed on the surface.

[23] This result can also arise from the interaction of two different limiter constraints . For example, CC·EDGE-(σ) allows correspondence between the onset and coda of the same syllable penalizes; however, this correspondence is penalized by another constraint, CC·SROLE, which requires correspondents to have matching syllable roles. Together, they effectively prohibit correspondence entirely.

Chapter 6
Compete Identity Effects

6.1. Introduction

In some languages, identical consonants are allowed to co-occur, but similar consonants otherwise are not permitted – a situation that MacEachern (1999) calls the 'Complete Identity Effect' (='CIE')[1]. Dissimilation is one way to interpret these cases: they are "*identical-or-else-dissimilated* patterns" (Suzuki 1999, emphasis original). This chapter shows how the dissimilatory interpretation of Complete Identity Effects falls out from the Surface Correspondence Theory of Dissimilation. It is not necessary to stipulate a special status for completely identical consonants in the SCTD. Instead, their special treatment follows from the fact that correspondence between identical consonants can never incur violations of CC·Ident constraints: CC·Ident constraints can favor dissimilation *only between non-identical consonants.*

An example of a language with Complete Identity Effects is Chol Mayan (Attinasi 1973, Gallagher 2008, Gallagher & Coon 2009). The generalization in Chol is that roots may contain two ejectives only if they are identical. That is, multiple ejectives may co-occur if and only if they agree in anteriority, place, and continuancy[2], the features that distinguish among the ejectives in Chol.

(1) Complete Identity Effects in Chol ejectives (Gallagher & Coon 2009)
   a. Identical ejectives may co-occur: ✓p'~p', ✓t'~t', ✓k'~k', (etc.)
   b. Non-identical ejectives are bad: *t'~p', *t'~k', *p'~k', (etc.)

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[1] This is precedented by recurrent observations that completely identical consonants sometimes behave differently from those that are just similar, or 'partially identical' (Mester 1986; McCarthy 1986, 1989; Yip 1989; Baković 2005; a.o.).
[2] Or possibly stridency rather than continuancy - see §6.3 for discussion.

Chol does not exhibit any alternations based on this pattern; it is a static restriction on roots. This is also the case for other known languages with Complete Identity Effects, including at least Aymara, Gojri, Old Georgian, Hausa, and numerous Mayan languages (listed in §6.3.2). As previous work points out (Hansson 2001:167, Wayment 2009:19), the lack of alternations in these cases presents an ambiguity for analysis: they can be interpreted either as dissimilation, or as harmony. The factual observation for Chol is that combinations of non-identical ejectives do not occur, and the implicit generalization is that they *cannot* occur. But, without any alternations, it is impossible to tell precisely how this ban is enforced: it could be that pairs of non-identical ejectives *assimilate* to become identical (e.g. /t’ k’/ → [t’ t’]), or it could be that they *dissimilate* so that one becomes a non-ejective (e.g. /t’ k’/ → [t’ k]). Since the focus of this dissertation is dissimilation, the dissimilatory interpretation is the one pursued here.

The analysis proposed here – for Chol in particular, and for Complete Identity Effects in general – treats CIEs as dissimilation that is "parasitic" on disagreement (cf. Kimper 2011). In Chol, an ejective dissimilates to a plain stop or affricate only in the presence of another ejective that *disagrees* with it on some feature, e.g. [Place]. This is schematized in (2).

(2) Chol: Ejectives dissimilate if and only if they disagree on some feature
a. /T’…K’/ → [T’…**K**], $\mathcal{R}$:{T’}{K} (non-identical ejectives dissimilate for [+c.g.])
b. /T’…T’/ → [T’…**T’**], $\mathcal{R}$:{T’ **T’**} (identical ejectives do not dissimilate)

Disagreement as a precondition for dissimilation arises in a system where the active CC·Limiter constraints – the constraints that penalize faithful correspondence –

are members of the CC·Ident family. CC·Ident constraints assign violations only when correspondents disagree on some feature. This means that correspondence between non-identical ejectives can violate one or more CC·Ident constraints. If two corresponding ejectives differ in anteriority, they violate CC·Ident [±anterior]; if they differ in continuancy, they violate CC·Ident [±continuant]; if they differ in place, they violate CC·Ident [Place], and so on. By contrast, if two corresponding ejectives are completely identical, then they necessarily never agree in all respects, and thus cannot violate any CC·Ident constraints. As a group, CC·Ident constraints can penalize correspondence and thereby produce dissimilation just like other CC·Limiter constraints; however, they can only favor dissimilation for consonants that are non-identical.

Many previous analyses of Complete Identity Effects have devised special mechanisms just to make fully-identical segments special, an approach that sheds no light on how these patterns relate to other phenomena. For instance, MacEachern (1999) posits a constraint 'BeIdentical' that explicitly demands total identity between consonants. Similarly, Gallagher & Coon (2009) posit a special mechanism of consonant-to-consonant "linking"[3] for analyzing complete identity effects and nothing else. Their claim is that all long-distance consonant agreement *always* results in complete identity; there is abundant evidence that this is not so (see earlier work by

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[3] Gallagher & Coon's (2009) notion of linking is ostensibly a re-labeling of surface correspondence as proposed in earlier work by Rose & Walker and Hansson; it differs only in conflating all of the CC·Ident constraints together into a single 'Identity' constraint, which penalizes linking (≈ correspondence) between any non-identical pair of consonants.

Hansson 2001/2010, Rose & Walker 2004, among others), but Gallagher & Coon argue that all such counter-examples should be re-construed as local spreading. This contrasts with the theory advanced here, in which CIEs are derived by the interaction of the same Corr & CC·Ident constraints responsible for consonant harmony generally.

The treatment of Complete Identity Effects proposed here also predicts a related type of pattern, 'Sufficient Identity Effects': systems where agreement on just *some* features makes consonants "identical enough" to be excused from dissimilation. When the CC·Limiter constraint in a dissimilation system is a CC·Ident constraint, dissimilation is contingent on featural disagreement between segments. Complete Identity Effects arise when multiple different CC·Ident constraints work in tandem so that disagreement on *any* feature leads to dissimilation. Sufficient Identity Effects arise when different CC·Ident constraints work differently, so that disagreement on *some* feature(s) leads to dissimilation, but disagreement on other features is tolerated. Thus, correspondents that aren't completely identical can escape dissimilation in the same way that completely identical pairs do. This prediction is in line with Yip's (1989) notion of 'Identity Classes' (see also Mester 1986, Baković 2005). The idea is that identity effects are not inherently tied to *complete* identity, and can also happen with *partial* identity, i.e. agreement (cf. MacEachern 1999, and contra Gallagher & Coon 2009). There are a number of languages with static agreement patterns that are amenable to analysis as Sufficient Identity Effects. The example case analyzed in this chapter is Ponapean, where labial consonants agree for secondary labio-velarization.

This chapter is structured as follows. Section 2 shows how identity effects emerge from CC·Ident constraints serving as the limiter constraint in a dissimilation system, and outlines the analysis of Chol based thereupon. Section 3 presents the facts of Chol in closer detail, and shows that total identity among ejectives in this language reduces to agreement for the three features place, anteriority, and continuancy. Section 4 takes up the analysis again, and shows how the Complete Identity Effects in Chol are explained by the theory. Section 5 considers 'Sufficient Identity Effects' and shows how this prediction falls out, using Ponapean as an illustrative example. Section 6 summarizes and presents the main conclusions: the special treatment of identical consonants falls out as a predicted outcome of the theory of surface correspondence, and this outcome arises because the CC·Ident family of Limiter constraints favor dissimilation only if two consonants disagree.

6.2. The SCTD, as applied to Chol

6.2.1. Representational preliminaries

Chol has an inventory of five ejective consonants: {p' tʲ' k' ts' tʃ} (see (4) below for non-ejective inventory)[4]. I assume these five ejective consonants are the full set of constricted glottis consonants. They are distinguished from each other by three features: Major Place, continuancy, and anteriority. Place of articulation distinguishes the labial and velar ejectives from the three coronals, continuancy distinguishes the

[4] The presence of a palatalized ejective stop [tʲ'] but not its regular alveolar counterpart [t'] is cross-linguistically unusual, but unremarkable from the standpoint of Chol. The language has palatalized alveolar stops [tʲ tʲ'], but lacks plain alveolar [t t']: the absence of [t] isn't a quirk of the ejective inventory, it's a general and consistent property of alveolar non-continuants in the language.

ejective Coronal stop [tʲ’] from the two ejective coronal affricates [ts’ tʃ’], and anteriority is what distinguishes between the two affricates.

(3) Representations of Chol ejectives

	[Place]	[±continuant]	[±anterior]	[±constricted glottis]
p’	Lab	–	(∅)	+
k’	Dor	–	(∅)	+
tʲ’	Cor	–	(–)	+
ts’	Cor	+	+	+
tʃ’	Cor	+	–	+

Only the anteriority values of the affricates [ts’ tʃ’] are crucial for the analysis, but for concreteness I will assume that [tʲ’] is [–anterior], and that the non-coronal ejectives [p’ k’] are devoid of any anteriority specification (they are neither [+anterior] nor [–anterior]). The distinction between the affricates and the stops is represented here as continuancy, rather than with the feature [±strident] used by some authors (e.g. Gallagher & Coon 2009); this is also not crucial – either continuancy or stridency is enough for the analysis to go through, and I will refer only the former.

The Chol consonant inventory is given in full below (Gallagher & Coon 2009:547; see also Attinasi 1973:34). Consonants in parentheses [d g r] are found only in Spanish loanwords.

(4) Chol consonants

	Labial	Coronal		Velar	Glottal
Stop	p ɓ	(d)	tʲ	k (g)	ʔ
Affricate		ts	tʃ		
Ejective (stop)	p’		tʲ’	k’	
(affricate)		ts’	tʃ’		
Fricative		s	ʃ		h
Nasal	m		ɲ		
Approximant	w	l (r)	j		

Beyond the ejectives, there are three consonants that have glottal or glottalized articulation: [ɓ ʔ h]. These consonants do not participate in the same co-occurrence restrictions that hold for the ejectives (Gallagher & Coon 2009:548). For simplicity I will assume that they are not specified as [+constricted glottis][5].

The co-occurrence restriction on ejectives in Chol holds at the level of the root (Gallagher & Coon 2009:548). Roots are mostly CVC in shape (Attinasi 1973:105, Gallagher & Coon 2009:549). Shorter roots (of shapes CV, VC and V) exist but are not common (Attinasi 1973:106); longer roots, with more than two consonants, seem to be nonexistent[6]. So, the observed restriction generally holds for pairs of consonants, and not larger groups.

6.2.2. Complete Identity Effects in Chol ejectives

The target generalization in Chol is that two *identical* ejectives may co-occur within a root, but two *different* ejectives cannot. This pattern is fundamentally a type of agreement: two ejectives on the surface must agree in all relevant respects. The proposed analysis decomposes the difference between identical and non-identical into agreement on each of the three features that differentiate the ejectives from each other, as in (5).[7] These three agreement requirements are analyzed as effects of the CC·Ident constraints that refer to each feature.

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[5] This is equivalent to using [±c.g.] just like the [±ejective] feature employed by Gallagher & Coon, or the feature [±checked] used by Attinasi. I will continue to refer to it as [±c.g.] rather than [±ejective] for consistency, especially in the constraint names.

[6] based on the descriptions provided by Attinasi (1973), Gallagher (2008), and Gallagher & Coon (2009).

[7] The observation that total identity reduces to agreement on the three relevant features is not new: see McCarthy (1989), Yip (1989) for earlier discussion.

(5) Chol roots may contain only identical ejectives. Therefore...
   a. Ejectives in the root must agree in Place (*p’~k’, etc.)
   b. Ejectives in the root must agree in Continuancy (*tʲ’~ts’, etc.)
   c. Ejectives in the root must agree in Anteriority (*ts’~tʃ’)

The Chol ejective agreement pattern is interpreted here as being enforced by dissimilation rather than by assimilation, as noted above. This assumes that agreement between ejectives is obtained by mapping inputs with illicit combinations of ejectives are mapped to outputs with only one ejective. In other words, disagreeing pairs of ejectives dissimilate for [+constricted glottis] (precedented in Quechua; see ch. 5), but inputs with two fully-agreeing ejectives surface faithfully. This constellation of mappings is depicted in (6).

(6) Representative Input-Output Mappings:

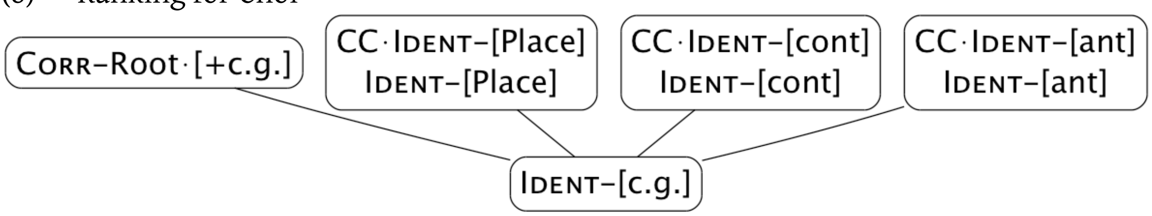
	Input	Output	SCorr structure	Remarks
a.	p’ p’	p’ p’	{p’ p’}	identical ejectives faithfully correspond
b.	p’ k’	p’ **k**	{p’}{**k**}	[Place] disagreement → [+c.g.] dissim.
c.	tʃ’ tʲ’	tʃ’ **tʲ**	{tʃ’}{**tʲ**}	[±cont] disagreement → [+c.g.] dissim.
d.	tʃ’ ts’	tʃ’ **ts**	{tʃ’}{**ts**}	[±ant] disagreement → [+c.g.] dissim.

The key premises of the analysis represented by these mappings are laid out in the table in (7), along with the rankings that derive each one. Correspondence between ejectives in the root is required by Corr-Root·[+c.g.] (a). The CC·Ident constraints operate in the way familiar from other Limiter constraints (see previous chapters): each one limits correspondence to only ejectives that agree in that feature (b-d). When two ejectives in a root cannot correspond without violating any of the three CC·Ident constraints, they dissimilate to non-ejectives. This outcome (e) is obtained by faithfulness for ejectivity (i.e. Ident-[c.g.]) being dominated by faithfulness for each of the other three features involved. The result is that non-identical ejectives prefer to dissimilate for ejectivity – the feature inciting their correspondence – rather than achieve agreement by assimilating. The full ranking obtained for Chol is given in (8).

(7) Premises of the analysis of Chol, and the rankings responsible for them:

	Premises:	Ranking conditions:
a.	Ejectives in the root are required to correspond (always)	≈ Corr-Root·[+c.g.] » Ident-[c.g.]
b.	Correspondence among ejectives is contingent on anteriority agreement	CC·Ident-[anterior] » Ident-[c.g.] Ident-[anterior] » Ident-[c.g.]
c.	Correspondence among ejectives is contingent on Major Place agreement	CC·Ident-[Place] » Ident-[c.g.] Ident-[Place] » Ident-[c.g.]
d.	Correspondence among ejectives is contingent on stricture agreement	CC·Ident-[continuant] » Ident-[c.g.] Ident-[continuant] » Ident-[c.g.]
e.	If two ejectives do not satisfy (a)-(d), one dissimilates to a non-ejective: any unfaithful mappings change the values of [±c.g.] (not other features)	Ident-[Place] » Ident-[c.g.] Ident-[anterior] » Ident-[c.g.] Ident-[continuant] » Ident-[c.g.]

(8) Ranking for Chol

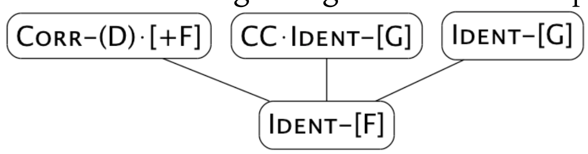


In the ranking diagram in (8), certain constraints are arranged in pairs. These pairs represent constraints that are not crucially ranked relative to each other, and that function together as a single unit in the sub-systems that the ranking is composed of.

6.2.3. Correspondence contingent on agreement

When a CC·Ident constraint *and* the input-output Ident constraint for the same feature are ranked in the same strata, and both dominate faithfulness for the feature referred to by the relevant Corr constraint, the result is correspondence that is contingent on agreement. The general structure of this "ranking molecule" is illustrated in (9). It produces a system where correspondence spurred by one feature, [+F], is contingent on agreement for another feature, [±G].

(9) Generalized ranking configuration for correspondence contingent on agreement



The ranking in (9) requires [+F] consonants to correspond; however, it allows that correspondence only for those [+F] consonants that also agree for [±G] in the input. In essence, it is an agreement system where assimilation is off-limits. Two [+F] consonants must correspond, and must agree for [±G]. However, because Ident-[G] is undominated (and dominates Ident-[F]), the optimal candidate will never be one that changes the [±G] value of one correspondent to match another. This means that agreement among correspondents must be achieved in some other way, e.g. by dissimilating one [+F] consonant to [–F] when they disagree. Instead of driving assimilation, CC·Ident [±G] works together with Ident-[G] to limit correspondence so it's possible only between consonants that already agree for [±G].[8]

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[8] The notion of contingent correspondence is reminiscent of parasitic agreement – where agreement on one feature depends on agreement on another (Mester 1986). McCarthy (2010) employs the contingent correspondence idea to conflate all Corr·[α F] constraints into one 'Max-CC' constraint, which blindly penalizes non-correspondence between any and all consonants. The essence of McCarthy's proposal is that harmony can be limited to similar consonants even if the Corr constraints are not based on similarity, and it is the 'contingent correspondence' ranking structure in (9) that makes this possible. McCarthy's (2010) Max-CC constraint is inadequate for explaining dissimilation, however – as pointed out in chapter 2, the Corr constraints are crucially responsible for determining which feature dissimilates.

The tableauxs in (10) & (11) illustrates this ‘contingent correspondence’ interaction. The ranking has the same structure as in (9), but with constricted glottis as the feature ‘F’, and Place as the feature ‘G’. The result of this ranking is a language where ejectives that have different Place values are not allowed to correspond (10), while ejectives that have the same Place value are allowed to correspond (11).

(10) Heterorganic ejectives may *not* correspond (and so dissimilate)

Input: /t’ k’/ Output: /t’ k/		CORR·[+c.g.]	IDENT-[Place]	CC·IDENT-[Place]	IDENT-[+c.g.]
☞ a.	t’ k ℛ: {t’}{k}	(0)	(0)	(0)	(1)
~ b.	t’ k’ ℛ: {t’ k’}			W (0~1)	L (1~0)
~ c.	t’ k’ ℛ: {t’}{k’}	W (0~1)			L (1~0)
~ d.	t’ t’ ℛ: {t’ t’}		W (0~1)		L (1~0)

(11) Homorganic ejectives *may* correspond (and so do *not* dissimilate)

Input: /t’ t’/ Output: /t’ t’/		CORR·[+c.g.]	IDENT-[Place]	CC·IDENT-[Place]	IDENT-[+c.g.]
☞ a.	t’ t’ ℛ: {t’ t’}	(0)	(0)	(0)	**(0)**
b.	t’ t ℛ: {t’}{t}				W (0~1)
c.	t’ t’ ℛ: {t’}{t’}	W (0~1)			
d.	t’ k’ ℛ: {t’}{k’}		W (0~1)		

As (11) illustrates, if two consonants are identical, then faithful correspondence between is not penalized by any Corr, CC·Ident, or faithfulness (IO Ident) constraints. That is, *all* of the constraints in (11) favor the candidate (a); no constraint yields an ‘L’.

The analysis of Chol defined in §6.2.2 employs basically the same interaction, but extends it to other features at the same time. The paired constraints in the ranking in (8) each represent a distinct instance of the 'contingent correspondence' configuration in (9). The net result is correspondence among root ejectives that is contingent on agreement for place, and contingent on agreement for continuancy, and contingent on agreement for anteriority. When a pair of ejectives in the input meets all three of these agreement conditions, they may surface faithfully, with correspondence (on par with (11)). When a pair of input ejectives *does not* meet all three conditions, they undergo dissimilation (on par with (10)).

The analysis is resumed in further detail in §6.4, which shows how the ranking obtained for Chol explains the generalizations. The intervening section, §6.3, examines the facts of Chol in more detail, to show the raw empirical support for the target generalizations.

6.3. The Chol Facts, up close

6.3.1. Basis for the target generalizations

The reported generalization in Chol, repeated from above, is that a morphological root may contain two identical ejectives, but cannot contain two non-identical ones. The empirical basis for this is two-fold. First, there are attested roots with all possible pairs of identical ejectives (12) (examples from Aulie & Aulie 1987, via Gallagher & Coon 2009:552). Second, roots with all other combinations of ejectives are unattested (13) (Gallagher & Coon, *ibid.*).

(12) Chol roots with all combinations of identical ejectives are attested:

a. p'ip' 'wild'
b. tʲ'otʲ' 'snail'
c. ts'aʰts' 'soak'
d. tʃ'atʃ' 'bush'
e. k'ɨk' 'flame'

(13) Chol has no roots with non-identical ejectives:

a. *k'~p'
b. *tʲ'~tʃ'
c. *ts'~tʃ'
(etc.)

Gallagher & Coon (2009) calculate Observed/Expected ratios for all co-occurrence combinations of the ejectives, based on a database of 893 CVC roots. They report O/E values of 0.00 for all combinations of non-identical ejectives. In other words, roots with two different ejectives simply are not observed in their corpus of data.

6.3.2. Further details on the reliability of the generalizations

The prohibition in Chol against just non-identical ejectives appears to be common across Mayan languages. Similar patterns are also found in Chontal (Hansson 2001/2010, Keller 1959), Tzeltal (Suzuki 1999, Kaufman 1971), Tzotzil (Weathers 1947, Hansson 2001/2010, McCarthy 1989), Tzutujil (MacEachern 1999, Dayley 1985), and Yucatec (McCarthy 1989, Yip 1989, Straight 1976). This cross-Mayan recurrence of the same pattern is noteworthy because some exceptions are reported in Chol (see §6.3.2.2 below). It's not clear that these should be regarded as genuine counter-examples, but this issue is tangential to the analysis proposed here. Chol is one example among many; even if this one case is deemed suspect, the same analysis could still be applied to other languages where the same generalization holds without exceptions.

6.3.2.1. Scope of the restriction

The restriction on ejective co-occurrence in Chol (as in various other Mayan languages; see MacEachern 1999, a.o.) is limited to the root domain; non-identical ejectives may co-occur in the word, e.g. in compounds. Some examples of compounds with multiple different ejectives are given in (14). These show that the co-occurrence restriction is not enforced at the word level, only within each root.

(14) Chol's co-occurrence restriction on ejectives holds over the root, not the word:

a.	[tʃ'ɨm-pɨk']	'type of bird'	(Gallagher & Coon 2009:553)
b.	[p'us-ik'al]	'life source, heart, mind, wish'	(Attinasi 1973:310)
c.	[p'is-k'ut]	'sign of the cross'	(Attinasi 1973:209)
d.	[ik'-uːts']	'type of fruit'	(Attinasi 1973:274)
e.	[tʃ'ek'ek']	'mountain turkey'	(Attinasi 1973:258)

This root-level bounding is interpreted in the analysis as a consequence of the scope of the relevant Corr constraint, CORR-Root·[+c.g.]: correspondence is only required for two ejectives that occur in the same root.

6.3.2.2. Exceptions

Gallagher & Coon (2009) claim that there are no exceptions to the ejective identicality generalization; however, it should be noted that Attinasi's (1973) grammar does include a handful of apparent counter-examples.[9] These counter-examples are CVC roots containing two different ejectives; some of them are listed in (15).

[9] Gallagher & Coon (2009) cite Attinasi's grammar among their references, so they were presumably aware that he reports words like these. They also had access to primary data, and consulted native speakers. Since they claim the ejective generalization is exceptionless, I infer that words like (14) were non-exceptional in their data.

(15) Apparent counter-examples: roots with non-identical ejectives

a.	tʃ'ip'	'open slightly'	(Attinasi 1973:258)
b.	p'ets'	'kind of mole trap'	(Attinasi 1973:309)
c.	p'uts'	'flee'	(Attinasi 1973:310)
d.	t'uk'	'thorny tree'	(Attinasi 1973:327)
e.	p'ak'	'planting'	(Attinasi 1973:308)
f.	p'ʌk'	'sowing'	(Attinasi 1973:83)

Forms like these would seem to directly contradict Gallagher & Coon's (2009) claim that non-identical ejectives never co-occur in Chol. The status of such examples is not entirely clear from the data available to me. The counterexamples transcribed by Attinasi may reflect a different dialect of Chol, or simply a difference in transcription conventions. It's also worth noting that a number of Attinasi's examples with heterorganic ejectives are listed in his lexicon alongside other forms that *do* comply with the generalization. For example, the stem in (16a) contains a root [-t'op'-], apparently with two heterorganic ejectives; however, the lexicon entry Attinasi gives for this root lists it as /t'op/, with only one ejective. This sort of variation, together with Attinasi's own report that he found the distinction between ejectives and plain obstruents very difficult to perceive[10], suggests that the forms he transcribes with multiple ejectives should be treated with some caution. Confusion of this sort is to be expected, in view of Gallagher's (2010) finding that the distinction between 1 ejective and 2 ejectives (C'VC vs. C'VC') is perceptually weak.

[10] "…/p/ and /p'/ are often very difficult to distinguish…often the characteristic secondary articulation of glottalization is extremely weak, yet frequent occurrences of aspiration for both the glottalized and plain 'p' make difficult any exceptionless identification of realizations of the plain morphophoneme." (Attinasi 1973:82). Attinasi notes similar difficulties with distinguishing /t/ vs. /t'/ (p.87), and plain vs. glottalized obstruents in general (p.93).

(16) Apparent variation/alternation in some counter-examples:

a. ʃin-t’op’-ol ‘a half’ (Attinasi 1973:327)
t’op ‘half, split’

b. tʃuk’ ‘flea’ (Attinasi 1973:260)
“cf. /tʃik/”[11] (related form with <k>, not <k’>)

c. ts’ʌk’ ‘arrive, complete’ (Attinasi 1973:348)
“cf. /suk’/, /tsuk/” (related forms without ejective [ts’])

Another class of counter-examples arises due to word-final devoicing of /ɓ/. As noted above, /ɓ/ does not follow the same co-occurrence generalizations as the ejectives: it freely co-occurs with ejectives, e.g. in roots like /k’ʌɓ/ ‘hand’ or /ɓa:ts’/ ‘howler monkey’ (Attinasi 1973). Gallagher & Coon (2009:548, f.n.) report that /ɓ/ is typically realized as [p] or [ʔ] word-finally. Attinasi (1973:81), however, also notes a third realization of word-final /ɓ/, an ejective [p’]. This ejective variant gives rise to apparent exceptions to the co-occurrence generalization. For example, devoicing of /ɓ/→[p’] in a root like /k’ʌɓ/ yields the surface form [k’ʌp’][12], apparently containing two different ejectives.

For purposes of the analysis, I will suppose that the generalization is as Gallagher & Coon (2009) report it. A small number of forms in Attinasi’s (1973) data seem at odds with this, and I will abstract away from these potential counter-examples. The primary goal of this chapter is to show how the SCTD offers analyses of complete identity effects. The exceptions identified here are an issue of how well the facts of Chol support the generalization that only identical ejectives may co-occur. These

[11] The ‘cf.s’ in (16b,c) are quoted directly from Attinasi’s lexicon entries.
[12] Attinasi (1973:81) explicitly lists [k’ʌp’], [k’ʌʔ] & [k’ʌp] as the possible surface forms of /k’ʌɓ/ ‘hand’.

exceptions do not bear on how the theory explains the generalization, which is the focus of interest here.

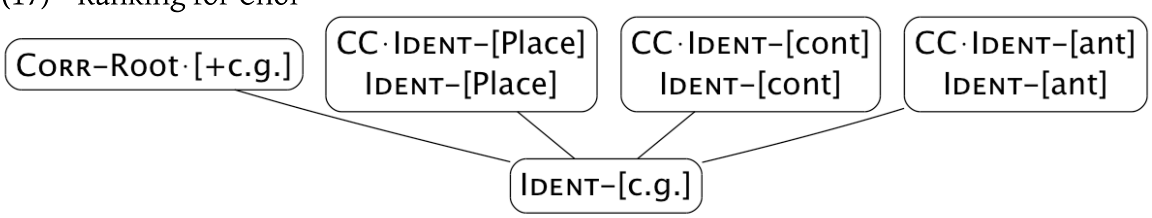
6.3.3. Other co-occurrence restrictions in Chol

The co-occurrence of [ts'] and [tʃ] in Chol is independently prohibited by a distinct pattern of [±anterior] agreement in stridents – sibilant fricatives & affricates (Gallagher & Coon 2009). The anteriority harmony in Chol holds for ejectives and non-ejectives alike. An Agreement By Correspondence analysis – along the same lines as Hansson's (2001/2010) treatment of similar patterns in other languages[13] – is presumably plausible, but will not be taken up here.

6.4. Analysis of Chol ejectives

The ranking obtained for Chol is repeated in (17) below.

(17) Ranking for Chol



As noted previously (§6.2.3), the ranking is made up of three sub-systems, one relating to each of the features that distinguish the ejectives, reflected by the pairing of CC·Ident & Ident constraints in the ranking. For each of these features, a pair of ejectives in the same root must either agree, or face dissimilation to a non-ejective.

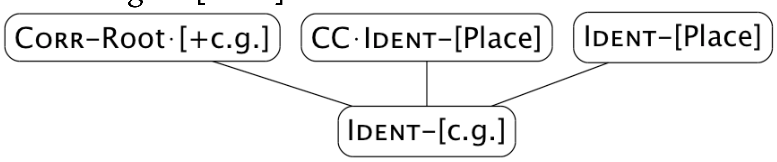
[13] Like the ejective co-occurrence restriction, the anteriority agreement pattern in Chol also has parallels in other Mayan languages (see Hansson 2001/2010, Yip 1989, McCarthy 1989, Lombardi 1990, among others).

The following sub-sections run through each of these sub-systems, showing how each one derives the 'agreeing-or-else-dissimilated' generalization.

6.4.1. Place

The sub-ranking that explains the homorganicity component of the complete identity restriction on ejectives is shown in (18).

(18) Sub-ranking for [Place]



The effect of this ranking is that correspondence is demanded of ejectives, but is only allowed between consonants that agree with respect to Major Place of Articulation. When two ejectives have different places, one dissimilates to a plain stop (19).

(19) Heterorganic ejectives dissimilate for [+c.g.]:

Input: /p' k'/ Output: [p' k]		CORR-Root· [+c.g.]	IDENT- [Place]	CC·IDENT- [Place]	IDENT-[+c.g.]
☞ a.	p' k ℛ: {p'}{k}	(0)	(0)	(0)	(1)
~ b.	p' k' ℛ: {p'}{k'}	W (0~1)			L (1~0)
~ c.	p' k' ℛ: {p' k'}			W (0~1)	L (1~0)
~ d.	k' k' ℛ: {k' k'}		W (0~1)		L (1~0)

But, when two ejectives have the same [Place], this sub-system of the constraints does not force them to dissimilate. This is shown in (20): when the input is two labial ejectives instead of a labial and a velar, they both surface faithfully. This is because CC·Ident [Place] does not penalize correspondence between two identical ejectives.

Nor, for that matter, do any of the CC·Ident constraints involved in the analysis – the dissimilating candidates (b)–(c) are harmonically bounded over this subset of constraints.[14]

(20) Homorganic ejectives do not dissimilate:

Input: /p’ p’/ Output: [p’ p’]		CORR-Root·[+c.g.]	IDENT-[Place]	CC·IDENT-[Place]	IDENT-[+c.g.]
☞ a.	p’ p’ ℛ: {p’ p’}	(0)	(0)	(0)	(0)
~ b.	p’ p ℛ: {p’}{p}				W (0~1)
~ c.	p’ p’ ℛ: {p’}{p’}	W (0~1)			

This explains the lack of dissimilation in Chol roots like [p’ip’] ‘wild’, and [k’ɨk’] ‘flame’, etc. The constraints related to [Place] favor dissimilation for heterorganic ejectives, but not for homorganic ones.

What remains now is to apply the same explanation to the features that separate the different coronal ejectives, namely anteriority and continuancy.

6.4.2. Continuancy

The continuancy agreement component of the complete identity effect is explained by the sub-ranking shown in (21). The ranking configuration is the same as with the Place sub-system examined above. The difference is that this portion of the ranking Limits correspondence among ejectives based on continuancy agreement rather than place agreement.

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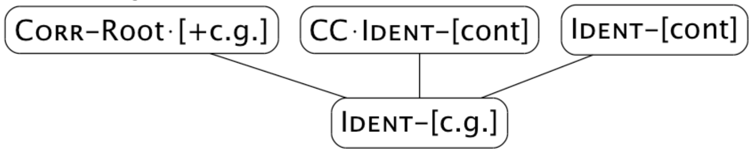
[14] Note, however, that the dissimilating candidates in (20b) & (20c) are not harmonically bounded over the entire constraint set; dissimilation between identical consonants can be favored by structural CC·Limiters, like CC·Srole or CC·Edge constraints.

(21) Sub-ranking for [±Continuant]



The effect of this ranking is that pairs of ejectives that differ in continuancy must dissimilate. This is illustrated in (22) below. (NB: IDENT-[Place] & CC·IDENT-[Place] omitted because they assign no violations here).

(22) Coronal ejectives dissimilate when they disagree for [±Continuant]:

Input: /tʃ’ tʲ’/ Output: [tʃ’ tʲ]		CORR- Root·[+c.g.]	IDENT- [Cont]	CC·IDENT- [Cont]	IDENT-[+c.g.]
☞ a.	tʃ’ tʲ ℛ: {tʃ’}{tʲ}	(0)	(0)	(0)	(1)
~ b.	tʃ’ tʲ’ ℛ: {tʃ’ tʲ’}			W (0~1)	L (1~0)
~ c.	tʃ’ tʲ’ ℛ: {tʃ’}{tʲ’}	W (0~1)			L (1~0)
~ d.	tʲ’ tʲ’ ℛ: {tʲ’ tʲ’}		W (0~1)		L (1~0)

Like with the Place sub-system, this ranking does not force dissimilation for ejectives that already agree in continuancy. This means that roots like [tʃ’atʃ’] ‘bush’ and [tʲ’otʲ’] ‘snail’ need not dissimilate – they surface faithfully, because CC·IDENT-[continuant] does not penalize correspondence between two continuants (i.e. two affricates), nor between two non-continuants (i.e. two stops). This is shown in (23).

(23) No dissimilation for underlying pairs of ejectives that agree for [±continuant]:

Input: /tʲ’ tʲ’/ Output: [tʲ’ tʲ’]		CORR-Root·[+c.g.]	IDENT-[Cont]	CC·IDENT-[Cont]	IDENT-[+c.g.]
☞ a.	tʲ’ tʲ’ ℛ: {tʲ’ tʲ’}	(0)	(0)	(0)	(0)
~ b.	tʲ’ tʲ ℛ: {tʲ’}{tʲ}				W (0~1)
~ c.	tʲ’ tʲ’ ℛ: {tʲ’}{tʲ’}	W (0~1)			
~ d.	tʲ’ tʃ ℛ: {tʲ’}{tʃ}		W (0~1)		W (0~1)

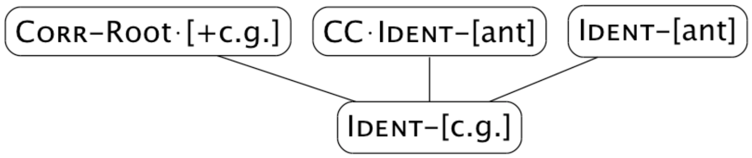
The candidate in (23d) also shows that this ranking produces dissimilation only for constricted glottis, not for continuancy. This candidate dissimilates for both features, and is harmonically bounded. Dissimilation is motivated only for those features that incite correspondence – those that are referred to by relevantly-ranked Corr constraint.

Note that this sub-ranking does not force dissimilation in inputs that have two non-identical ejectives that agree in continuancy. That is, this portion of the ranking allows correspondence between any two stops, or between any two affricates – not just identical ones. In the case of pairs of two ejective stops, all of the non-identical combinations are independently forced to dissimilate, given the ranking conditions for place agreement (developed in §6.4.1 above). In the case of two ejective affricates, the non-identical combination *[ts’~tʃ’] will be ruled out by another sub-system of the ranking that requires anteriority agreement among ejectives. Thus, the continuancy agreement condition is crucial only for prohibiting co-occurrence of the ejective coronal affricates [ts’ tʃ’] with the ejective coronal stop [tʲ’].

6.4.3. Anteriority

The ranking that derives the final piece of the identicality requirement, identicality with respect to anteriority, is shown in (24).

(24) Sub-ranking for anteriority



The effect of this ranking is limiting correspondence among ejectives to only those that agree in anteriority. As in the other sub-systems, pairs of ejectives that disagree on this feature are forced to dissimilate for ejectivity. This is illustrated in (25) (NB: Ident-[continuant] & CC·Ident-[continuant] are omitted here because they assign no violations for these candidates).

(25) Coronal ejectives dissimilate when they disagree for [±anterior]:

Input: /tʃ ts'/ Output: [tʃ ts]		Corr-Root·[+c.g.]	Ident-[anterior]	CC·Ident-[anterior]	Ident-[+c.g.]
☞ a.	tʃ ts ℛ: {tʃ}{ts}	(0)	(0)	(0)	(1)
~ b.	tʃ ts' ℛ: {tʃ ts'}			W (0~1)	L (1~0)
~ c.	tʃ ts' ℛ: {tʃ}{ts'}	W (0~1)			L (1~0)
~ d.	ts' ts' ℛ: {ts' ts'}		W (0~1)		L (1~0)

Also like in the other sub-systems, two ejectives that agree for anteriority need not dissimilate. Thus, pairs of non-identical ejective affricates (i.e. *[ts'~tʃ']) are forced to dissimilate, but there is no dissimilation in roots like [ts'aʰts'] 'soak' or [tʃ'atʃ'] 'bush'. This is illustrated in the tableau in (26).

(26) No dissimilation for ejective affricates that agree in [±anterior]:

Input: /ts' ts'/ Output: [ts' ts']		CORR-Root·[+c.g.]	IDENT-[anterior]	CC·IDENT-[anterior]	IDENT-[+c.g.]
☞ a.	tʃ' tʃ' ℛ: {tʃ' tʃ'}	(0)	(0)	(0)	(0)
~ b.	tʃ' tʃ ℛ: {tʃ'}{tʃ}				W (0~1)
~ c.	tʃ' tʃ' ℛ: {tʃ'}{tʃ'}	W (0~1)			

Recall (from §6.3.3) that Chol also has anterior harmony among stridents in general. It's worth pointing out that an agreement by correspondence analysis of this harmony is compatible with the ranking obtained here. In order for anteriority assimilation to happen, CC·IDENT-[anterior] must dominate IDENT-[anterior]. This does not present any ranking conflict: the analysis of the ejective co-occurrence restriction advanced here only requires IDENT-[anterior] to dominate IDENT-[c.g.]; it is not crucially ranked relative to CC·IDENT-[anterior]. Under the ranking CC·IDENT-[anterior] » IDENT-[anterior], the Complete Identity Effect is still obtained.

6.4.4. Section summary

The three sub-systems of the ranking each derive the same effect: for each of the features [Place], [±Continuant], and [±anterior], two ejectives in the same root must agree or face dissimilation for ejectivity. Since these three are all and only the features that distinguish among the ejectives occurring in Chol, the effect *in toto* of the full ranking is that only pairs of identical ejectives may emerge with faithful correspondence. All other combinations of ejectives disagree in at least one of these features, so they must dissimilate, surfacing as only one ejective. This derives the generalization behind the Complete Identity Effect: only identical ejectives co-occur in Chol roots, because only identical ejectives can correspond without violating any of the three CC·Ident constraints.

6.5. Sufficient Identity Effects?

6.5.1. The prediction

The analysis of the Complete Identity Effect in Chol decomposes complete identity into agreement in all of the relevant features.[15] Correspondence between ejectives comes with the condition of agreement for each of the features that distinguish the ejectives. And, each of these agreement conditions is imposed by the same ranking structure, but referring to each of the three different features.

Decomposing complete identity comes with a prediction. CIEs arise when constraints on all relevant features are ranked in the same configuration, but this is not logically necessary. The Ident & CC·Ident constraints for each feature are ranked independently. IDENT-[Place] & CC·IDENT-[Place] are not crucially ranked with respect to IDENT-[anterior] & CC·IDENT-[anterior], and the ranking of each of these pairs is similarly independent of IDENT-[Continuant] & CC·IDENT-[Continuant]. Consequently, it is possible for the different features to work differently: the theory can generate a

[15] "Identical *in all respects*" (emphasis mine), as McCarthy (1989:81) remarks on this breakdown of identicality by features.

grammar where the constraints that refer to one feature are ranked in the 'contingent correspondence' configuration (9), while the constraints for another feature are not. In other words, decomposing total identity into agreement for each relevant feature entails the possibility that the features may not all line up the same way.

The outcome of a ranking like this is a dissimilation system similar to the Complete Identity Effect seen in Chol, but where the zone of safety from dissimilation extends beyond completely identical consonants to those that are *incompletely* identical. Let's call these patterns 'Sufficient Identity Effects' (='SIEs')[16]. What happens in these systems is that a class of segments must agree, or else dissimilate – like the ejectives in Chol. The difference is that in the predicted SIE case, agreement on just *some* feature is *sufficient* to make two consonants "identical enough" that they do not need to dissimilate. So, the total result is an "*agreeing*-or-else-dissimilated" pattern, rather than "*identical*-or-else-dissimilated" one.

The gist of Sufficient Identity Effects is illustrated in (27) below, for a hypothetical language Chol', parallel to actual Chol. Like Chol, this language bans the co-occurrence of heterorganic ejectives in roots (27a). Unlike Chol, this language does not impose the same agreement restriction for anteriority or continuancy. Thus, all combinations of coronal ejectives are permitted – not just those that agree in anteriority and continuancy (27b).

(27) Hypothetical Chol': only heterorganic ejectives banned
  a. Prohibited: * t'~k' t'~p' p'~ts' p'~tʃ' k'~ts' k'~tʃ'

  b. Allowed: ✓t'~t' **t'~ts' t'~tʃ' ts'~tʃ'**
  (Key differences from Chol in bold)

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[16] MacEachern (1999) uses the term '*Incomplete* Identity Effect' for a completely different phenomenon.

(28) Chol' treatment of ejectives:

a. Difference in [Place] → ejective dissimilation
(≈ CC·IDENT-[Place], IDENT-[Place] » IDENT-[+c.g.])

b. Difference in [±anterior] → no dissimilation
(≈ IDENT-[c.g.] » IDENT-[anterior] » CC·IDENT-[anterior])

c. Difference in [±continuant] → no dissimilation
(≈ IDENT-[c.g.] » IDENT-[continuant] » CC·IDENT-[continuant])

Do dissimilation systems like this exist? So far, I don't know of any examples that are conclusively identifiable as such. There are a wealth of languages with static agreement that can be accurately characterized as SIE patterns (see §6.5.3 for a list). However, all of these potential cases lack visible alternations; as such, they can all be analyzed as assimilation instead of dissimilation, and this is the approach that prior work has generally taken (e.g. Hansson 2001/2010, Rose & Walker 2004; though see also Yip 1989). From the view of the theory, though, there's no reason that all of these cases must be analyzed in the same way; nor is there any reason why dissimilation with SIEs could not manifest with synchronic alternations.

In the following section, I examine one of the potential cases of Sufficient Identity Effects, labio-velarization agreement in Ponapean. The Ponapean case has previously been interpreted as consonant harmony, but the data does not necessitate this as there are no alternations. And, if viewed as a dissimilation system, it does exhibit the Sufficient Identity Effect predicted.

6.5.2. Ponapean as a potential example of SIEs

The pattern observed in Ponapean (also known as Pohnpeian) is one of labio-velar agreement (Rehg & Sohl 1981[17]; also discussed previously by Mester 1986; McCarthy 1988, 1989; Yip 1989; Hansson 2001/2010). Ponapean has four labial consonants: two "plain" labials [p m], and two (labio)-velarized labials [p^w m^w][18]. The pertinent generalization is that the plain labials and the labio-velarized ones do not co-occur in the same root (29) (examples from Hansson 2001:105, originally from Rehg & Sohl 1981).

(29) Ponapean: *P^w~P

a. Plain labials may co-occur: ✓ p~p, m~m, p~m (either order)

pirap	'steal, be stolen'
mem	'sweet'
matep	'species of sea cucumber'
parem	'nipa palm'

b. Labio-velar labials co-occur too: ✓ p^w~p^w, m^w~m^w, p^w~m^w (either order)

p^wup^w	'fall down'
m^waam^w	'fish'
m^wop^w	'out of breath'
p^wum^w-p^wup^w	'falling' (reduplicated)[19]

c. Plain & Labio-velar labials don't mix: * p^w~p, m^w~m, p^w~m, m^w~p (unattested)[20]

Roots in Ponapean are not restricted to CVC shape (they may be CVCVC); intervening consonants have no effect on the pattern.

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[17] This Ponapean grammar is sometimes cited as Rehg (1981), other times as Rehg & Sohl (1981). I'm using the latter.

[18] I transcribe these as [p^w m^w] following Rehg & Sohl. Note that Hansson (2001/2010) transcribes them as [$p^ɣ$ $m^ɣ$], following Rehg & Sohl's description of them as 'velarized' rather than 'labio-velarized'.

[19] I don't have any examples of simplex roots with [p^w…m^w]; the example here is a reduplication of /p^wup^w/, where the second /p^w/ surfaces as a nasal. This nasal substitution is a consistent pattern in Ponapean phonology: it happens to the first member of any consonant cluster made of labials and/or velars (Rehg & Sohl 1981:61).

[20] The observation that the nasal~stop combinations p^w~m & m^w~p are unattested was first identified, I believe, by Mester (1986:21); Rehg and Sohl (1981) only observe that m^w~m is banned.

The Ponapean labio-velarization agreement generalization is a static pattern, it does not produce alternations. The agreement restriction has previously been analyzed as harmony; in other words, it is implicitly assumed that the agreement results from assimilation among the labials for labio-velarization (see Hansson's 2001:105 discussion, and references cited there). But, as there are no alternations, a dissimilation interpretation is equally possible: the available data under-determines the mapping enforced by the grammar.

The dissimilation analysis of Ponapean is schematized in (30).

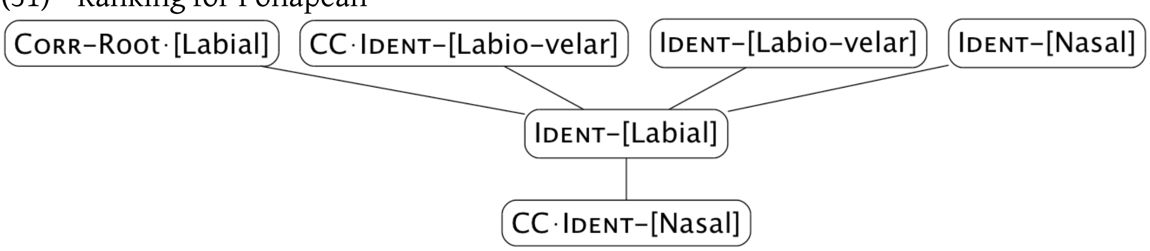
(30) Ponapean interpreted as dissimilation with Sufficient Identity Effects

a. /p^w~p/ → [p^w~t], {p^w}{t} (*p^w~p)
/p^w~m/ → [p^w~n], {p^w}{n} (*p^w~m)
Difference in Labio-velarity → Labial dissimilation
(≈ CC·Ident-[Labio-velar], Ident-[Labio-velar] » Ident-[Labial])

b. /p^w~m^w/ → [p^w~m^w], {p^w m^w} (*p^w~n)
Difference in Nasality → No dissimilation
(≈ Ident-[nasal] » Ident-[Labial] » CC·Ident-[nasal])

The total ranking obtained for this pattern is given in (31).

(31) Ranking for Ponapean



Labials in the root are required to correspond by Corr-Root·[Labial]. Agreement in labio-velarity – represented here with an ad hoc feature [±labio-velar] – is a condition for this correspondence, due to Ident-[labio-velar] and CC·Ident-[labio-velar] being ranked in the contingent correspondence configuration. The Ident & CC·Ident constraints referring to nasality, on the other hand, are not ranked in the contingent correspondence configuration, so correspondence among labials is *not* affected by whether they agree in nasality.

The ranking in (31) produces dissimilation when two labials *do not* agree in labio-velarity. This is shown in (32). CORR-Root·[Labial] rules out non-correspondence between the labials (d). CC·IDENT-[Labio-velar] demands agreement for labio-velarity, which rules out the candidate with faithful correspondence (c). And, faithfulness for labio-velarity rules out the candidate that assimilates to achieve agreement (b).

(32) Labials that differ in labio-velarization dissimilate to coronals:

Input: /pʷ p/ Output: [pʷ t]		CORR·Root [Labial]	IDENT-[labio-velar]	CC·IDENT-[labio-velar]	IDENT-[nasal]	IDENT-[Labial]	CC·IDENT-[nasal]
☞ a.	pʷ **t** ℛ: {pʷ}{t}	(0)	(0)	(0)	(0)	(1)	(0)
~ b.	pʷ pʷ ℛ: {pʷ pʷ}		W (0~1)			L (1~0)	
~ c.	pʷ p ℛ: {pʷ p}			W (0~1)		L (1~0)	
~ d.	pʷ p ℛ: {pʷ}{p}	W (0~1)				L (1~0)	

The limiter constraint that favors dissimilation in (32) is a CC·Ident constraint, so it produces dissimilation only when segments disagree. Consequently, two identical labials, that *do* agree in labio-velarity, do not dissimilate. This is shown in (33). The result is the same as the treatment of identical ejectives in the Chol example above.

(33) No dissimilation for identical labials:

Input: /p^w p^w/ Output: [p^w p^w]		CORR·Root [Labial]	IDENT- [labio-velar]	CC·IDENT- [labio-velar]	IDENT- [nasal]	IDENT- [Labial]	CC·IDENT- [nasal]
☞ a.	p^w p^w $\mathcal{R}$: {p^w p^w}	(0)	(0)	(0)	(0)	(0)	(0)
~ b.	p^w t $\mathcal{R}$: {p^w}{t}					W (0~1)	
~ c.	p^w p^w $\mathcal{R}$: {p^w}{p^w}	W (0~1)					

What makes this analysis of Ponapean a case of Sufficient Identity Effects is the treatment of labials that agree in labio-velarity, but not in nasality. Under the ranking in (31), combinations like /p^w~m^w/ surface faithfully, with correspondence. That is, these *non-identical* labials are spared from dissimilation, just like the identical ones in (33): agreement in labio-velarity renders them "identical enough" to be tolerated. This is shown in (34).

Like the identical labials in (33), the candidate in (34a) with faithful correspondence between [p^w] & [m^w] satisfies CORR-Root·[Labial] and IDENT-[Labial], and the constraints that refer to labio-velarity (because it has labio-velar agreement even without any assimilation). It therefore handily defeats the alternatives with dissimilation (b) and non-correspondence (c). Where this differs from the case in (33) is in nasal agreement. The candidate in (a) has correspondence between a nasal and a non-nasal; this violates CC·IDENT-[nasal]. There is an alternative that has no such violation, the candidate with nasal agreement (by assimilation) in (d). This nasal agreement is ruled out because CC·IDENT-[nasal] is dominated by faithfulness for nasality.

(34) No dissimilation for non-identical labials, *as long as they agree in labio-velarity*:

Input: /p^w m^w/ Output: [p^w m^w]		CORR-Root·[Labial]	IDENT-[labio-velar]	CC·IDENT-[labio-velar]	IDENT-[nasal]	IDENT-[Labial]	CC·IDENT-[nasal]
☞ a.	p^w m^w $\mathcal{R}$: {p^w m^w}	(0)	(0)	(0)	(0)	(0)	(1)
~ b.	p^w n $\mathcal{R}$: {p^w}{n}					W (0~1)	L (1~0)
~ c.	p^w m^w $\mathcal{R}$: {p^w}{m^w}	W (0~1)					L (1~0)
~ d.	p^w p^w $\mathcal{R}$: {p^w p^w}				W (0~1)		L (1~0)

The effect derived here, then, is that a difference in nasality does not make labials so different that they must dissimilate. The ranking for Ponapean in (31) has the constraints for labio-velarity ranked to produce the "agreeing-or-else-dissimilated" outcome that forms the basis of the analysis of Complete Identity Effects (as in Chol). But, the constraints on nasality are not ranked that way. Since CC·IDENT-[nasal] is dominated by both IDENT-[Labial] and IDENT-[nasal], nasal agreement is not grounds for nasal assimilation or labial dissimilation. Thus, labials do not need to be identical in this respect in order to co-occur.

6.5.3. *It's not just Ponapean*

Ponapean is not the only potential example of a language with Sufficient Identity Effects. Some other possible instances of this phenomenon include: dental stop agreement in Luo and Alur, interpreted as an OCP effects in some prior by Yip (1989, on Luo), and Mester (1986, on Alur)[21]; similar coronal agreement patterns in Apache and Ngiyambaa (McCarthy 1988, Hansson 2001/2010); implosive harmony in Ịjọ languages

[21] There are also similar patterns of coronal harmony in many other Nilotic languages; see Hansson (2001/2010) for a review of pertinent cases.

including Bumọ Izon (Efere 2001, Mackenzie 2009, Gallagher 2010) and Kalaḅari (Jenewari 1977, Hansson 2001/2010); and rhotic type agreement in Yuwaalaraay (detailed in chapter 9). These are only a handful of examples: most patterns of static agreement are amenable to analysis as dissimilation with SIEs. See Hansson's (2010) typological survey for a more extensive list of static agreement cases.

6.6. Conclusion

In this chapter, I have shown that the surface correspondence theory of dissimilation produces languages with Complete Identity Effects – where similar consonants dissimilate unless they are identical. These systems can be analyzed as "Identical-or-else-dissimilated" patterns (a la Suzuki 1999). This result emerges from the behavior of CC·Ident family of Limiter constraints. In harmony systems, these constraints provide the impetus for assimilation. But, being Limiter constraints (constraints that penalize correspondence), they also participate in dissimilation systems. And, when a dissimilation system is based on CC·Ident constraints, the outcome is an "agreeing-or-else-dissimilated" pattern: dissimilation happens only to consonants that disagree for certain feature(s), and does not apply to other non-identical co-occurrencess.

Complete Identity Effects, in the theory advanced here, are a subset of "agreeing-or-else-dissimilated" dissimilation systems: they arise when all of the features that distinguish among a class of segments each exhibit this requirement. The result is that agreement is required in all (observable) respects, or else dissimilation happens. Thus, the special treatment of identical consonants emerges from the theory, without stipulating any special mechanisms that are uniquely applicable to identical consonant co-occurrence.

A consequence of decomposing complete identity into being "identical in all respects" (McCarthy 1989) is the possibility of languages where consonant co-occurrence is dependent only on being identical in *some* respects. I have termed these "Sufficient Identity Effects": segments are excused from dissimilating as long as they are "identical enough" – they need not be *completely* identical in order to exhibit the 'identity effect' behavior (along similar lines as Yip's (1989) notion's of 'non-distinctness' and 'identity *classes*'). And, I present Ponapean labio-velarity "harmony" as a potential example: this pattern is consistent with the predicted "agreeing-or-else-dissimilated" outcome. It is also not the only case of this sort; other cases of "static agreement" are also potential examples of SIEs.

6.7. Appendix: An aside about typological predictions

The existence of any CC·Ident constraint comes with the prediction that there can be harmony for that feature. The analyses of Chol & Ponapean involve four CC·Ident constraints, referring to Labio-velarity, Anteriority, Continuancy, and Major Place.

CC·IDENT-[Anteriority] predicts the possibility of anteriority harmony. This is robustly attested (see Hansson 2001/2010, Rose & Walker 2004 for discussion).

CC·IDENT-[Labio-velar] predicts the possibility of harmony for labio-velarity. Neither Hansson (2001/2010) nor Rose & Walker (2004) report this as a confirmed type of consonant harmony, though Hansson (2001/2010) does note the Ponapean case (as well as the same pattern in a related language, Mokilese). These are not the only cases like this, however. In Ngbaka (Thomas 1963), roots may contain two labials or two labio-velars, but not one of each (previously discussed by Sagey 1986, Mester 1986; see also van de Weijer 1994). Cahill (2008) reports that restrictions against the co-occurrence of labio-velar stops and labials are also found in "at least" Kukú, Bari, and possibly Kaanse, though little data is available on these languages. I know of no cases where such agreement produces alternations between labials and labio-velars, but these at least suggest that Ponapean & Mokilese are not alone, and that the phenomenon of labio-velar agreement is more general than previously thought.

CC·IDENT-[Continuant] predicts the possibility of stricture harmony. This is where some class of segments agrees for [±continuant], e.g. for the distinction between stops and fricatives. Stricture harmony is questionably attested: Hansson (2001/2010) reports a potential case in Yabem, where [s] in a prefix alternates with [t] before another coronal stop. Rose & Walker (2004) reject stricture harmony in their survey, on the grounds that Yabem is the only example where such harmony produces observable alternations that are clearly about stricture, and that the Yabem case is somewhat marginal (See Rose & Walker 2004:484 for discussion). There is perhaps additional support for CC·IDENT-[Continuant] from the language Kalasha (Arsenault & Kochetov 2011), where coronals must agree in retroflexion only if they also agree on [±continuant]. Thus, there is a ban on disagreeing pairs of fricatives like [s…ʂ], and disagreeing pairs of stops [t…ʈ], but disagreeing stop-fricative pairs are permitted: [saʈuk] 'apple sauce', [ʂit] 'tight-fitting'. Kalasha appears to be a system where harmony for retroflexion is limited by continuancy agreement. Continuancy agreement of this sort is support for CC·IDENT-[Continuant] as a valid constraint.

The final CC·Ident constraint featured in this chapter, CC·IDENT-[Place], predicts the possibility of Major Place harmony. This phenomenon is more controversial than the other features above. It has repeatedly been claimed that long-distance assimilation for major place of is unattested (see, among others, Shaw 1991, Gafos 1996/1999, Ní Chiosáin & Padgett 1997, 2001). Neither Hansson (2001/2010, 2010) nor Rose & Walker (2004) find any clear examples of long-distance major place harmony, a point which Gallagher & Coon (2009) use to argue against analyses that decompose total identity in the way this chapter does.

To me, the absence of major place harmony seems like a very plausible accidental gap. Consider what such a language would look like. Major place harmony would only be conclusively identifiable as such if it cuts across different manners of articulation. That is, if place harmony holds only within one manner of articulation, it is not distinguishable from Complete Identity Effects. Moreover, in order to be a truly convincing example, the pattern would have to produce observable alternations that result in different surface patterns. If only dorsals undergo place assimilation to match coronals, for instance, then the pattern could be interpreted as markedness-based reduction to other places of articulation, and not as true consonant harmony. In order to fully justify the pattern as place harmony, there would need to be alternations that show labials and coronals assimilating as well, and this assimilation would need to produce multiple different agreeing combinations.

In order to clearly demonstrate that a language has major place harmony, then, multiple different factors must align. Some of these present obvious functional hurdles. For instance, a language where place harmony holds as a restriction in roots, like the Chol & Ponapean cases discussed here, would have a severely restricted inventory of possible root shapes. There are also potential acquisition processing issues. If place harmony causes assimilation in affixes, then the underlying place specification of affixal consonants would be identifiable only from a relatively narrow range of data, which the learner is not necessarily guaranteed to encounter. So, major place harmony seems like a pattern that might be unattested for reasons external to the grammar.

Chapter 7
SCTD, the OCP, and Zulu labial dissimilation

7.1. Introduction

Zulu presents a case of labial dissimilation, which appears in passive verb forms as a phenomenon of "labial palatalization" (termed such in previous work Doke 1923, 1926, 1927, 1954; O'Bryan 1974; Stahlke 1976; Herbert 1977, 1990; Ohala 1978; Khumalo 1987, 1988; among others). The gist of the pattern is that when a root containing a medial or final [labial] consonant is combined with the passive suffix /-w/, which consists of another [labial] consonant, the underlying root labial(s) surface as pre-palatal consonants instead. The result is labial ~ (pre)-palatal alternations of the sort illustrated in (1) (example from Khumalo 1987). The example in (1a) shows a verb root, /kʰumul-/ 'undress', containing a medial labial consonant (/m/). The example in (1b) is its counterpart with the passive suffix /-w/ added after the root. The addition of the /w/ in this morpheme causes the /m/ in the root to surface as a pre-palatal [ɲ] instead.

(1) Zulu Labial Palatalization

a.	uku⟨kʰu**m**ul-a⟩	'to undress' (active)	
b.	uku⟨kʰu**ɲ**ul-wa⟩	'to be undressed' (passive)	*uku⟨kʰu**m**ul-wa⟩

The pattern of interest can be schematized as in (2). In this schematic representation, 'B' is a labial consonant, and 'J' is a palatal one; the stem domain is marked off by angle brackets, and the root edges by dashes. Note that the passive suffix /-w/ is the only productive suffix in Zulu; as such, the pattern in (1) holds as an interaction among labials generally. I analyze it here as a kind of labial dissimilation[1].

[1] The labial ~ palatal alternations occur in certain other contexts, but in these cases it is not a case of long-distance dissimilation. See §7.3.1.2 for more detailed discussion.

(2) Zulu labial dissimilation, schematically

⟨…B… –B⟩ → ⟨…J…–B⟩

e.g.:⟨…m…–w⟩ → ⟨…ɲ…–w⟩ (as in [-⟨kʰuluɲ-wa⟩] in (1b) above)

The table in (3) lists (in full) the alternations that emerge by this pattern. In essence, the alternation is between the bilabials and their pre-palatal counterparts, and this aspect is the focus of the analysis. Some of the mappings involve disparities in more than just place of articulation, but these follow from gaps in the Zulu palatal inventory (see §7.3.1 for discussion). Zulu does not make a contrast between plain voiceless stops and ejectives, so glottalization is not systematically marked in most sources (Doke 1927, Khumalo 1987, Poulos & Msimang 1998, a.o.), or in the examples given in this chapter. It is not crucial whether homorganic NC sequences like [mb] and [ndʒ] are analyzed as clusters or prenasalized consonants, but for illustrative purposes I have included them as single segments in the table in (14). The continuant labials /f v w/ are not included in the table because they are unaffected by this alternation.

(3) Inputs & Outputs of Labial Palatalization (Doke 1926)

Input		Output
p⁽’⁾	→	tʃ
pʰ	→	ʃ
ᵐp’	→	ⁿtʃ
m	→	ɲ[2]
ɓ	→	tʃ
b	→	dʒ
ᵐb	→	ⁿdʒ

[2] Doke (1926) states that palatalization of /m/ yields a “pre-palatal” nasal. He transcribes it as the palatal [ɲ], but his characterization suggests it does not differ in place of articulation from the rest of the consonants involved in this alternation. That is, the difference between [ɲ] and [tʃ], etc. is not an actual contrast between palatal and post-alveolar articulations, it is just an artifact of the transcription conventions. This is clear from the palatography data he provides (Doke 1926:74, 110).

When a stem includes a suffix that contains a labial consonant (i.e. the passive suffix /-w/), the labial ~ palatal dissimilation happens for any and all *non-initial*, non-continuant, labials in the root[3]. Stem-initial labials do not alternate in this way; they always surface faithfully. This exceptional faithfulness is illustrated by the pairs in (4), featuring roots with multiple labial consonants (4a,c). When the passive suffix /-w/ is added to these stems (4b,d), the stem-initial labials remain unaffected, but the other labials in the root surface as palatals.

(4) Stem-initial labials are unaffected:

a.	uku⟨bem-a⟩	'to smoke'	
b.	uku⟨beɲ-wa⟩	'to be smoked'	*uku⟨dʒeɲ-wa⟩
c.	uku⟨pʰapʰam-isa⟩	'to awaken'	
d.	uku⟨pʰaʃaɲ-iswa⟩	'to be awakened'	*uku⟨pʰapʰaɲ-iswa⟩

The surface correspondence analysis of this case is based on a CORR constraint, CORR-Stem·[labial] (which demands correspondence among all labials in the stem), and a structural CC·Limiter constraint, CC·EDGE-(Root) (which prohibits correspondence across the edge of the root). When an input contains a labial in a root and another labial in a suffix, the interaction of these constraints makes correspondence simultaneously required and prohibited; cumulatively, these demands amount to a prohibition against the co-occurrence of root labials and suffix labials in the same stem. The result is labial dissimilation, which satisfies both the correspondence requirement for labials (because there are no non-corresponding labials), and also satisfies the prohibition against correspondence across the root edge (because there is no correspondence between dissimilated labials and faithful ones). Stem-initial labials are

[3] With a few exceptions due to misalignment of the root & stem edges - see §3.3.1 for discussion

protected from this dissimilation by a positional faithfulness constraint (IDENT-Initial-[Labial], and another specialized faithfulness constraint (IDENT-Continuant-[Labial]) protects labial continuants.

The goal of this chapter is to show (i) that this case of long-distance dissimilation is explained by the surface correspondence theory (in the manner described above), and (ii) that it is not explained by the OCP. This point is significant because most previous theories of dissimilation (Itô & Mester 1996, Alderete 1997, Myers 1997, Suzuki 1998, Fukazawa 1999, among others) are based on some formulation of the OCP idea of similarity-avoidance. These OCP-based approaches derive dissimilation as an effect of general anti-similarity constraints. They fail to explain the long-distance dissimilation found in Zulu because in this case the co-occurrence of two labials is prohibited *only* when one is in the root and the other is in a suffix: the dissimilation in Zulu does *not* happen generally (as shown by (4a,c) above). The fact that the SCorr theory *can* explain this pattern therefore proves that it has a broader empirical coverage than the OCP.

The chapter is structured as follows. In §2, I present the relevant Zulu generalizations and the surface correspondence analysis of them. §3 examines the data in closer detail, and shows that it supports the characterization of the pattern that the analysis is based on. §4 takes up the analysis again, showing how the application of the surface correspondence theory prescribed in §2 actually explains the generalizations observed in the data. §5 considers three OCP-based alternative analyses, and shows that none of them explain the observed generalizations. §6 has concluding discussion.

7.2. Applying the SCorr theory to Zulu

7.2.1. Representational Preliminaries

I take Zulu verbs to have the morphological structure in (5): the root and suffixes together form the stem domain, and all prefixes are outside of this domain.

(5) Morphological structure of Zulu
    Word = Prefixes + ⟨$_{\text{STEM}}$ Root + Suffixes ⟩

This is the same structure posited for the analysis of Kinyarwanda in chapter 3. It reflects the canonical structure found across Bantu languages in general, simplified slightly by the omission of other domains that aren't important for the analysis; see chapter 3, §3.2.1 for references and more detailed discussion.

Following the same conventions as chapter 3 (and the examples above), I will mark the stem domain in output forms with angle brackets, and use dashes in output forms to mark (a) the root-suffix juncture, and (b) bare stems with no prefixes.

7.2.2. Target of analysis

The focus of the analysis is the long-distance labial dissimilation pattern seen in passive verbs (as exemplified in (1) & (4) in §7.1 above). This is where the long-distance dissimilation pattern is observed. The same group of labial ~ palatal alternations also happens in some other situations contexts; however in these other cases, the alternation does not arise from a long-distance consonant interaction, and it is not consistently dissimilatory in nature. For this reason, the scope of the analysis is limited to only the long-distance pattern seen in verbs.

Zulu has exactly one productive suffix that contains a labial consonant, and it is the passive suffix /-w/. As such, the dissimilation pattern induced by this morpheme can accurately be characterized as a property of [labial] suffixes in Zulu generally. I will use this characterization: the generalizations that the analysis will explain are framed as interactions between root labials and suffix labials, and not as morpheme-specific effects.

Focusing only on the labial dissimilation in verbs, the generalizations to be explained are those listed in (6).

(6) Zulu generalizations to be accounted for:

a. Labial dissimilation
  i) Non-initial labials in the root dissimilate when the stem contains another labial that is in a suffix
  ii) Dissimilation occurs irrespective of the quality & quantity of material that intervenes between the labials

b. Dissimilation is limited to non-continuant labials, in stem-non-initial positions
  i) stem-initial labials are faithful - they do not dissimilate
  ii) continuant labials are faithful - they do not dissimilate
  iii) no dissimilation occurs in prefixes

c. Dissimilation is caused by labials in suffixes only
  i) Roots that contain multiple labials do not dissimilate generally (co-occurrence of labials in the root is permitted)
  ii) Roots with multiple labials follow the same dissimilation patterns as above (they do not have exhibit special behavior)

The analysis proposed in this chapter derives these generalizations from the interaction of two conditions imposed on surface correspondence structures. First, labials in the stem are required to correspond with one another (the effect of CORR-Stem·[labial]). Second, surface correspondence is prohibited across the edge of the root (the effect of CC·EDGE-(Root), a structural CC·Limiter constraint). The combination of these requirements makes the co-occurrence of root labials and suffix labials problematic: a root labial and a suffix labial must either fail to correspond, or must correspond across the root edge, yet neither of these options is permitted in Zulu. The result is labial dissimilation throughout the root when (and only when) there is another labial in a suffix.

The limitations on dissimilation (6b, 6c) are explained in part by the scope of correspondence requirements, and also by specialized faithfulness constraints. Correspondence among labials is only demanded within the stem. Prefixes are outside the stem; this means prefix labials are not required to correspond with labials in the root, so no dissimilation is needed. (The same prediction is made for pairs of suffixal labials as well). The other circumstances where dissimilation does not occur are explained by specialized faithfulness constraints. Continuant labials and labials in stem-initial position are subjected to the same correspondence requirements as all labials, but undominated faithfulness constraints (IDENT-Initial-[Labial] & IDENT-Continuant-[Labial]) prevent their correspondence problems from being resolved by dissimilation.

The broader relevance of this analysis is that it captures a set of facts that an OCP-based theory of dissimilation does not. The two pertinent generalizations from (6) are that only labials *in suffixes* cause dissimilation, and they cause it for any non-initial, non-continuant labials in the root. It is not the case that all co-occurrence of labials leads to dissimilation (cf. Suzuki's (1998) characterization of the pattern). Labials may co-exist without dissimilating (e.g. when both are in the root); moreover, even where dissimilation happens, the output may still have multiple labials (e.g. one that dissimilates and one that does not, per (6b, 6c)).

7.2.3. Constraints & Ranking

Two correspondence-based constraints are involved in the Zulu labial dissimilation analysis: a CORR constraint (that requires correspondence), and a CC·Limiter constraint (that restrict correspondence). Dissimilation may arise where these constraints dominate the relevant faithfulness constraints (which are violated by dissimilation).

The CORR constraint relevant for the Zulu case is CORR-Stem·[labial], defined in (7). This constraint assigns violations whenever there are two (or more) labial consonants in the stem that fail to correspond with one another.

(7) CORR-Stem·[labial]: 'Labials in the stem must correspond'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are in the same morphological stem *and*
b. X and Y are both [labial] *and*
c. X and Y are not in the same correspondence class

The CC·Limiter constraint used in the analysis is CC·EDGE-(Root), defined in (8). This constraint favors dissimilation by penalizing correspondence across the edge of the root: it assigns violations when consonants in the root are in correspondence with those outside of it. The morphological structure of Zulu (5, above) means the CC·EDGE-(Root) forbids consonants in suffixes from corresponding with those in the root, and this is its essential role in the analysis.

(8) CC·EDGE-(Root): 'no correspondence across the edge of the root'
For each distinct pair of output consonants X & Y, assign a violation if:
a. X and Y are in surface correspondence
b. X is contained in a morphological root domain, D_{ROOT}
c. Y is not contained in D_{ROOT} (i.e. is not in the same root)

Finally, there are three faithfulness constraints, defined in (9)-(11). The first (9) is IDENT-[Labial], general faithfulness for labials. This constraint must be dominated for labial dissimilation to occur. The second (10) is its positional cousin IDENT-Initial-[labial], which demands faithfulness for only those labials that are in stem-initial positions. This constraint is key to capturing the generalization that stem-initial labials do not dissimilate. Finally, (11) is faithfulness for only those labials that are also continuants; its role is parallel to IDENT-Initial-[labial] – it prevents dissimilation from applying to fricatives in the root, and prevents dissimilation from changing the passive suffix /w/ rather than the root labials.[4]

(9) IDENT-[labial]: 'Don't change labials (to non-labial)'
Where X is an output segment, and X' is its correspondent in the input, assign a violation if:
a. X & X' have different specifications for the feature [labial]

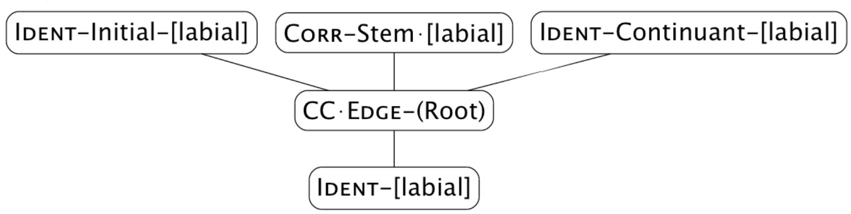
(10) IDENT-Initial-[labial]: 'Don't change stem-initial labials (to non-labial)'
Where X is an output segment, and X' is its correspondent in the input, assign a violation if:
a. X is the initial consonant in a stem
b. X & X' have different specifications for the feature [labial]

[4] IDENT-Initial-[labial] is defined here to refer to whether the *output* segment is stem-initial, not the input one. The reason for this is to allow for vowel-initial verb roots to be mis-aligned with the stem (Downing 1998)

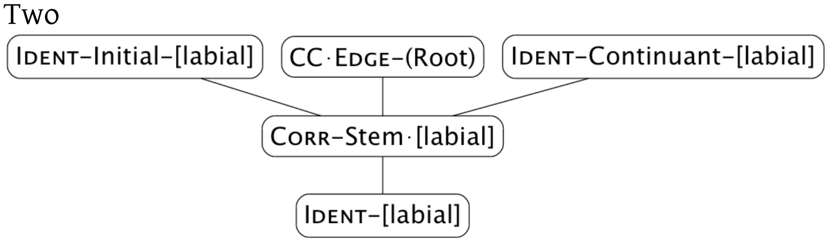
(11) Ident-continuant-[labial]: 'Don't change continuant labials (to non-labial)'
Where X is an output segment, and X' is its correspondent in the input, assign a violation if:
a. X is a [+continuant] segment
b. X & X' have different specifications for the feature [labial]

Two rankings of these constraints explain the Zulu pattern; they are shown in (12). The difference between them is the relative ranking of the Corr constraint Corr-Stem·[labial] and the CC·Limiter constraint CC·Edge-(Root). In either case, the specialized Ident constraints crucially dominate only the lower of the two correspondence constraints.

(12) Rankings obtained for Zulu
a. One



b. Two



The consequence of this difference is the treatment of labials that fail to dissimilate, i.e. stem-initial labials and continuant labials. If Corr-Stem·[labial] dominates CC·Edge-(Root), then pairs of non-dissimilating labials are in faithful correspondence with each other. If CC·Edge-(Root) » Corr-Stem·[labial], then such pairs of labials instead surface with faithful non-correspondence. This is the only difference in the outcomes of the two rankings: both derive the correct pattern of dissimilation in all cases.

7.2.4. The basis for the analysis

To capture the generalizations listed in (6), the analysis will produce the set of input-output mappings shown in the table in (13). These inputs are key representative data points that peg out the edges of the pattern. Input (a) represents the basic case of dissimilation. Input (b) represents the generalization that stem-initial labials do not dissimilate. Input (c) shows that there is no dissimilation root-internally: multiple labials may co-occur in the root, and they do not dissimilate. Input (d) illustrates how dissimilation occurs when multiple-labial roots are combined with the labial suffix /-w/: the initial labial is faithful, while any medial labials are not. Input (e) represents the observation that no dissimilation happens for labials in prefixes. Inputs (f–g) are the basic case of faithfulness: these stems have only one labial, and it surfaces faithfully, devoid of any notable correspondence-related interactions.

(13) Input-Output mappings

	Input	Output form	SCorr classes	Remarks
a.	seɓenz-w-a 'be worked'	⟨setʃenz-wa⟩	{s}{tʃ}{n}{z}{w}	labial dissimilation in the stem
b.	bon-w-a 'be seen'	⟨ɓon-wa⟩	{ɓ}{n}{w}, *or* {ɓ w}{n}	initial faithfulness; no dissimilation
c.	bem-a 'to smoke'	⟨bem-a⟩	{b m}	no dissimilation inside the root
d.	bem-w-a 'be smoked'	⟨beɲ-wa⟩	{b}{ɲ}{w}, *or* {b w}{ɲ}	dissiml for only non-initial labials
e.	ɓa-lw-is-a 'they made to fight'	ɓa⟨lw-isa⟩	{ɓ}{l}{w}{s}	no dissim. in prefixes
f.	ɓon-a 'see'	⟨ɓon-a⟩	{ɓ}{n}	faithfulness
g.	seɓenz-a 'work'	⟨seɓenz-a⟩	{s}{ɓ}{n}{z}	faithfulness

The basis for each mapping is the surface correspondence structure paired with it. In the cases where the output exhibits dissimilation, this unfaithful mapping occurs because it allows for a better surface correspondence structure. An underlying labial that changes to a non-labial in the output is not required to correspond with any of the labials in the output (thereby avoiding the problem of correspondence across the root edge). Consequently, the occurrence of dissimilation indicates that the resulting non-labial is not in correspondence with labials in the output. Where a stem contains two faithful labials, since no alternation occurs, the observable data does not fully determine the correspondence structure of the output form: there are two feasible surface correspondence structures that are consistent with this output configuration. The two surviving labials may either correspond, or not – the theory allows for both of these possibilities, and the disjunctive ranking relations in (12a,b) make the choice between the two.

7.3. The Zulu data, up close

This section shows how the raw Zulu data supports the characterization of the phenomenon schematized above. §3.1 gives some background about the labial ~ palatal alternation & the contexts where it occurs. Only some of these cases present genuine long-distance dissimilation; others are outside the scope of the dissertation, and the analysis will therefore not address them (see discussion in §3.1.3). §3.2 presents the supporting data for the basic long-distance dissimilation pattern, and §3.3 gives supporting data to show that dissimilation fails for stem-initial labials and labial continuants. §3.4 addresses roots with multiple labials, which exhibit dissimilation and faithfulness together. The analysis is resumed in §4, and the reader is welcome to skip ahead to there if not interested in the fine-grained empirical basis of the generalizations listed in (6).

7.3.1. *About the labial ~ palatal alternation*

7.3.1.1. Segments and Features involved

The phenomenon of interest involves the set of alternations listed in (14) (repeated from (3) above).

(14) Inputs & Outputs of Labial Palatalization (≈ Dissimilation) (repeated from (3))

Input		Output
p⁽ʼ⁾	→	t͡ʃ
pʰ	→	ʃ
ᵐp⁽ʼ⁾	→	ⁿt͡ʃʼ
m	→	ɲ
ɓ	→	tʃʼ
b	→	d͡ʒ
ᵐb	→	ⁿd͡ʒ

In featural terms, this alternation can be understood as essentially a change in place of articulation. The input segments (on the left) all share the features [Labial] and [–continuant]. Their respective outputs, the result of the alternation (the segments on the right), all differ in being palatal ([Coronal, –anterior]) instead of [Labial]. This difference in Major Place is the only systematic discrepancy between the consonants.

Some of the input-output pairs in (14) differ in more than just [Place], e.g [±continuant] and [±voice]. These other differences are secondary to the [labial] ~ [palatal] change: they can be seen to follow from independent gaps in the inventory of consonants allowed in Zulu. The non-click consonant inventory of Zulu is given in (15) below (after Doke 1926; clicks are omitted as they are not relevant here)[5].

(15) Zulu non-click consonant inventory (Doke 1926)

	Labial	Alveolar	Pre-palatal	Velar	Glottal
Stops	p' pʰ b ɓ	t' tʰ d		k' kʰ g k	
Affricates			tʃ dʒ	kɬ' (~kx')	
Fricatives	f v	s ɬ z ɮ	ʃ	x	h ɦ
Nasals	m	n	ɲ	ŋ	
Liquids		l			
Glides	w		j		

Note that there are no palatal stops. This means that the labial stops [p' pʰ b ɓ] cannot map to their direct palatal counterparts, as [c' cʰ ɟ ʄ] are not allowed to occur in the language. This explains the occasional disparities in [±continuant] involved in the labial ~ palatal alternation alternation: the labial stops are mapped to palatal affricates instead of palatal stops[6].

Zulu's palatals also offer a smaller range of laryngeal distinctions than the labials; this explains the behavior of [pʰ] & [ɓ]. Since there are no aspirated palatals, the closest parallel to [pʰ] is the fricative [ʃ]. As an aspirated stop, [pʰ] has the specifications [+spread glottis], [−constricted glottis], and [−voice]. Mapping it to the

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[5] I have also omitted consonants that are found only in ideophones, or only in specific clusters (e.g. [ts'] - Doke lists this in his inventory, but states that it occurs only when /s/ is preceded by a nasal). Vowels are omitted as well, and vowel length is not marked in data given here. Vowels are predictably long in certain prefixes, and in phrase-penultimate position (Doke 1926:180).

[6] Doke (1926) presents palatographs showing that [tʃ] in Zulu has a significantly larger and more post-alveolar closure than [tʃ] in English. In other words, Zulu [tʃ] is much closer to a true palatal stop [c] than the transcription may imply (e.g. perhaps [cʃ] would be a better approximation). (It is worth noting that in the related language Xhosa, which does have true palatal stops, [ɓ] maps to a true palatal [c'] instead of pre-palatal [tʃ'] (Doke 1954).)

ejective affricate [tʃʼ] entails a change from [−cg] to [+cg], and mapping it to voiced [dʒ] entails a change from [−voice] to [+voice]. The [pʰ]→[ʃ] mapping involves neither of these changes, so is closer in terms of laryngeal features. The voicing alternation in the [ɓ]→[tʃʼ] mapping is understood in a similar fashion. As an implosive, [ɓ] is [+cg]; as such, it maps to the only [+cg] palatal, the voiceless affricate [tʃʼ].

In sum: the constellation of alternations (14) is quintessentially about the place features [Labial] and [Palatal] (≈ [Coronal, −anterior]). Other shifts involved in the pattern occur only as necessary, and are a reflection of each labial being mapped to its closest palatal equivalent.

7.3.1.2. Where the labial ~ palatal alternation happens

The same set of labial ~ palatal alternations (14) induced by the passive suffix /-w/ also happens in 3 other situations: it is caused by the locative suffix /-ini/, by the diminutive suffix /-ana/, and is observed historically in certain words. It should be noted, however, that these other instances of the labial ~ palatal alternation are not actually cases of long distance dissimilation, for reasons discussed in §3.1.3.

7.3.1.2.1. Labial palatalization in locatives

Some examples of labial ~ palatal alternations in locatives are shown in (16). Doke (1927) reports that this palatalization is most common for roots ending in a labial followed by a round vowel (as in (a)-(c)), and he observes that such final round vowels would otherwise turn into [w] to resolve the /{u,o}+i/ hiatus (cf. [i⟨zulu⟩] 'the sky' → [e⟨zul**w**ini⟩] 'in the sky'), creating an environment comparable to affixation of the passive suffix /-w/. Like the passive case, the alternation appears not to apply to continuants (d). However, as Doke (1926, 1927) points out, the generalization is not as systematic as in passive verbs. Some roots with final labial + round vowel sequences fail to show palatalization (e), while others have no round vowel yet still exhibit the palatalization (f). There is also significant optionality and/or variation (also evident in (f))[7]. Also unlike the passive case, there is consistently *not* a [w] on the surface in the locative forms, even for roots with final long vowels: /e-ama-popo-ini/ → [ema⟨potʃʼeni⟩], *[ema⟨potʃʼweni⟩].

(16) Labial palatalization with locative suffix /-ini/: (Doke 1927)[8]

a.	/e-ama-popo-ini/	→ ema⟨potʃ-eni⟩, *ema⟨popw-eni⟩	‘in the paw-paws’
		cf. ama⟨popo⟩ ‘paw-paws’	
b.	/e-isi-ɓopʰo-ini/	→ esi⟨ɓoʃeni⟩	‘in the grass rope’
		cf. isi⟨ɓopʰo⟩ ‘grass rope’	
c.	/e-isi-gubu-ini/	→ esi⟨gudʒini⟩	‘in the calabash’
		cf. isi⟨gubu⟩ ‘calabash’	
d.	/e-i-fu-ini/	→ e⟨fini⟩ ~ e⟨fwini⟩	‘in the cloud’
		cf. i⟨fu⟩ ‘cloud’	
e.	/e-i-ɬwempu-ini/	→ e⟨ɬwempini⟩	‘by the poor person’
		cf. i⟨ɬwempu⟩ ‘poor person’	
f.	/e-um-kʰumbi-ini/	→ em⟨kʰundʒini⟩ (~ em⟨kʰumbini⟩)	‘in the ship’
		cf. um⟨kʰumbi⟩ ‘ship’	
g.	/um-kʰambatʰi/	→ um⟨kʰambatʰini⟩	‘table mountain’
		cf. um⟨kʰambatʰi⟩ (species of tree)	

Doke (1926, 1927) notes also that the labial ~ palatal alternation, when it occurs, is limited to the final consonant of the root. Thus, root-medial labials never exhibit the alternation (16g); it happens only for consonants that are directly followed by the first segment of the locative suffix.

[7] For roots where both labial and palatal variants are possible, Doke (1927, 1926) notes which form is more frequent. For some roots it is the labial one, for others (like ‘ship’ in 16f), it is the palatal one.

[8] These examples come from Doke (1927, 1926:142-143). I have constructed glosses with locative meaning; Doke supplies glosses only for the roots themselves.

7.3.1.2.2. *Labial palatalization in diminutives*

The labial ~ palatal alternation can also be found in some forms with the diminutive suffix /-ana/; some examples are given in (17) below. Unlike in the locatives considered above, Doke (1926:143) reports that palatalization in diminutives happens irrespective of the final vowel (compare (a) vs. (b–c)). Like the locatives, and unlike the passive case, the pattern is not systematic: there are roots where both options are possible (d), and others where palatalization is unacceptable (e). Also like the locative case, the alternation occurs only for a consonant that immediately precedes the first segment of the suffix: it is not a long-distance pattern (c).

(17) Labial palatalization with diminutive suffix /-ana/

a.	/im-pup^{h}u-ana/	→ im⟨puʃana⟩, *im⟨tʃuʃana⟩ cf. im⟨pup^{h}u⟩ 'meal'	'meal (dim.)'
b.	/isi-kebe-ana/	→ isi⟨kedʒana⟩ cf. isi⟨kebe⟩	'boat (dim.)'
c.	/isi-vimbo-ana/	→ isi⟨vindʒana⟩ cf. isi⟨vimbo⟩	'stopper (dim.)'
d.	/iN-kaɓi-ana/	→ i⟨ŋkatʃana⟩ ~ i⟨ŋkaɓana⟩ cf. i⟨ŋkaɓi⟩	'ox (dim.)'
e.	/iN-pi-ana/	→ i⟨mpana⟩, *i⟨ntʃana⟩ cf. i⟨mpi⟩	'army (dim.)'

The diminutive suffix /-ana/ also induces comparable palatalization for alveolar coronals; some examples are given in (18). The alternations involved are comparable to those seen with labials (14): alveolar stops map to the nearest palatal (with changes to continuancy or laryngeal features only as needed). Doke (1926) reports variation for some roots (c), but not others (a). He also provides examples where this alternation happens for a stem-initial consonant (d), an outcome not seen with in locatives or passives.

(18) Alveolar palatalization with diminutive suffix /-ana/ (Doke 1926, 1927)

a.	/i-kati-ana/	→ i⟨katʃana⟩ *i⟨katana⟩ cf. i⟨kati⟩ ‘cat’	‘cat (dim.)’
b.	/i-twetwe-ana/	→ i⟨twetʃana⟩ cf. i⟨twetwe⟩	‘apprehension (dim.)’
c.	/i-!anda-ana/	→ i⟨!andana⟩ ~ i⟨!andʒana⟩ cf. i⟨!anda⟩	‘egg (dim.)’
d.	/u-tʰi-ana/	→ u⟨tʰana⟩ ~ u⟨ʃana⟩ cf. u⟨tʰi⟩	‘stick (dim.)’

The labial ~ palatal alternation found in diminutives does not appear to be phonologically conditioned. Zulu has a productive reciprocal suffix /-an/, so verb roots may also be followed by the sequence /-an-a/. These forms do not exhibit palatalization like the diminutives: /ɓon-an-a/ ‘see each other’ surfaces faithfully as [⟨ɓonana⟩], *[⟨ɓoɲana⟩].

7.3.1.2.3. Labial palatalization diachronically

The labial ~ palatal alternation is also observed historically, in at least a handful of roots. Some examples are given in (19)[9] (Doke 1954, Louw 1975). Note that these diachronic cases also do not exhibit the same generalizations as the synchronic pattern in passive verbs: in these examples, the labial dissimilation happens to stem-initial labials (a), and labials in prefixes (b). Recall (from (6b) above) that the labial ~ palatal alternation in passives, on the other hand, consistently fails to happen to labials in these situations.

(19) Diachronic dissimilation does not follow the same generalizations

a.	Proto-Bantu *i-mbwa > indʒa	‘dog’	(stem-initial dissimilation)
b.	Proto-Bantu *ubu-ala > utʃwala	‘beer’	(prefix dissimilation)

[9] The proto-bantu forms here are from Doke (1954), but he gives modern forms only in Xhosa, not Zulu. I know the Zulu forms to be comparable, and these examples were also double-checked with a Zulu dictionary (isiZulu.net).

7.3.1.3. Only palatalization in passives is long-distance labial dissimilation

The focus of the analysis is limited to the long-distance labial palatalization pattern that occurs in passive verbs. Previous analyses have often tried to yoke all the different cases of labial palatalization together.[10] Conflating all occurrences of the labial ~ palatal alternation in this way makes it impossible to characterize the pattern in a homogenous way. The reason the labial ~ palatal alternation seen in passive verbs is of interest for the Surface Correspondence Theory of Dissimilation is because it is a case of long-distance consonant dissimilation: it's an interaction which holds between potentially non-adjacent labial consonants, and has the effect of changing them to non-labials. Other occurrences of the labial ~ palatal alternation in Zulu do not have this long-distance dissimilatory character. Non-dissimilatory interactions and strictly segment-adjacent interactions fall outside the scope of this dissertation. As such, the analysis will not try to explain them; palatalization in contexts other than passive verbs will be left aside. The basis for drawing this distinction between the passive and other types of labial palatalization in Zulu is discussed below in more detail.

7.3.1.3.1. Other labial palatalization is not dissimilatory

Whenever the labial ~ palatal alternation occurs in passive verbs, it is always dissimilatory: it always turns a pair of labials into one labial and one palatal. This is not true of the locative and diminutive cases. Consider the locatives as an illustration.

[10] Some examples of this approach include: Khumalo 1987, 1988; Beckman 1993; Poulos & Msimang 1998; Naidoo 2002; see also Louw 1975, Ohala 1978, Chen & Malambe 1998, Vondrasek 2001, Sibanda 2004, Malambe 2006, Bateman 2010 for the same conflation of the pattern in other languages.

When labial palatalization occurs in locatives, the output does not systematically retain a labial consonant: for example, /e-isi-gubu-ini/ 'in the calabash' surfaces as [esi⟨gudʒini⟩], with *no* labial consonants. If this form was *[esi⟨gudʒ**w**-ini⟩], it would be accurate to characterize it as dissimilation; but, without any labial consonants on the surface, there is no sound basis for characterizing it as a case of dissimilation. This issue is compounded in the cases where the data offers no suggestion of even a derived labial, as in locative & diminutive forms of roots without a final round vowel. An example is /isi-kebe-ana/ → [isi⟨kedʒ-ana⟩] 'boat (dim.)': in this form and others like it, there is no basis for positing more than one [labial] segment, so the labial palatalization it is clearly not an example of labial dissimilation. This is doubly true for palatalization in diminutives, where the alternation systematically involves one labial and one alveolar.

7.3.1.3.2. Other labial palatalization is strictly segment-adjacent

Doke (1927) notes that the labial ~ palatal alternation arises as a long-distance phenomenon only in passives. The alternations induced by the diminutive & locative suffixes, and those observed historically, are clearly *not* long-distance consonant interactions. The diminutive & locative forms exhibit palatalization only for the consonant that immediately precedes the affix. Even where the data invites speculation about a [w] derived by glide mutation from final round vowels before a vowel-initial suffix, the interaction would be a strictly segment-adjacent one. And, in the diachronic examples, this is also the case: only historical labial + w clusters turned into palatals.

The analysis will also not address other cases of labial dissimilation that do not produce the labial ~ palatal alternation. I know of only one example where this occurs in Zulu. Possessive pronouns are formed by a vowel-initial root like /-akʰo/ 'your', together with a noun class prefix (determined by the class of the possessum). When the noun class prefix ends in /u/ (for instance, as in the class 11 concord prefix /lu-/) that /u/ it surfaces as a [w]: /lu-akʰo/ → [lwakʰo] 'your (cl. 11)'. However, this /u/→ [w] change does not happen in the class 13 prefix /ɓu-/, and the vowel is simply deleted instead. Thus, /ɓu-akʰo/ → [bakʰo], *[bwakʰo] 'your (cl. 13)'. The relevant observation here is that the glide formation fails where it would result in a labial + [w] cluster. However, there is only one example like this, and it would seem to be a strictly segment-adjacent restriction, so I will also leave this aside.

7.3.1.4. The generality of the long-distance dissimilation

The passive suffix /-w/ is the only productive suffix that contains any labial consonants in Zulu. As such, I interpret the pattern of dissimilation it induces as a general one – not something unique to the passive morpheme, nor to the segment /w/ that it contains. This suffix happens to be the only productive suffix in Zulu that contains any labial consonants. In the absence of evidence that other labials would not trigger the same dissimilation, I assume the pattern generalizes.

Several other *non*-productive suffixes with labials are reported in Zulu; these are interpreted in the analysis as being part of the root rather than true suffixes. Some examples are given in (20) below. These suffixes derive verbs from other verbs, or from roots of other categories, often ideophones. Unlike the passive /-w/, none of these suffixes appear to be in systematic use in the Zulu variety described by Doke. They are reported to be infrequent if not very rare, and the meanings of their resulting forms often do not seem compositional (e.g. 'lick' ~ 'bow down' in (b)).

(20) Examples of non-productive suffixes with labials (Doke 1927, O'Bryan 1974)

a.	⟨ɓi⟩	'ugly'	
	⟨ɓipʰa⟩	'commence to cry'	(de-nominative/de-adjectival /-pʰa/)
b.	⟨kʰotʰa⟩	'lick'	
	⟨kʰotʰama⟩	'bow down'	(stative positional /-ama/)
c.	⟨mfoː⟩	(ideophone)	
	⟨mfoma⟩	'ooze'	(de-ideophonic /-ma/)
d.	⟨zwiː⟩	'of swinging' (ideophone)	
	⟨zwiɓa⟩	'fling, hurl'	(de-ideophonic /-ɓa/)
e.	⟨!a!a⟩	(ideophone)	
	⟨!a!amba⟩	'ache'	(de-ideophonic /-mba/)
f.	⟨bamba⟩	'belabour'	
	⟨bambaɓula⟩	'hit all over'	(extensive /-Vɓula/)

There are no reports of these non-productive suffixes are causing dissimilation in the same way as the passive /-w/. This is what we expect if these alleged "morphemes" are really part of the root, i.e. that they are not treated as suffixes in the synchronic grammar of the language.[11] This interpretation is supported in the data by the example /pʰapʰama/ 'wake up', derived from the ideophone /pʰapʰa/ + /-ama/ (cf 20b). This root has the passive form [⟨pʰaʃaɲ-wa⟩], where the /m/ of the alleged suffix /-ama/ participates in dissimilation exactly like a root-internal labial.

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[11] For the last one in (16), /-Vɓula/, O'Bryan (1974) reports a group of words where the /ɓ/ does not dissimilate to when the passive suffix /-w/ is present. Thus, [⟨gadaɓula⟩] 'bound along' (derived from the ideophone [gada]) has the passive form [⟨gadaɓul-w-a⟩], rather than *[⟨gadatʃul-w-a⟩]. Non-dissimilation in these forms could be understood as instances where /-Vɓula/ is a genuine suffix rather than part of the root. I do not pursue this idea here, because it is not clear what the generalizations are - further data is required.

7.3.2. Labial dissimilation: the empirical basis

The examples in (21) illustrate the full constellation of mappings involved in the long-distance dissimilation pattern.

(21) Labial dissimilation: the full constellation of mappings

a.	/t'ap'-w-a/ 'collect (pass.)'	→ ⟨t'atʃ'-wa⟩	(/p'/→[tʃ']; Khumalo 1987)
b.	/elapʰ-w-a/ 'treat medically (pass.)'	→ e⟨laʃ-wa⟩	(/pʰ/→[ʃ]; Khumalo 1987)
c.	/ᵐp'aᵐp'-w-a/ 'flutter (pass.)'[12]	→ ⟨ᵐp'aⁿtʃ'-wa⟩	(/ᵐp'/→[ⁿtʃ']; Doke 1927)
d.	/lum-w-a/ 'bite (pass.)'	→ ⟨luɲ-wa⟩	(/m/→[ɲ]; Doke 1927)
e.	/ɬaɓ-w-a/ 'stab (pass.)'	→ ⟨ɬatʃ'-wa⟩	(/ɓ/→[tʃ']; Doke 1927)
f.	/gub-w-a/ 'dig (pass.)'	→ ⟨gudʒ-wa⟩	(/b/→[dʒ]; Khumalo 1987)
g.	/kʰoᵐb-w-a/ 'point (pass.)'	→ ⟨kʰoⁿdʒ-wa⟩	(/ᵐb/→[ⁿdʒ]; Khumalo 1987)

The basis for treating this pattern as dissimilation is that it is crucially an interaction between labial consonants, to the exclusion of other places of articulation. This is illustrated by the data in (22): the addition of the passive suffix /-w/ has no effect on non-labial consonants. As previous literature has noted (Chen & Malambe 1998, Herbert 1977), this is atypical of palatalization phenomena cross-linguistically - typically palatalization happens to coronals or velars, not labials.

[12] Doke notes of this form and several others: "Sense does not permit of these stems forming complete words, i.e. imperatives, as they stand." I take this to mean that his consultants produced such forms, and judged them as morphologically/phonologically well-formed, but semantically unacceptable (comparable to English passives like "to be slept")

(22) No palatalization of non-labials:

a. /i-ja-kʰetʰ-w-a/ → ija⟨kʰetʰ-wa⟩ (/tʰ/↛[ʃ]; Beckman 1993)
'it is being picked out'

b. /ᶢ!ok'-w-a/ → -⟨ᶢ!ok'-wa⟩ (/k'/↛[tʃ']; Khumalo 1987)
'dress (pass.)'

The labial ~ palatal dissimilation pattern is not contingent on segmental adjacency: it holds over the stem domain. In the examples above, the segments involved in the dissimilation happen to be adjacent, but this need not be so. The forms in (23) show that the same dissimilation occurs when another affix intervenes between the suffixal /w/ and the labials in the root (an observation noted by Doke 1927 and in much subsequent work). These forms reveal that the generalization is that dissimilation holds throughout the stem, modulo faithfulness for stem-initial consonants (e.g. as in 23c – see §3.3 for discussion).

(23) Labial dissimilation over intervening affixes

a. /ɬupʰ-ek-w-a/ → ⟨ɬuʃ-ek-wa⟩ (Khumalo 1987)
'suffer' ('trouble (pass.)')

b. /uku-lum-isis-w-a/ → uku⟨luɲ-isis-wa⟩ (Doke 1927)
'to be bitten hard'

c. /ɓopʰ-el-w-a/ → ⟨ɓoʃ-elwa⟩ (Doke 1927)
'tie for (pass.)', 'be yoked'

d. /uku-pʰapʰam-is-w-a/ → uku⟨pʰaʃaɲ-iswa⟩ (Khumalo 1987)
'to awaken (pass.)'

e. /bub-is-w-a/ → ⟨budʒ-iswa⟩ (Doke 1927)
'kill (pass.)'

f. /ʃumaj-el-w-a/ → ⟨ʃuɲaj-elwa⟩ (Doke 1927)
'preach (pass.)'

g. /si-a-seɓenz-el-w-a/ → saː⟨setʃ'enz-elwa⟩ (Doke 1927)
'we were worked for'

From these examples, we can also observe that there isn't some kind of morphological adjacency condition involved in the pattern. The suffixal /-w/ that induces dissimilation and the root labials that undergo it can be not just non-adjacent segments, but even members of non-adjacent morphemes (along the same lines noted by Doke 1927:137).

Dissimilation also occurs across intervening material in the root. This is shown in (24): these words have root-medial labials, and they exhibit the dissimilation pattern just the same. This shows that the long-distance occurrence of dissimilation is not a derived environment effect – the material that separates them need not be the result of adding another morpheme.

(24) Labial dissimilation over distance in root

a.	/i-ja-^{g}loboz-w-a/ 'it is being dipped'	→ ija⟨^{g}lod͡ʒoz-wa⟩	(Beckman 1993)
b.	/t^{h}aɓat^{h}-w-a/ 'take (pass.)'	→ ⟨t^{h}atʃat^{h}-wa⟩	(Doke 1927)
c.	/ɓaɓaz-w-a/ 'flatter (pass.)'	→ ⟨ɓatʃaz-wa⟩	(Doke 1927)
d.	/ɬa^{m}bulul-w-a/ 'cleanse (pass.)'	→ ⟨ɬa^{n}d͡ʒulul-wa⟩	(Doke 1927)
e.	/uku-p^{h}ap^{h}am-w-a/ 'wake up (pass.)'	→ uku⟨p^{h}aʃaɲ-wa⟩	(P&M 1998)
f.	/uku-p^{h}umul-w-a/ 'rest (pass)'	→ uku⟨p^{h}uɲul-wa⟩	(P&M 1998)
g.	/seɓenz-w-a/ 'work (pass.)'	→ ⟨setʃenz-wa⟩	(Khumalo 1987)
h.	/ɬaɓelel-w-a/ 'sing (pass.)'	→ ⟨ɬatʃelel-wa⟩	(Doke 1927)

The data presented above also demonstrates the absence of "blocking" effects. Dissimilation occurs when the two labials are separated by alveolars (e.g. the [l]s in 24h), palatals (e.g. [j] in 23f), or velars (e.g. [k] in 23a), or even another dissimilating labial (24e, 23d). The round vowels [o u] may also intervene between the interacting labials, and also do not prevent dissimilation from happening (24a, 24d).

Dissimilation may also occur for multiple labials in the same root. This is illustrated by forms like (24e) /uku-p^{h}ap^{h}am-w-a/ → [uku⟨p^{h}aʃaɲ-wa⟩] 'wake up (passive)', where dissimilation occurs for both the non-initial /p^h/ and the following /m/. The apparent generalization is that any *and all* non-initial labials undergo the dissimilation. It is not the case, for instance, that dissimilation happens only to the labial closest to the suffixal /w/.[13]

7.3.3. Failure of dissimilation

Dissimilation fails to occur in three distinct situations, summarized in (25).

(25) No dissimilation occurs for:

a. Stem-initial labials
b. Continuant labials (fricatives & /w/)
c. Labials in prefixes

Supporting data for each of these cases is presented below.

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[13] There may be variation on this point. The majority of Zulu verb roots are CVC in shape, so roots with multiple labials are rare. The forms [uku⟨p^{h}aʃaɲ-w-a⟩] & [uku⟨p^{h}aʃaɲ-is-w-a⟩] show that it is not just the last labial in the stem that dissimilates. However, Beckman (1993) gives the form [ija⟨p^{h}up^{h}uɲ-is-w-a⟩], where dissimilation happens for only one of the two medial labials. This could be a single exception, or may represent cross-speaker variation (similar to that reported in SiSwati Malambe (2006:64), and Ndebele (Sibanda 2004)).

7.3.3.1. No Stem-initial dissimilation

Dissimilation systematically fails to happen to labials in stem-initial position[14]. The basis for this generalization is two-fold. First, no palatalization occurs for root-initial labials (26) (as pointed out by Doke 1927, Beckman 1993, a.o.). Second, there is also no dissimilation for a labial consonant that immediately follows a root-initial vowel (27). These are interpreted as being in the stem-initial position, just like the labials in (26).

(26) No dissimilation for root-initial labials:

a.	/uku-**ɓ**on-**w**-a/ 'to be seen'	→ uku⟨**ɓ**on-wa⟩	*uku⟨**ɗ͡ʒ**on-wa⟩	(Khumalo 1987)
b.	/**ɓ**oŋg-**w**-a/ 'praise (pass.)'	→ ⟨**ɓ**oŋg-wa⟩	*⟨**ɗ͡ʒ**oŋg-wa⟩	(Khumalo 1987)
c.	/uku-ᵐ**b**-**w**-a/ 'dig (pass.)'	→ uku⟨ᵐ**b**-i-wa⟩[15]	*uku⟨ⁿ**ɗ͡ʒ**-i-wa⟩	(Doke 1927)

(27) No dissimilation for a labial following a root-initial vowel:

a.	/aɓ-w-a/ 'apportion (pass.)'	→ a⟨ɓ-i-wa⟩	(Doke 1927)
b.	/opʰ-w-a/ 'bleed (pass.)'	→ o⟨pʰ-i-wa⟩	(Khumalo 1987)
c.	/eɓ-w-a/ 'steal (pass.)'	→ e⟨ɓ-i-wa⟩	(Khumalo 1987)
d.	/aɓ-el-w-a/ 'apportion to (pass.)'	→ a⟨ɓ-elwa⟩	(Doke 1927)

[14] The observation that faithfulness happens in the *stem*-initial position has been noted previously for the analogous labial dissimilation patterns found in Xhosa (Vondrasek 2001) and Siswati (Malambe 2006). To my knowledge, all previous work on the Zulu version has framed this as root-initial faithfulness, though as Malambe & Vondrasek point out, this is not sufficient.

[15] The passive form in (26) has an epenthetic [i], which appears in the passive forms of all short (mono-syllabic) verb roots: e.g. *uku⟨ɮ-a⟩*, 'to eat' ~ *uku⟨ɮ-**i**-w-a⟩*, 'to be eaten' (Doke 1927:136).

These consonants are regarded as being in the stem-initial position (along the same lines as a proposal that Vondrasek (2001) makes for labial palatalization in Xhosa; see also Downing 1998, 2005; Malambe 2006, among others). The idea is that the minimal verb stem is CVCV: minimally two syllables, and with an initial consonant.[16] Consequently, root-initial vowels are not included in the verb stem.

Evidence for the CVCV stem requirement in Zulu can be seen in epenthesis in order to reach the minimum stem size. For verb roots of the shape -C-, an extra [i] gets inserted between the root and the passive suffix /-w/, as seen above in (27), and below in (28). This epenthesis expands the stem domain to reach the shape CVCV. Roots of the shape -VC- also display the same [i]-epenthesis, as the data in (29) shows. In this respect, -VC- roots behave like -C- roots: they fail to meet the bisyllabic minimal size requirement for the verb stem. That the initial V does not count as part of the minimal stem suggests that it is not really a part of the stem. (Note that vowel-initial roots are rare in Zulu, as well as in related languages. For Ndebele, Sibanda (2004:18) finds that only 6% of verb roots have an initial vowel).

(28) Epenthesis of [i] before passive suffix /-w/ for -C- verb roots:

a.	/-ɮ-w-a/	→ -⟨ɮ-iwa⟩ cf. *-⟨ɮ-wa⟩	‘eat (pass.)’	(Doke 1927)
b.	/-m-w-a/	→ -⟨m-iwa⟩	‘stand (pass.)’	(Khumalo 1987)
c.	/-^{m}b-w-a/	→ -⟨^{m}b-iwa⟩	‘dig (pass.)’	(Doke 1927)
d.	/-p^{h}-w-a/	→ -⟨p^{h}-iwa⟩	‘give (pass.)’	(Doke 1927)

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[16] There is abundant evidence for this across Bantu languages, including in the Nguni sub-group. See Vondrasek (2001:5) on Xhosa, Malambe (2006:55) on Siswati, Sibanda (2004) on Ndebele, among others.

(29) The same epenthesis of [i] for -VC- roots:

a.	/uku-on-w-a/	→ uko⟨n-iwa⟩ cf. *uko⟨n-wa⟩	'spoil (pass.)'	(Khumalo 1987)
b.	/-al-w-a/	→ -a⟨l-i-wa⟩	'refuse (pass.)'	(Khumalo 1987)
c.	/-enz-w-a/	→ -e⟨nz-i-wa⟩	'make (pass.)'	(Doke 1927)
d.	/-ak^h-w-a/	→ -a⟨k^h-i-wa⟩	'build (pass.)'	(Doke 1927)
e.	/-os-w-a/	→ -o⟨s-i-wa⟩	'roast (pass.)'	(Doke 1927)

Since root-initial vowels are outside of the stem, the consonant following a root-initial vowel must be in the stem-initial position. As such, the reason there is no labial dissimilation in (27) is because the labials are in the stem-initial position. Their exceptional faithfulness is completely parallel to the preservation of root-initial labials (26).

7.3.3.2. No dissimilation for continuants

No dissimilation happens for [+continuant] labials (Beckman 1993:4). Zulu has three labial continuants: the fricatives [f v], and the glide [w]. All three may occur in root-medial positions, but they never alternate with palatals. This is illustrated by the examples in (30) below: these forms have the passive suffix /-w/, but the /f v w/ in each root surfaces faithfully (even when another labial in the root does manifest the dissimilation, as in (30b-c).

(30) No dissimilation for fricative labials or /w/

a.	/i-ja-ǁov-w-a/	→ ijaǁ⟨ǁov-wa⟩ cf. *ija⟨ǁoʒ-wa⟩	'it is being kneaded'	(Beckman 1993)
b.	/-bovumul-w-a/	→ -⟨bovuɲul-wa⟩	'growl (pass.)'	(O'Bryan 1974)
c.	/-fufumez-w-a/	→ -⟨fufuɲez-wa⟩	'be bold (pass.)'	(O'Bryan 1974)
d.	/-zw-w-a/	→ -⟨zw-iwa⟩	'be heard'	(Doke 1927)

7.3.3.3. No dissimilation in prefixes

The long-distance labial dissimilation pattern holds only within the domain of the stem. Zulu has a wealth of prefixes that contain labial consonants, none of which alternate with palatals. This is shown by the data in (31)-(33). A root containing a labial does not trigger dissimilation in a labial prefix (31), nor does a suffix labial (i.e. /w/ in the passive suffix) trigger dissimilation for in a prefix (32). There is also no dissimilation in a string of prefixes with labials (33). (Examples from Doke 1927, except where noted otherwise.)

(31) No dissimilation from root to prefix:

a.	/ŋgi-ja-m-w-is-a/	→ ŋgijam⟨w-isa⟩ cf. *ŋgijaɲ⟨w-isa⟩	'I pushed him'[17]
b.	/i-a-m-tʰwal-a/	→ jam⟨tʰwal-a⟩	'it took her' (Doke 1926:254)
c.	/ɓa-lw-is-a/	→ ɓa⟨lw-isa⟩	'they cause to fight'
d.	/imi-nwe/	→ imi⟨nwe⟩	'fingers (cl. 4)'
e.	/uɓu-ntwana/	→ uɓu⟨nt'wana⟩	'childhood (cl. 14)
f.	/uɓu-ɓi/	→ uɓu⟨ɓi⟩	'evilness (cl. 14)'

[17] This example helpfully provided by Claire Halpert (p.c.).

(32) No dissimilation from passive suffix /-w/ to labials in prefixes:

a.	/ɓa-ja-kʰol-w-a/	→ ɓaja⟨kʰol-wa⟩ cf. *tʃaja⟨kʰol-wa⟩	'they are satisfied'
b.	/ɓa-a-ʃon-el-w-a/	→ ɓaː⟨ʃon-elwa⟩	'they were descended for'[18]
c.	/ku-a-ɓon-an-w-a/	→ kw-a⟨ɓon-anwa⟩	'there was a seeing of one another'
d.	/ɓa-fik-ile/	→ ɓa⟨fik-ile⟩	'they arrived (perf.)'

(33) No dissimilation among prefixes:

a.	/ma-wu-zi-letʰ-e/	→ mawuzi⟨letʰ-e⟩ cf. *ɲawuzi⟨letʰ-e⟩	'may you bring them'
b.	/u-a-m-minz-a/	→ wam⟨mindz-a⟩	'he swallowed him' (Doke 1926:68)
c.	/ɓa-u-mu-zi/	→ ɓom⟨zi⟩	'them of the kraal' (Doke 1926:256)

Thus, prefixes are never subject to the dissimilation pattern under investigation here. The non-dissimilation in prefixes is interpreted as non-correspondence. The CORR constraint key to the analysis is CORR-Stem·[labial], which scopes only over the stem. Since prefixes are outside the stem, this constraint does not demand correspondence between prefixal labials and those in the root or suffixes (nor is correspondence required between labials in different prefixes).

7.3.4. Roots with multiple labials

Zulu allows verb roots to contain more than one labial consonant. These multiple-labial roots do not exhibit special behavior; they follow the same generalizations discussed above. This generalization is significant because it teases the surface correspondence theory's predictions apart from those of the OCP.

[18] literal gloss "they were set on" (by the sun)

When a root with multiple labials is combined with the passive suffix /-w/, dissimilation applies to (any and all) non-initial labial consonants in the root. This is illustrated in (34). In these forms, root-initial labials surface faithfully (per §3.3), while medial labials dissimilate (per §3.2). The point to observe here is that faithful preservation of stem-initial labials does not affect the dissimilation of non-initial ones. Stem-initial labials do not "protect" subsequent labials from dissimilating, nor does the presence of a dissimilating medial labial exceptionally cause a stem-initial labial to also dissimilate. (Examples from Doke (1926:140, 1927:136-137), Khumalo (1987:169), and Poulos & Msimang (1998)).

(34) Initial faithfulness and medial dissimilation may co-occur:

a.	/uku-ɓa^{m}b-w-a/	→ uku⟨ɓa^{n}dʒ-wa⟩ cf. *uku⟨ba^{m}b-wa⟩	'to be caught'
b.	/uku-bab-w-a/	→ uku⟨badʒ-wa⟩	'to be trapped'
c.	/uku-bem-w-a/	→ uku⟨beɲ-wa⟩	'to be smoked'
d.	/uku-popol-w-a/	→ uku⟨potʃol-wa⟩	'to be examined'
e.	/uku-ɓop^{h}-el-w-a/	→ uku⟨ɓoʃ-elwa⟩	'to be tied for'
f.	/uku-p^{h}ap^{h}am-is-a/	→ uku⟨p^{h}aʃaɲ-iswa⟩	'to be awakened'

Roots with multiple labials otherwise surface faithfully, as shown in (35). That is, labial dissimilation does occur root-internally; it happens only when the stem contains a suffix containing a labial.

(35) No root-internal dissimilation (Examples from Doke 1926:140-141)

a.	/-ɓamb-a/	→ -⟨ɓamb-a⟩	'catch'
b.	/-bub-a/	→ -⟨bub-a⟩	'die'
c.	/-bab-a/	→ -⟨bab-a⟩	'trap'
d.	/-mp'amp'-a/	→ -⟨mp'amp'-a⟩	'flutter'
e.	/-ɓaɓaz-a/	→ -⟨ɓaɓaz-a⟩	'flatter'
f.	/-ɓop^h-a/	→ -⟨ɓop^h-a⟩	'tie'

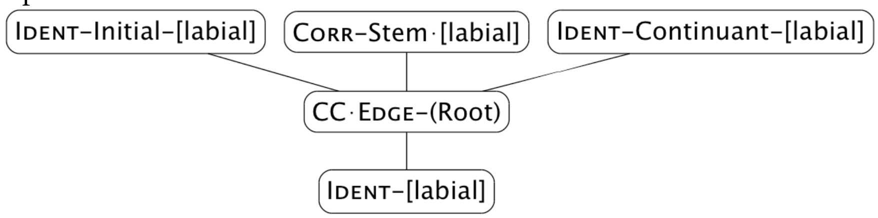
In the surface correspondence analysis, the generalization that dissimilation happens only before a labial suffix (and not within the root itself) is understood as a consequence of the limiter constraint CC·EDGE-(Root). This constraint penalizes correspondence across the edge the root. Consequently, it freely permits the co-occurrence of multiple labials in the same root (35), since correspondence among them does not involve spanning across the edge of the root. What CC·EDGE-(Root) does *not* permit is correspondence between labials in the root and labials in affixes - the condition where dissimilation occurs (34).

7.4. The SCTD analysis of the pattern

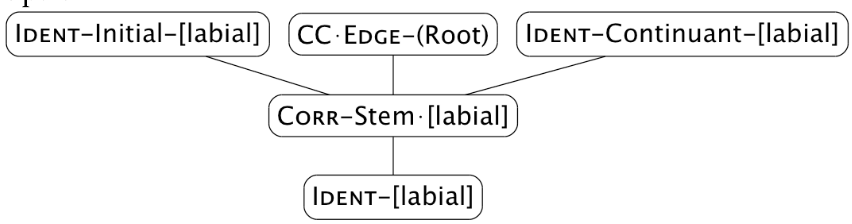
The two rankings obtained for Zulu are repeated in (36a,b). As noted previously (§2), both rankings explain the facts of Zulu. They produce the same segmental output forms, and differ only in the correspondence structure of those forms where the output contains more than one labial.

(36) Rankings obtained for Zulu:

a. Option #1



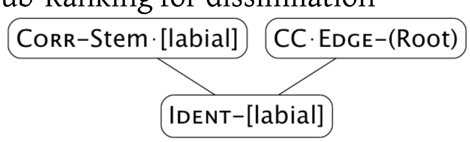
b. Option #2



7.4.1. Explaining dissimilation

Both of the rankings in (36) share the same core sub-ranking, shown in (37) below. This is the set of ranking conditions responsible for the basic dissimilation pattern; its interaction with the other constraints determines the cases where dissimilation fails to occur.

(37) Sub-Ranking for dissimilation



Justification for this sub-ranking is given in the tableau in (38). The input includes the root /-lum-/, which contains a non-initial labial (the /m/); as well as the passive suffix, which contains another labial (the /w/). These morphemes (together with the final vowel /-a/) comprise the stem domain. As such, Corr-Stem·[labial] penalizes non-correspondence between the [m] & [w]; this rules out the faithful non-correspondent candidate in (b). Since the /m/ is in the root and the /w/ is in a suffix, CC·EDGE-(Root) penalizes correspondence between them; this eliminates the faithful correspondent candidate in (c). The result is that dissimilation (a) is optimal.

(38) CORR-Stem·[labial], CC·EDGE-(Root) » IDENT-[labial]

Input: lum-w-a Output: -⟨luɲ-wa⟩		CORR-Stem·[labial]	CC·EDGE-(Root)	IDENT-[labial]
☞ a.	⟨l_1u$ɲ_2$-w_3-a⟩, ℛ: {l}{ɲ}{w}	(0)	(0)	(1)
~ b.	⟨l_1um_2-w_3-a⟩, ℛ: {l}{m}{w}	W (0~1)		L (1~0)
~ c.	⟨l_1um_2-w_2-a⟩, ℛ: {l}{m w}		W (0~1)	L (1~0)

Note that this interaction in no way hinges on any sort of adjacency between the interacting labials. This is illustrated by the tableau in (39) below. Here, the input is /lum-isis-w-a/ 'bite hard (pass.)': it is the same as in (38), but for the addition of the emphatic suffix /-isis/ between the root /m/ and the suffixal labial /w/. The same ranking favors dissimilation in precisely the same way, irrespective of the intervening consonants. CORR-Stem·[labial] demands correspondence only among [labial] consonants, so it does not favor correspondence between the interacting labials and the intervening [s]s. Consequently, the intervening non-labial consonants are inert, in the same way as the root-initial [l] that precedes both labials.

(39) Long-distance dissimilation is derived as well

Input: -lum-isis-w-a Output: -⟨luɲ-isiswa⟩		CORR-Stem·[labial]	CC·EDGE-(Root)	IDENT-[labial]
☞ a.	⟨l_1u$ɲ_2$-is_3is_4-w_5-a⟩, $\mathcal{R}$: {l}{ɲ}{s}{s}{w}	(0)	(0)	(1)
~ b.	⟨l_1um_2-is_3is_4-w_5-a⟩, $\mathcal{R}$: {l}{m}{s}{s}{w}	W (0~1)		L (1~0)
~ c.	⟨l_1um_2-is_3is_4-w_2-a⟩, $\mathcal{R}$: {l}{m w}{s}{s}		W (0~1)	L (1~0)

In sum, the sub-ranking in (37) has the effect of favoring dissimilation for labial consonants throughout the root, whenever the stem contains another labial outside of the root. Dissimilation comes out as optimal in this situation because the limiter constraint CC·EDGE-(Root) prohibits the necessary correspondence among labials when they are separated by the edge of the root.

7.4.2. Explaining non-dissimilation

Dissimilation fails to happen in 3 distinct circumstances: there is no dissimilation when a labial is stem-initial (§3.3.1), nor when a labial is a continuant (§3.3.2), nor when a labial is in a prefix (§3.3.3).

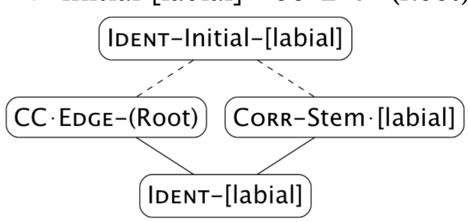
The lack of dissimilation in prefixes follows automatically from the sub-ranking (37) responsible for dissimilation. This is demonstrated by the tableau below in (40). CORR-Stem·[labial] demands correspondence only within the stem. When a labial is in a prefix, it is not in the stem. This means non-correspondence between prefix labials and those in the root (a) incurs no violations of CORR-Stem·[labial]. While CC·EDGE-(Root) forbids correspondence between root labials and prefix labials (c), no constraint demands their correspondence. So there is no basis for dissimilation to occur: the faithful non-correspondent candidate (a) wins over its dissimilated counterpart (b) on IDENT-[labial]. The spurious dissimilation candidate (b) is harmonically bounded over the set of constraints posited in the analysis.[19]

(40) No dissimilation in prefixes: no correspondence required of stem-external labials

Input: ɓa-lw-is-a Output: ɓa⟨lw-isa⟩		CORR-Stem·[labial]	CC·EDGE-(Root)	IDENT-[labial]
☞ a.	ɓ$_1$a⟨l$_2$w$_3$-is$_4$a⟩, $\mathcal{R}$: {ɓ}{l}{w}{s}	(0)	(0)	(0)
~ b.	tʃ$_1$a⟨l$_2$w$_3$-is$_4$a⟩, $\mathcal{R}$: {tʃ}{l}{w}{s}			W (0~1)
~ c.	ɓ$_1$a⟨l$_2$w$_1$-is$_3$a⟩, $\mathcal{R}$: {ɓ w}{l}{s}		W (0~1)	

The failure of dissimilation for stem-initial labials is explained by undominated IDENT-Initial-[labial]. For this constraint to be undominated, it must dominate *either* CC·EDGE-(Root) *or* CORR-Stem·[labial], as shown in (41).

(41) IDENT-Initial-[labial] » CC·EDGE-(Root) *or* CORR-Stem·[labial]



Either ranking is sufficient to force stem-initial labials to surface faithfully, so either one derives the correct set of output forms. This is shown in the tableauxs in (42) & (43) below. If IDENT-Initial-[labial] » CC·EDGE-(Root) as in (42), then dissimilation (42b)

[19] This candidate is not harmonically bounded on the total set of constraints in the theory. Corr constraints with a different domain of scope can favor the dissimilation candidate in (40b); this would be parallel to the treatment of Dahl's Law in Kinyarwanda analyzed in chapter 3.

loses to the alternative faithful correspondent candidate (42a). If, instead, IDENT-Initial-[labial] » CORR-Stem·[labial] as in (43), then dissimilation (43b) still loses, albeit to the faithful *non*-correspondent candidate (43a) instead of the faithful correspondent one (43c).

(42) IDENT-Initial-[labial] » CC·EDGE-(Root): faithful labials in the stem correspond

Input: -ɓon-w-a Output: -⟨ɓon-wa⟩		IDENT-Initial-[labial]	CORR-Stem·[labial]	CC·EDGE-(Root)	IDENT-[labial]
☞ a.	-⟨$ɓ_1on_2$-w_1a⟩, ℛ: {ɓ w}{n}	(0)	(0)	(1)	(0)
~ b.	-⟨$tʃ_1on_2$-w_3a⟩, ℛ: {tʃ}{n}{w}	W (0~1)		L (1~0)	L (0~1)
~ c.	-⟨$ɓ_1on_2$-w_3a⟩, ℛ: {ɓ}{n}{w}		W (0~1)	L (1~0)	

(43) IDENT-Initial-[labial] » CORR-Stem·[labial]: faithful labials don't correspond

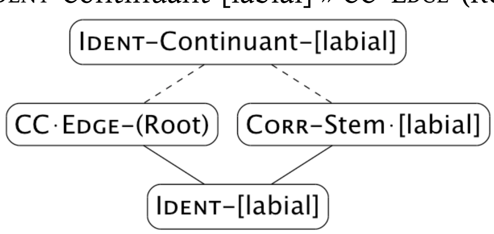
Input: -ɓon-w-a Output: -⟨ɓon-wa⟩		IDENT-Initial-[labial]	CC·EDGE-(Root)	CORR-Stem·[labial]	IDENT-[labial]
☞ a.	-⟨$ɓ_1on_2$-w_3a⟩, ℛ: {ɓ}{n}{w}	(0)	(0)	(1)	(0)
~ b.	-⟨$tʃ_1on_2$-w_3a⟩, ℛ: {tʃ}{n}{w}	W (0~1)		L (1~0)	L (0~1)
~ c.	-⟨$ɓ_1on_2$-w_1a⟩, ℛ: {ɓ w}{n}		W (0~1)	L (1~0)	

The relative ranking of CORR-Stem·[labial] & CC·EDGE-(Root) determines the whether the faithful labials correspond with each other or not. The ranking conditions responsible for the dissimilation pattern (37 above) require both of the correspondence-related constraints, together, to dominate faithfulness for [labial]; however, it is not crucial that one of them dominates the other. Both CC·EDGE-(Root) »

Corr-Stem·[labial] and Corr-Stem·[labial] » CC·Edge-(Root) are consistent with the output forms. The stem-initial faithfulness generalization is explained by stem-initial faithfulness (i.e. Ident-Initial-[labial]) dominating the lower of the two. Undominated Ident-Initial-[labial] pins down the stem-initial segment, forcing it to be faithful. For inputs like /ɓon-w-a/ 'see (pass.)' in (42)-(43), this fully determines the segments of the output form. In this case, the only choice left to the correspondence constraints is deciding between faithful correspondence (42a, 43c) and faithful non-correspondence (42c, 43a).

The lack of dissimilation for labial continuants is explained in the same manner as stem-initial faithfulness, just using a different specialized Ident constraint. The constraint Ident-Continuant-[labial] is like Ident-Initial-[labial], but for continuants rather than for stem-initial labials. It behaves the same way as Ident-Initial-[labial] in the ranking: it must dominate either the Corr constraint Corr-Stem·[labial] *or* the CC·Limiter constraint CC·Edge-(Root), as illustrated in the diagram in (44).

(44) Ident-Continuant-[labial] » CC·Edge-(Root) *or* Corr-Stem·[labial]



The bases for these two possible rankings are shown by the tableauxs in (45) & (46) below. The input is /i-ja-‖ov-w-a/ 'it is being kneaded', which contains a labial continuant /v/ in non-initial position in the root. This labial fricative does not dissimilate: the observed surface form is [ija⟨‖ov-wa⟩] (Beckman 1993), with two faithful labials in the stem. This output form is correctly derived as long as IDENT-Continuant-[labial] dominates the lower-ranked one of the two surface correspondence constraints, CC·Edge-(Root) and CORR-Stem·[labial]. As in the stem-initial condition in (42)-(43) above, the relative ranking of CORR-Stem·[labial] and CC·EDGE-(Root) is not crucial: it only determines whether the faithful labials are in correspondence (45a,46c) or not (45c,46a).

(45) Faithful [v]~[w] correspondence: IDENT-Continuant-[labial] » CC·EDGE-(Root)

Input: i-ja-‖ov-w-a Output: ija⟨‖ov-wa⟩		IDENT-Continuant-[labial]	IDENT-Initial-[labial]	CORR-Stem-[labial]	CC·EDGE-(Root)	IDENT-[labial]
☞ a.	$ij_1a⟨‖_2ov_3\text{-}w_3a⟩$, $\mathcal{R}$: {j}{‖}{v w}	(0)	(0)	(0)	(1)	(0)
~ b.	$ij_1a⟨‖_2oʒ_3\text{-}w_4a⟩$, $\mathcal{R}$: {j}{‖}{ʒ}{w}	W (0~1)			L (1~0)	L (0~1)
~ c.	$ij_1a⟨‖_2ov_3\text{-}w_4a⟩$, $\mathcal{R}$: {j}{‖}{v}{w}			W (0~1)	L (1~0)	

(46) Faithful non-correspondence: IDENT-Continuant-[labial] » CORR-Stem·[labial]

Input: i-ja-‖ov-w-a Output: $ij_1a⟨‖_2ov_3\text{-}w_4a⟩$		IDENT-Continuant-[labial]	IDENT-Initial-[labial]	CC·EDGE-(Root)	CORR-Stem·[labial]	IDENT-[labial]
☞ a.	$ij_1a⟨‖_2ov_3\text{-}w_4a⟩$, $\mathcal{R}$: {j}{‖}{v}{w}	(0)	(0)	(0)	(1)	(0)
~ b.	$ij_1a⟨‖_2oʒ_3\text{-}w_4a⟩$, $\mathcal{R}$: {j}{‖}{ʒ}{w}	W (0~1)			L (1~0)	L (0~1)
~ c.	$ij_1a⟨‖_2ov_3\text{-}w_3a⟩$, $\mathcal{R}$: {j}{‖}{v w}			W (0~1)	L (1~0)	

Note that the two specialized faithfulness constraints must pattern together in the disjunctive ranking. IDENT-Initial-[labial] & IDENT-Continuant-[labial] must both dominate either the CORR constraint or the CC·Limiter constraint, whichever is lower of the two. It is not possible to obtain a ranking where IDENT-Initial-[labial] crucially dominates CC·EDGE-(Root), while IDENT-Continuant-[labial] crucially dominates CORR-Stem·[labial]. The choice represented by the disjunction in the ranking is how the language manages surface correspondence requirements where dissimilation is not an option. Thus, the strategy (i.e. correspondence or non-correspondence) chosen for faithful continuant labials is necessarily the same as the one used for faithful stem-initial labials, even though different constraints are responsible for preventing dissimilation in each case.

The ranking of IDENT-Continuant-[labial] over the two surface correspondence constraints also explains the direction of the dissimilation. Zulu has only one synchronically active suffix containing a labial, the passive suffix /-w/. Since /w/ is a continuant, undominated IDENT-Continuant-[labial] means this labial always surfaces faithfully. This captures the generalization that dissimilation always happens to labials in the root, never to the labial in the suffix, as shown in (47), using the ranking from (46) above for illustration. IDENT-Continuant-[labial] penalizes changing the /w/ in the suffix to [j] (b), but does not penalize changing the root-internal /m/ to [ɲ] (a).

(47) IDENT-Continuant-[labial] prevents suffixal /w/ from dissimilating

Input: -lum-w-a Output: -⟨luɲ-wa⟩		IDENT-Continuant-[labial]	IDENT-Initial-[labial]	CC•EDGE-(Root)	CORR-Stem•[labial]	IDENT-[labial]
☞ a.	-⟨l₁uɲ₂-w₃a⟩, ℛ: {l}{ɲ}{w}	(0)	(0)	(0)	(0)	(1)
~ b.	-⟨l₁um₂-j₃-a⟩, ℛ: {l}{m}{j}	W (0~1)				e (1~1)

If IDENT-Continuant-[labial] dominates IDENT-[labial], this ranking also explains the lack of "majority rule" effects. The /w/ in the passive suffix /-w/ is retained as a labial, even if this means violating IDENT-[labial] multiple times, as in a form like /-pʰapʰam-w-a/ → [-⟨pʰaʃaɲ-wa⟩] 'wake up (pass.)' where two labials in the root dissimilate rather than one in the suffix.

7.4.3. Explaining both dissimilation & non-dissimilation together

The generalization noted (in §2.2) is that roots with multiple labials do not exhibit special behavior: they follow all the same generalizations as roots with only one labial. This entails (i) that co-occurrence of multiple labials within the root *does not* lead to dissimilation, and (ii) that roots containing multiple labials exhibit dissimilation of some labials and faithful retention of others at the same time.

The generalization that labials may freely co-occur within the root follows from how the correspondence constraints favor dissimilation. Under the theory advanced here, limiting correspondence is what favors dissimilation. In Zulu, the constraint that limits correspondence is CC•EDGE-(Root), which penalizes correspondence across the edge of the root domain. When an input contains multiple labials that are all in the same root, partitioning them all into the same correspondence class does not result in any cross-edge correspondence, as illustrated in (48) below. This is shown using the same ranking as in (46) & (47), where CC·EDGE-(Root) dominates CORR-Stem·[labial]. The result is the same under the other ranking of these constraints, though - no constraint favors non-correspondence in this situation.

(48) Co-occurrence of multiple labials in the same root falls out from the ranking:

Input: -ɓopʰ-el-a Output: -⟨ɓopʰ-ela⟩		IDENT-Continuant-[labial]	IDENT-Initial-[labial]	CC·EDGE-(Root)	CORR-Stem·[labial]	IDENT-[labial]
☞ a.	-⟨ɓopʰ-ela⟩, ℛ: {ɓ pʰ}{l}	(0)	(0)	(0)	(0)	(0)
~ b.	-⟨ɓoʃ-ela⟩, ℛ: {ɓ}{ʃ}{l}					W (0~1)
~ c.	-⟨tʃopʰ-ela⟩, ℛ: {tʃ}{pʰ}{l}		W (0~1)			W (0~1)
~ d.	-⟨ɓopʰ-ela⟩, ℛ: {ɓ}{pʰ}{l}				W (0~1)	

Thus, CC·EDGE-(Root) favors labial dissimilation only when two labials in the stem straddle the edge of the root. This situation arises only when a root with a labial is combined with a stem containing another one – the presence of a suffixal labial is necessary for dissimilation to be worthwhile. Labial co-occurrence is prohibited only in those situations where it necessitates a penalized surface correspondence structure.

The generalization that faithfulness and dissimilation can happen in the same form follows from the rankings developed above. This is demonstrated by the tableau in (49), (again using the ranking where CC·EDGE-(Root) dominates CORR-Stem·[labial] to illustrate). Here, the input is /ɓopʰ-el-w-a/ 'tie for (pass.)', with one initial labial (the /ɓ/), and another non-initial labial (the /pʰ/). This input surfaces as [⟨ɓoʃ-elwa⟩], with dissimilation of the medial labial only.

(49) Compatibility of dissimilation with initial faithfulness falls out from the ranking:

Input: -ɓopʰ-el-w-a Output: -⟨ɓoʃ-elwa⟩		IDENT-Continuant-[labial]	IDENT-Initial-[labial]	CC·EDGE-(Root)	CORR-Stem·[labial]	IDENT-[labial]
☞ a.	$⟨ɓ_1oʃ_2\text{-}el_3w_4a⟩$, $\mathcal{R}$: {ɓ}{ʃ}{l}{w}	(0)	(0)	(0)	(1)	(1)
~ b.	$⟨ɓ_1op^h{}_1\text{-}el_2w_3a⟩$, $\mathcal{R}$: {ɓ pʰ}{l}{w}				W (1~2)	L (1~0)
~ c.	$⟨ɓ_1op^h{}_1\text{-}el_2w_1a⟩$, $\mathcal{R}$: {ɓ pʰ w}{l}			W (0~2)	L (1~0)	L (1~0)
~ d.	$⟨tʃ_1oʃ_2\text{-}el_3w_4a⟩$, $\mathcal{R}$: {tʃ}{ʃ}{l}{w}		W (0~1)		L (1~0)	W (1~2)
(☞)e.	$⟨ɓ_1oʃ_2\text{-}el_3w_1a⟩$, $\mathcal{R}$: {ɓ w}{ʃ}{l}	e (0~0)	e (0~0)	W (0~1)	L (1~0)	e (1~1)

The winning candidate in (a) has one instance of dissimilation (/pʰ/→[ʃ]), and one instance of faithfulness in the root (stem-initial /ɓ/→[ɓ]). This wins over alternatives with no dissimilation, because retaining the medial labial translates to additional violation(s) of either CORR-Stem·[labial] (b) or CC·EDGE-(Root) (c). That is, the faithful stem-initial [ɓ] cannot "protect" the medial /pʰ/ from dissimilation by corresponding with it. (Note that this is true regardless of the ranking relation between CORR-Stem·[labial] & CC·EDGE-(Root). If the ranking CC·EDGE-(Root) » CORR-Stem·[labial] shown in (49) is reversed, then the winner is candidate (e) instead of (a): it is still better for the medial /pʰ/ to dissimilate than to correspond with the faithful [ɓ].

The point here is that the ranking developed here mandates dissimilation for each labial in the root independently from the rest. The presence of a suffixal labial presents each labial in the root with the same problem, irrespective of any of the other segments in the root. For each distinct pair consisting of one root labial and one suffix labial, they may either correspond (violating CC·EDGE-(Root)), or not correspond (violating CORR-Stem·[labial]), or dissimilate (violating one of the Ident constraints). The ranking CORR-Stem·[labial], CC·EDGE-(Root) makes dissimilation the preferred choice, regardless of what happens to any other segments in the root. The interaction between a root labial and a suffix labial is not affected by the presence of another labial in the same root.

7.5. The problems with alternative OCP-based analyses

We have seen that the surface correspondence theory of dissimilation explains the pattern of long-distance labial dissimilation found in Zulu. Now, let us consider alternatives based on the OCP.

Widely-accepted as the general basis for dissimilation, the OCP is a prohibition against the co-occurrence of similar or identical elements. The basic idea is well-precedented and richly developed in the literature on non-linear (autosegmental) phonology (Leben 1973, Goldsmith 1976, McCarthy 1986, Odden 1988, Yip 1988, among others). Various formalizations of the OCP have been proposed in which the OCP is a ranked, violable constraint, and these different formulations make different predictions. I consider three of these here: the Generalized OCP (Suzuki 1998) which operates at the segment level and is constrained based on distance; Local self-conjunction (Alderete 1996, 1997; Itô & Mester 1996, 1998) which operates at the segment level and is constrained by domains; and the more traditional conception of the OCP (Myers 1997, Fukazawa 1999, among others) which operates at the melodic level and is constrained by other constraints on autosegmental linking.

The claim of this chapter is that the OCP approach is, in general, not an adequate way to explain the Zulu dissimilation pattern. To show this, I will examine the three formulations of the OCP noted above, and demonstrate that none of them of the OCP are sufficient to capture the data. The problem is basically one of "fine-grainedness": when the OCP is formulated in a way that captures the basic dissimilation pattern, then it does not get the right results for where labials fail to dissimilate, and vice versa. Specifically, an OCP that applies at the level of the segment predicts – incorrectly – that labial dissimilation must happen for all pairs of root-internal labials. An OCP that holds at the melodic level (i.e. over autosegmental features) can avert that prediction by allowing multiple segments in the root to link to the same [Labial] feature. But, this analysis works by yoking all of the labials in the root together: it therefore this fails to get the right result for stems with multiple labials like /ɓopʰ-w-a/ →[⟨ɓoʃ-wa⟩], where faithful preservation of one labial does not prevent dissimilation of another. The point is that generic prohibitions against the co-occurrence of labial consonants fail to describe the combination of generalizations found in Zulu.

7.5.1. OCP Alternative #1: General Segmental OCP

The most extensive work on the OCP as a family of Optimality Theoretic constraints is the Generalized OCP (='GOCP') proposed by Suzuki (1998). In the GOCP theory, OCP constraints are defined according to the schema in (50). The constraints in this family thus assign violations for pairs of identical entities, and each individual constraint is specified for (i) which feature (or other entity) it looks at, and (ii) how close the two things must be in order to incur a violation.

(50) Generalized OCP (Suzuki 1998:27)
"*X…X"
i) 'X' $\in$ {PCat, GCat}
(any phonological or grammatical category)
ii) '…' is intervening material
(picked from the proximity hierarchy values {$\emptyset > C_0 > \mu > \mu\mu > \sigma\sigma > \ldots > \infty$})

For analyzing the Zulu labial dissimilation pattern, the necessary GOCP constraint is the one defined in (51)[20]. This constraint picks the feature [Labial] as the 'X' in the GOCP schema, and picks the unbounded value for intervening material. The choice of the unbounded proximity specification '∞' corresponds to the generalization that the dissimilation in Zulu happens irrespective of distance (it also matches Suzuki's (1998:153) somewhat erroneous characterization of the Zulu pattern).

(51) *[Labial]-∞-[Labial]
'A sequence of two identical [Labial] is prohibited (over unbounded distance)'

Note that this constraint operates at the segmental level: it assigns violations to pairs of segments that have the same [Labial] feature. It does not posit that different features are represented on different tiers, and it does not involve any notion of tier-based or segmental adjacency between the two identical entities. The labial OCP constraint in (51) penalizes *any* pair of [Labial] consonants, no matter how far apart they are, and no matter what intervenes between them. In other words, it is an extremely general prohibition against labial co-occurrence.

[20] I have adapted this phrasing from the definitions Suzuki (1998:76) gives for the constraints *[Place]…[Place] and *[cont]…[cont].

The generality of the *[Labial]-∞-[Labial] constraint is obviously problematic because it cannot restrict dissimilation to the stem domain. The ranking necessary for dissimilation to occur is *[Labial]-∞-[Labial] » IDENT-[labial], shown in (52).

(52) *[Labial]-∞-[Labial] » IDENT-[labial]

Input: -lum-isis-w-a Output: ⟨luɲ-isis-wa⟩		IDENT-Initial-[labial]	*[Labial]-∞-[Labial]	IDENT-[labial]
☞ a.	⟨luɲ-isis-wa⟩	(0)	(0)	(1)
~ b.	⟨lum-isis-wa⟩		**W** (0~1)	**L** (1~0)

However, this ranking incorrectly produces dissimilation in prefixes, as shown in (53). This is because *[Labial]-∞-[Labial] is not sensitive to morphological structure in any way – it penalizes co-occurrence of *all* labials, not just those in the stem. Note that stem-initial faithfulness does not affect this outcome in any way.

(53) *[Labial]-∞-[Labial] » IDENT-[labial] incorrectly predicts dissimilation in prefixes

Input: ɓa-lw-is-a Output: ɓa⟨lw-isa⟩		IDENT-Initial-[labial]	*[Labial]-∞-[Labial]	IDENT-[labial]
☹ a.	ɓa⟨lw-isa⟩	(0)	(1)	(0)
☠ b.	tʃa⟨lw-isa⟩		**L** (1~0)	**W** (0~1)

('☹' marks the desired winning output, which loses to the candidate marked with '☠')

The same ranking also leads to dissimilation in all roots containing two labials, not just when there is a following labial suffix. This incorrect result is shown in (54).

(54) *[Labial]-∞-[Labial] » IDENT-[labial] predicts dissimilation in prefixes

Input: ɓopʰ-a Output: ⟨ɓopʰ-a⟩		IDENT-Initial-[labial]	*[Labial]-∞-[Labial]	IDENT-[labial]
☹ a.	⟨ɓopʰ-a⟩	(0)	(1)	(0)
☠ b.	⟨ɓoʃ-a⟩		**L** (1~0)	**W** (0~1)
~ c.	⟨tʃopʰ-a⟩	**W** (0~1)	**L** (1~0)	**W** (0~1)

In fairness to Suzuki, this is a relatively simplistic presentation of the GOCP theory[21]; the point I want to make is only that a very general prohibition against the co-occurrence of labials is very wrong for the generalizations observed in Zulu. The GOCP constraint in (51) limits dissimilation only by specifying how material can intervene between two identical elements without preventing them from incurring an OCP violation. But, in Zulu, the occurrence of long-distance labial dissimilation depends on morphological structure, *not* locality. A pair of faithful labials may be closer together than a pair that undergoes dissimilation, so an OCP restrained only by distance is not sufficient.

7.5.2. OCP Alternative #2: Domain-delimited Segmental OCP

If the Generalized OCP is problematic because of its insensitivity to morphological structure, what about an alternative that restricts OCP constraints to hold only inside a particular domain? This version of the OCP matches the one proposed by Itô & Mester (1996, 1998) and Alderete (1996, 1997), where OCP constraints are derived from regular markedness constraints by local self-conjunction (Smolensky 1993, 1995). Locally conjoining two constraints yields a third constraint that assigns violations only when both conjuncts are violated in the same domain of locality. So, self-conjunction of a markedness constraint that penalizes the *occurrence* of some feature results in a constraint that penalizes the *co-occurrence* of two instances of that feature in the same domain of locality.

[21] As Suzuki (1998:77) points out, local conjunction of multiple different GOCP constraints yields more restrained OCP constraints, including ones that penalize co-occurrence only within a specified domain. These locally conjoined GOCP constraints are not appreciably different from other proposals that derive OCP constraints by local conjunction. See §5.2 for discussion of this issue.

The general form of OCP constraints derived by self-conjunction of markedness is shown in (55).

(55) OCP as local self-conjunction
$*[\alpha F]\ \&_L\ *[\alpha F] = *[\alpha F]^2_L$
'No two instances of [αF] in the local domain *L*'

From this template, we can stamp out the OCP constraint relevant for Zulu given in (56). This constraint is similar to the GOCP formulation in (51) above, but with the distinction of applying only over the stem domain. Limiting the OCP in this way solves one of the two problems with the GOCP identified above.

(56) $*[\text{Labial}]^2_{\textit{STEM}}$ (=*[Labial] $\&_{\textit{STEM}}$ *[Labial])
'No two instances of [Labial] in the same stem'

Unlike the GOCP formulation of the previous section (§5.1), this stem-domain OCP results – correctly – in no dissimilation for labials in prefixes. Prefixes are outside the stem, so the co-occurrence of a root labial and a prefix labial does not incur a violation of $*[\text{Labial}]^2_{\textit{STEM}}$ because the two violations of *[Labial] are not in the same local domain. This is shown in (57).

(57) $*[\text{Labial}]^2_{\textit{STEM}}$: no dissimilation in prefixes (only in the stem domain)

Input: ɓa-lw-is-a Output: ɓa⟨lw-isa⟩		IDENT-Initial-[labial]	$*[\text{Labial}]^2_{\textit{STEM}}$	IDENT-[labial]
☞ a.	ɓa⟨lw-isa⟩	(0)	(0)	(0)
~ b.	tʃa⟨lw-isa⟩			W (0~1)

What the domain-limited OCP does not fix is the result that dissimilation must happen root-internally, an outcome at odds with the Zulu facts. Since the beginning of the stem domain in Zulu coincides with the first consonant of the root and ends at the end of the word, it follows that any two labials in the same root are necessarily an instance of two labials in the same stem. Delimiting the OCP to the stem domain does not stop it from penalizing co-occurrence of labials within the root; consequently, it produces dissimilation for roots containing two labials. This is shown in (58).

(58) *[Labial]$^{2}_{STEM}$ produces dissimilation root-internally

Input: ɓopʰ-a Output: ⟨ɓopʰ-a⟩		Ident-Initial-[labial]	*[Labial]$^{2}_{STEM}$	Ident-[labial]
☹ a.	⟨ɓopʰ-a⟩	(0)	(1)	(0)
☠ b.	⟨ɓoʃ-a⟩		**L** (1~0)	**W** (0~1)

The incorrect outcome that dissimilation must happen root-internally could be averted by considering a faithfulness constraint for labials in the root, Ident-Root-[labial]. The ranking Ident-Root-[labial] » *[Labial]$^{2}_{STEM}$ causes roots with multiple labials to surface faithfully, as shown in (59). However, this ranking prevents root-internal consonants from dissimilating in *all stems* containing multiple labials. That is, it prevents dissimilation of labials in roots generally, including those situations where dissimilation is the observed outcome (60).

(59) Ident-Root-[labial] » *[Labial]$^{2}_{STEM}$: no root-internal dissimilation (right outcome)

Input: ɓopʰ-a Output: ⟨ɓopʰ-a⟩		Ident-Initial-[labial]	Ident-Root-[labial]	*[Labial]$^{2}_{STEM}$	Ident-[labial]
☞ a.	⟨ɓopʰ-a⟩	(0)	(0)	(1)	(0)
~ b.	⟨ɓoʃ-a⟩		**W** (0~1)	**L** (1~0)	W (0~1)

(60) Ident-Root-[labial] » *[Labial]$^{2}_{STEM}$: root labials *never* dissimilate (wrong outcome)

Input: lum-isis-w-a Output: ⟨luɲ-isis-wa⟩		Ident-Initial-[labial]	Ident-Root-[labial]	*[Labial]$^{2}_{STEM}$	Ident-[labial]
☹ a.	⟨luɲ-isis-wa⟩	(0)	(1)	(0)	(1)
☠ b.	⟨lum-isis-wa⟩		**L** (1~0)	**W** (0~1)	L (1~0)

The problem here is that the domain-delimited OCP constraint *[Labial]$^{2}_{STEM}$ has no sensitivity to the *edges* of domains. Since the root is a subset of the stem, any occurrence two labials in the same root is necessarily an instance of two labials in the same stem. The result is that *[Labial]^2*STEM* treats [⟨lum-isis-wa⟩] and [⟨ɓop^h-a⟩] in the same way: both have two labials in the same stem, so both violate it equally. The facts show that labial dissimilation happens in one case and not in the other, but this version of the OCP cannot tell them apart

The point here is that narrowing the OCP to look only *within* a domain isn't sufficient for the Zulu case. The generalization is that dissimilation is happens for two labials in the stem only when they *straddle the edge* of the root domain. In order to explain the observed generalization, the constraint(s) responsible for prohibiting labial co-occurrence must refer to domain edges in some way.

7.5.3. OCP Alternative #3: Autosegmental OCP

Let us consider a third version of the OCP, one more in line with its traditional characterization in autosegmental terms: a prohibition against adjacent elements *at the melodic level* (Leben 1973, Goldsmith 1976, McCarthy 1986, a.o.). This interpretation of the OCP differs substantially from those considered (in §5.1 & §5.2) above, in that it permits multiple similar segments to co-occur as long as they are not distinct at the featural level.

The implementation of an autosegmental OCP as an Optimality Theoretic constraint is the one initially proposed by Myers (1997; see also Fukazawa 1999), who astutely points out that the OCP does not derive dissimilation by itself – dissimilation emerges only from the interaction of the OCP with other constraints (Myers 1997:850-853). Consequently, analyzing the Zulu labial dissimilation pattern with this version of the OCP requires not jus the OCP constraint defined in (61), but also further constraints on autosegmental linking, along the lines of those given in (62)-(64)[22].

(61) OCP-[Labial]: Autosegmental formulation
*[Labial] [Labial], *at the melodic level.*

(62) MAX-IO (Labial): 'no deletion of [labial] features'
'Every [Labial] feature in the input has a correspondent instance of [Labial] in the output'

(63) UNIFORMITY-IO (Labial): 'no fusion of [labial] features'
'If *a* and *b* are distinct [labial] features in the input, then their output correspondents *a'* and *b'* are also distinct [Labial] features'

(64) CRISPEDGE-(Root): 'no linking across the root edge'[23]
For each instance-of-a-feature F, assign a violation if
a. F is linked to a segment contained in a root R *and*
b. F is also linked to a segment that is *not* contained in R

The constraints MAX-IO (labial) & UNIFORMITY-IO (labial) limit the manipulation of autosegments; without such constraints, OCP violations can be averted by freely adjusting the autosegmental representation of the output form without changing any of the segments. The constraint CRISPEDGE-(Root) imposes similar restrictions on the relation between segments and features, with an eye to morphological structure. Specifically, this constraint prohibits linking one feature to two (or more) segments that straddle the edge of the root: it makes this OCP analysis sensitive to the presence of root edges.

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[22] MAX-IO (Labial) & UNIFORMITY-IO (Labial) are adapted from the schema for these families given by Myers (1997:852). CRISPEDGE-(Root) is adapted from the CRISPEDGE constraint schema proposed by Itô & Mester (1994)

[23] (≈"If a feature is the content of a morphological root R_m, then it is not also the content of another constituent that is not contained by R_m. Assign one violation for each feature that does not meet this condition.")

The addition of CRISPEDGE-(Root) gives this OCP analysis the ability to distinguish pairs of root-internal labials from those that straddle the root edge – the distinction needed to account for dissimilation in /lum-isis-w-a/→[⟨luɲ-isis-wa⟩] but not in [⟨ɓopʰ-a⟩] (cf. *[⟨ɓoʃ-a⟩], see (59) above).

The autosegmental OCP analysis shares certain characteristics with the surface correspondence. When OCP-[labial] allows multiple linking of one labial feature, its effect is comparable to that of a CORR constraint: it penalizes pairs of labials that are not linked to the same instance of [Labial], and is satisfied by *either* co-association *or* dissimilation - parallel to how CORR-Stem·[labial] is equally satisfied when two labials dissimilate or when they correspond with one another. CRISPEDGE-(Root) is analogous to CC·EDGE-(Root): both constraints assign violations when a root labial and a suffix labial are co-related (i.e. by co-linking in the case of CRISPEDGE, and by correspondence in the case of CC·EDGE).

An analysis based on the autosegmental OCP can produce the basic dissimilation pattern caused by the /w/ in the passive suffix. It can also derive the generalization that no dissimilation occurs root-internally (an improvement relative to the segment-level OCP formulations considered previously). The problem with this analysis is that it cannot derive dissimilation of one labial in tandem with faithful retention of another.

The melodic-level formulation of the OCP produces dissimilation by interacting with CRISPEDGE-(Root); the interaction works in approximately the same way as for CORR-Stem·[labial] & CC·EDGE-(Root) in the surface correspondence account. This is shown in the tableau in (65): the OCP rules out the segmentally-faithful candidate that keeps both [Labial] features distinct (b), and CrispEdge-(Root) rules out the other faithful alternative (c) that fuses the [Labial] features together. The optimal candidate, then, is dissimilation (a), where one [Labial] feature is deleted in the output.

(65) Dissimilation at the root edge: OCP-[Labial], CrispEdge-(Root) » Max-IO(Labial)

Input: lum-w-a Output: ⟨luɲ-wa⟩		Ident-Initial-[labial]	OCP-[Labial]	CrispEdge-(Root)	Max-IO (Labial)	Uniformity-IO (Labial)
☞ a.	~~[Lab]~~$_{\cancel{1}}$ [Lab]$_1$ ǂ | ⟨l u ɲ - w - a⟩	(0)	(0)	(0)	(1)	(0)
~ b.	[Lab]$_1$ [Lab]$_2$ | | ⟨l u m - w - a⟩		**W** (0~1)		**L** (1~0)	
~ c.	[Lab]$_{1,2}$ | \\ ⟨l u m - w - a⟩			**W** (0~1)	**L** (1~0)	**W** (0~1)

The tableau in (66) shows how this OCP analysis explains the lack of dissimilation root-internally by multiply linking. Here, the input is the stem /ɓopʰ-a/, with two labials in the root, both of which surface faithfully in the observed output form. The autosegmental OCP allows this co-occurrence in this situation because it does not involve linking a feature across an edge. Since both labials are in the root, the candidate where both are associated to the same [Labial] autosegment (a) incurs no violations of CrispEdge-(Root). Thus, while the OCP rules out the faithful candidate in (b) that retains both [labial] features, this does not make dissimilation (c) optimal here. The choice between co-linking and dissimilation comes down to the relative ranking of the faithfulness constraints Max-IO (Labial] & Uniformity-IO (Labial). When Max-IO (Labial] » Uniformity-IO (Labial), fusion is preferred to deletion, leaving the non-dissimilated candidate (a) as optimal.

(66) No root-internal dissimilation: OCP-[Labial], MAX-IO (Labial) » UNIFORMITY-IO (Labial)

Input: ɓopʰ-a Output: ⟨ɓopʰ-a⟩		IDENT-Initial-[labial]	OCP-[Labial]	CRISPEDGE-(Root)	MAX-IO (Labial)	UNIFORMITY-IO (Labial)
☞ a.	[Lab]$_{1,2}$ | \\ ⟨ɓ o pʰ - a⟩	(0)	(0)	(0)	(0)	(1)
~ b.	[Lab]$_1$ [Lab]$_2$ | | ⟨ɓ o pʰ - a⟩		**W** (0~1)			**L** (1~0)
~ c.	[Lab]$_1$ ~~[Lab]$_2$~~ | ǂ ⟨ɓ o ʃ - a⟩				**W** (0~1)	**L** (1~0)

The problem is that the ranking MAX-IO (Labial) » UNIFORMITY-IO (Labial) prevents dissimilation whenever the root also contains a faithful labial. This consequence is shown in (67), for the input /ɓopʰ-w-a/. As before, the OCP rules out all of the candidates that retain multiple distinct [labial] features (c-e). Since undominated specialized faithfulness constraints force the stem-initial /ɓ/ and the continuant /w/ to surface as labials, this narrows the choice down to fusion of all three [Labial] features (67b), or fusion and dissimilation (67a). Both of these candidates have a single [Labial] feature linked to segments inside and outside the root, so both incur one violation of CRISPEDGE-(Root) – this constraint does not decide between them. The result is that the choice between dissimilation and faithfulness (via complete fusion) is passed down to the faithfulness constraints. Since MAX-IO (Labial) dominates UNIFORMITY-IO (Labial), the fusion candidate (b) is preferred over the dissimilating candidate (a). The result is that the input /ɓopʰ-w-a/ comes out as the faithful from *[⟨ɓopʰ-wa⟩] instead of the observed, dissimilated, form [⟨ɓoʃ-wa⟩].

(67) Dissimilation of medial labials leads to ranking conflict:
OCP-[Labial], UNIFORMITY-IO (Labial) » MAX-IO (Labial) (cf. (66): Max » Uniformity)

Input: ɓop^h-w-a Output: ⟨ɓoʃ-wa⟩		IDENT-Initial-[labial]	OCP-[Labial]	CRISPEDGE-(Root)	MAX-IO (Labial)	UNIFORMITY-IO (Labial)
☹ a.	[Lab]$_{1,3}$ ~~[Lab]$_2$~~ | ǂ ⟨ɓ o ʃ - w - a⟩	(0)	(0)	(1)	(1)	(1)
☠ b.	[Lab]$_{1,2,3}$ / | \\ ⟨ɓ o p^h - w - a⟩			**e** (1~1)	**L** (1~0)	**W** (1~2)
~ c.	[Lab]$_1$ ~~[Lab]$_2$~~ [Lab]$_3$ | ǂ | ⟨ɓ o ʃ - w - a⟩		W (0~1)	L (1~0)	e (1~1)	L (1~0)
~ d.	[Lab]$_1$ [Lab]$_2$ [Lab]$_3$ | | | ⟨ɓ o p^h - w - a⟩		W (0~2)	L (1~0)	L (1~0)	L (1~0)
~ e.	[Lab]$_{1,2}$ [Lab]$_3$ / \\ | ⟨ɓ o p^h - w - a⟩		W (0~1)	L (1~0)	L (1~0)	e (1~1)

The essential point here is that formulating the OCP to hold at the melodic level (instead of the segmental one) still does not yield a working analysis of Zulu labial dissimilation. The autosegmental implementation of OCP-[Labial] favors dissimilation only insofar as it reduces the number of [Labial] autosegments in the output. When a root contains two labials, and one is forced to surface faithfully (i.e. by undominated stem-initial faithfulness), dissimilation of the other does not entail a reduction in the number of [Labial] features. Consequently, the OCP produces an "all or nothing" pattern of dissimilation - this does not match the generalization observed in Zulu.

7.6. Summary & Conclusions

In this chapter, I have presented a case of long-distance [Labial] dissimilation in Zulu, and shown (§2, §4) that it is explained by the theory of surface correspondence. I have also shown that the same pattern is *not* explained by the OCP (§5), even in various different formulations.

The surface correspondence analysis explains the pattern by the interaction of CORR constraints, and CC·Limiter constraints. CORR-Stem·[labial] requires correspondence among all labial consonants throughout the stem. CC·EDGE-(Root) limits correspondence to just root-internal consonants, or just root-external ones - crucially, it prohibits correspondence classes from containing both root and non-root consonants together. Limiting correspondence across the edge of the root favors dissimilation when there are labials occur on opposite sides of the root-suffix boundary. These premises derive the generalizations observed in Zulu. When a root containing some (non-initial) [labial] consonant(s) is followed by a suffix containing another [labial] consonant, they are obliged to dissimilate – it is impossible for them to co-exist without having an unacceptable surface correspondence structure. This predicament arises in the same way for all of the labials in a root, which means that dissimilation is demanded equally for all non-initial labials in a root. The analysis developed here differs crucially from the OCP in that it does not penalize the co-occurrence of [labial] segments, but rather the surface correspondence structures that they give rise to. No dissimilation is predicted root-internally, because correspondence within the root does not violate CC·EDGE-(Root). Along similar lines, no dissimilation is predicted in prefixes, because they are outside the stem – the domain that CORR-Stem·[labial] scopes over.

This chapter has also explored 3 distinct alternative analyses, each based on the notion of the OCP, a prohibition against the co-occurrence of similar consonants, hashed out in various ways. While each of these is capable of producing some kind of dissimilation pattern, none of them derive the set of generalizations observed in Zulu. The segment-level implementations of the OCP predict too much dissimilation: if dissimilation occurs in the stem, it must occur root-internally as well. But, this is not what happens in Zulu (see data in §3). The autosegmental OCP, by contrast, does not produce enough dissimilation. This formulation of the OCP can explain the lack of dissimilation in roots as the result of featural fusion rather than dissimilation. But, it extends this prediction too far: the ranking conditions needed to prevent root-internal dissimilation also prevent dissimilation in any stem with a faithful surface labial. Thus, it fails to explain the generalization that stem-initial faithfulness for one labial does not prevent dissimilation of other labials in the same root.

The broader point we can observe here is that Surface Correspondence and the OCP make different empirical predictions. Zulu presents a case of dissimilation that the surface correspondence theory does, but that the OCP does not explain. It follows that the predictions of surface correspondence are not a subset of the OCP's predictions - the two theories can be empirically distinguished. And, there are attested patterns of dissimilation that make this distinction, and suggest the surface correspondence theory is better.

Chapter 8
Segmental blocking effects in dissimilation

8.1. Introduction

8.1.1. The phenomenon

One observation much-discussed in previous literature (Steriade 1987, Yip 1988, Odden 1994, Myers 1997, Suzuki 1998, Fukazawa 1999; see also Jensen & Strong-Jensen 1979, McCarthy 1989, Steriade 1995) is that long-distance dissimilation patterns may exhibit "segmental blocking" effects. What "segmental blocking" refers to here is cases where an underlying sequence of two segments (i) exhibits a non-sporadic (and relatively systematic) pattern of dissimilation, and (ii) where this dissimilation consistently does not occur in some well-defined circumstances due to the presence of a third segment – a "blocker" segment.

Latin is a classic example of the segmental blocking phenomenon in dissimilation. The base dissimilation generalization is that the suffix /-alis/ manifests /l...l/→[l...r] dissimilation after roots containing another /l/ (1). Examples like *milit-aris* (2a) show that this dissimilation pattern is not limited to the CVC domain - it can happen across an intervening [t]. However, there is no dissimilation when two /l/s are separated by an intervening /r/ (2b), or an intervening labial (2c), or an intervening velar (2d).

(1) L-dissimilation in Latin:

a. nav-alis ‘naval’ [-alis] is the normal form
b. sol-aris ‘solar’ dissimilation after root-final [l]

(2) Segmental blocking effects in Latin

a. milit-aris ‘military’ *milit-alis; L-dissimilation happens across [t]

b. flor-alis ‘floral’ *flor-aris; “blocking” of L-dissimilation by [r]
c. gleb-alis ‘of clods’ *gleb-aris; “blocking” of L-dissimilation by [b]
d. leg-alis ‘legal’ *leg-aris; “blocking” of L-dissimilation by [g]

The essence of the segmental blocking effect is the difference between (2a), where L-dissimilation happens, and (2b)-(2d), where L-dissimilation *doesn’t* happen. The inputs for all the forms in (2a-d) are stems containing two /l/s; given forms like (2a), it would seem that they all meet the conditions necessary for dissimilation to apply. The significant point is that in (2b)-(2d), the two laterals surface as laterals instead of dissimilating; *and* that the lack of dissimilation in these cases is based on the presence of the intervening consonants. Thus, L-dissimilation is “blocked” by intervening rhotics, and is also blocked by intervening non-coronals.

Observationally speaking, a segmental blocking interaction crucially involves three classes of consonants: dissimilators, blockers, and transparent segments. The dissimilators are the consonants that manifest the dissimilation alternation. The blockers are the class of segments associated with the failure of dissimilation. The transparent consonants are those that *do not* cause the dissimilation to fail. In order to demonstrate segmental blocking, it is crucial that a language has *both* “transparent” consonants and “blocker” consonants. If dissimilation fails to happen in the presence of any intervening consonant (i.e. if all consonants are blockers), then it can be characterized as a structurally limited pattern, without invoking the notion of a blocker segment. For instance, if Latin had no forms with transparent consonants like (2a), the generalization would be that L-dissimilation occurs only when the two laterals are in a CVC configuration, and could be characterized as dissimilation limited to that domain (along the same lines as the analysis of Dahl's Law in Kinyarwanda in chapter 3). Reference to particular "blocker" segments – the characteristic that makes something "*segmental* blocking" – is only necessary when some segments are "blockers", and others are not.[1]

The idea laid out in chapter 1 of this dissertation is that dissimilation arises from the combination of CORR constraints that demand correspondence among similar consonants, and Limiter constraints that penalize such correspondence. Dissimilation happens because correspondence is both required *and* penalized. This is an interaction among more than just one markedness constraint and faithfulness: in order for dissimilation to happen, *both* a CORR constraint and a Limiter constraint must dominate faithfulness for the dissimilating feature. What this means is that the lack of dissimilation can be interpreted in multiple ways. Where two consonants do not dissimilate, it could be (i) because they are not required to correspond, or (ii) because correspondence between them is not penalized, or (iii) because some other higher-ranked markedness and/or faithfulness constraint(s) disfavor the result of that

[1] I emphasize this observation because previous work frequently fails to recognize it. Saying that dissimilation is 'blocked by all consonants' is logically equivalent to saying that dissimilation is confined to CVC sequences – two consonants separated by only vowels. The same goes for saying that all consonants besides the dissimilators block dissimilation (which is precisely what Suzuki (1998:107) reports as the empirical generalization about Dahl's Law dissimilation). If a dissimilation pattern is blocked by all non-dissimilating segments, then it is not a genuine case of segmental blocking. This is along similar lines as Hansson's (2001:99) observation that reported cases of blocking in consonant harmony are actually distance restrictions, and have nothing to do with the nature of the intervening segments.

dissimilation. This disjunctivity is important for determining what the theory predicts about blocking, and is considered in more detail in §8.2.

The focus of this chapter is only *segmental* “blocking” patterns – cases where failure of dissimilation is induced by the presence of a particular consonant. The presence of an extra consonant cannot excuse two other consonants from corresponding with each other: segmental blocking cannot be interpreted as unrequired correspondence along the lines of (i) above. CORR constraints demand correspondence among consonants that share some feature, and occur in the same domain. These requirements are not affected by extraneous segments: if a CORR constraint penalizes non-correspondence between two consonants, it does so regardless of any other consonants that happen to be in that domain. A consonant can disrupt dissimilation between two (or more) other consonants only by affecting the penalty incurred by their correspondence (ii above), or by bringing other higher-ranked constraints into the fray (iii above).

8.1.2. Two SCTD approaches to segmental blocking

Previous work on Surface Correspondence in consonant harmony (Rose & Walker 2004, and especially Hansson 2001/2010) has suggested that the theory cannot generate segmental blocking effects – as Hansson (2007) puts it, “agreement by correspondence is *inherently incompatible* with blocking” (p.395). Hansson (2007) shows that this is not actually the case, and that blocking can arise in agreement by correspondence, as indeed it does in languages like Kinyarwanda (see ch. 3).

The situation is pretty much the same for segmental blocking in dissimilation. The surface correspondence theory of dissimilation advanced here is by no means "incompatible" with segmental blocking, and in fact it offers insightful contributions on this issue. Segmental "blocking" effects can emerge from the surface correspondence theory advanced here in at least two ways: I will call them "bridging", and "double dissimilation".

Blocking by bridging is the recruitment of extra consonants (more consonants than those required to correspond by the relevant CORR constraint) into the same correspondence class as the dissimilators. This extraneous correspondence can amend violations of certain limiter constraints, such as the locality constraint CC·SYLLADJ. This leads to blocking of dissimilation when there are appropriate consonants around to "fill the gap" between two non-local correspondents.[2]

Double dissimilation produces blocking as the result of two overlapping dissimilation systems in the same language – one of which trumps the other. The rough intuition (first stated by Dixon 1977) is that blocking of dissimilation is like dissimilation happening, and then being undone – the outcome of dissimilation actually dissimilates back to the form it started as. This is the suggestion Kenstowicz (1994:510) makes for the blocking of Latin L-dissimilation by rhotics: a word like /flor-alis/ "wants" to dissimilate the /...l...l.../ sequence to [...l...r...], but another dissimilatory restriction stops that from happening because it would result in [...r...r...]. In other words, L-dissimilation is blocked due to a distinct R-dissimilation effect.

[2] Note that the blocking by bridging interaction is not limited to dissimilation - a parallel interaction can occur in harmony as well. This was the basis of the analysis suggested for segmental blocking in Kinyarwanda sibilant retroflexion harmony (see chapter 3).

8.1.3. Four blocking effects, in three languages

Four cases of segmental blocking will be examined here; they are summarized in the table below. These patterns comprise the majority of cases where consonant dissimilation is blocked due to the presence of another consonant. Four other known cases of segmental blocking[3] are dismissed from consideration here because they cannot be accurately characterized as consonant-to-consonant interactions or are not cases of segmental blocking. Further details about these patterns and reasons why they are not analyzed here can be found in the appendix at the end of this chapter (§8.7).

(3) Segmental blocking cases to be examined in this chapter

Language	*Dissim. type*	*Blocking Effect*	*Basis of Analysis*	*Conceptual points illustrated*
Yidiny	Lateral	blocked by *non-intervening R*	Double dissimilation	Blocking is not tied to intervention
Latin: rhotics	Lateral	blocked by (*intervening) root-final R*	Double dissimilation, restricted scope	Blocking can be restricted to interveners epiphenomenally
Latin: non-coronals	Lateral	blocked by *intervening non-coronals*	Blocking by bridging	Blocking is not tied to similarity
Georgian	Rhotic	blocked by only *intervening L*	Double dissimilation (problematic)	Directionality asymmetries are an unsolved issue

The surface correspondence theory of dissimilation offers explanations of all four of these patterns, albeit with some qualifications. Directionality is an unresolved issue in surface correspondence theory, as noted in chapter 2. The SCTD is not silent on the matter, but explaining the direction of assimilation & dissimilation patterns is not a central focus of this work. However, reference to directionality turns out to be entangled in the characterization of the blocking pattern found in Georgian. In this

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[3] These are: Akkadian, Gurindji, Tzutujil, and certain variants of Dahl's Law in Bantu languages.

case, the theory provides ways to characterize both the dissimilation and the blocking effect, but it predicts blocking in certain situations where it does not happen.

8.1.4. Structure of this chapter

The two mechanisms by which blocking arises – double dissimilation and bridging – are presented in §8.2. The double dissimilation intuition was first put forth by Dixon (1977) in his grammar of Yidiny; this case of blocking is addressed in §8.3. The analysis builds on the same basic insight Dixon suggests, and shows how this is implemented in the surface correspondence theory of dissimilation.

In §8.4 I turn to Latin, a more complex case where the same dissimilation pattern is subject to blocking by two groups of segments, as illustrated in (1)-(2) above. The well-known blocking of L-dissimilation by an intervening [r] is explained by the same double dissimilation approach applied to Yidiny; the additional restriction that only an intervening [r] blocks dissimilation is explained by restricting the scope of dissimilation. The less widely known blocking of L-dissimilation by labials and velars is analyzed using a different mechanism, bridging of correspondence, by which extraneous correspondence with intervening labials allows to [l]s to faithfully correspond instead of dissimilating. This interaction works by treating dissimilation as driven by a locality constraint, CC·SYLLADJ. This constraint favors dissimilation for [l]s only when they are separated by an intervening syllable that contains no correspondents; blocking arises when the intervening syllable contains an acceptable correspondent of the [l]s, thereby rendering their correspondence local.

In §8.5, I consider the blocking effects found in Georgian, where blocking is crucially linked to intervention. In Georgian, rhotic dissimilation is blocked by any and all intervening [l]s, and is demonstrably *not* affected by *non*-intervening [l]s: R-dissimilation applies to /l…r…r/, but not /r…l…r/.

The Georgian pattern cannot be explained by the bridging interaction, yet it is also not fully accounted for by double dissimilation. The problem is one of directionality. The surface correspondence theory formulated in chapter 2 does not grant special status to consonants based on their relative order. This means the theory does not recognize any intrinsic distinction between the sequences [r…l] and [l…r]: the only basis to differentiate these sequences is by the position each liquid occurs in. This isn't sufficient to capture the Georgian facts: in Georgian, the generalization is that regardless of the position of each liquid, /l…r/ gives rise to dissimilation and /r…l/ does not. The observation is that /l/ blocks R-dissimilation if and only if it precedes one /r/ *and does not precede the other* /r/. A double dissimilation analysis cannot derive this outcome without a more fully developed theory of directionality in correspondence-driven alternations.

Section §8.6 summarizes the main conclusions: the surface correspondence theory of dissimilation advanced here is definitely *not* "incapable" of producing blocking effects (cf. Hansson 2001/2010, 2007). Indeed, the SCTD actually offers viable explanations for the segmental blocking effects found in Yidiny and Latin – a substantial proportion of the known cases where consonant dissimilation is blocked by the presence of another consonant[4]. The case that the SCTD can't explain, Georgian, resists analysis only because of directional asymmetries – a known issue that the theory does not attempt to resolve in full, and one that arises in harmony as well as dissimilation.

8.2. Two kinds of segmental blocking in the SCTD

Segmental blocking of dissimilation does not have a homogenous interpretation in the surface correspondence theory – blocking effects can emerge in multiple ways. In this section, I will identify two distinct ways that the theory can analyze blocking patterns: 'bridging' and 'double dissimilation'. These are two different kinds of constraint interaction, and they have different formal properties, and different empirical consequences.

8.2.1. Why blocking is heterogeneous in the theory

Why isn't there a single unified treatment of blocking? The interpretation of dissimilation, in the theory advanced here, is avoidance of penalized correspondence. Segments dissimilate in response to "opposing" requirements *for* correspondence on the one hand (the effect of the CORR constraints) and *against* correspondence on the other (the effect of Limiter constraints). The demand for correspondence renders faithful non-correspondence sub-optimal, and the prohibition against correspondence in that situation rules out faithful correspondence. It follows, then, that a pair of dissimilating consonants meets the three criteria in (4).

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[4] See appendix at the end of this chapter for details on the known typology of segmental blocking effects.

(4) Necessary criteria for dissimilation to occur:
A pair of input segments /X,Y/ will dissimilate to [X,Z] only if:

a. X & Y are subject to a requirement for correspondence
(They share a feature, and are both in the domain of scope of a CORR constraint)

b. Correspondence between X & Y is *not* permitted (in that configuration)

c. X & Z are *not* required to correspond (in that configuration)

d. The configuration of X,Y,Z cannot be changed

Since the occurrence dissimilation is dependent on more than one factor, there is more than one way to stop it from happening. A given dissimilation pattern occurs only when all of the conditions in (4) are met; if *any* of these conditions does not hold, the dissimilation will not occur. So, where an observed pattern of dissimilation fails to occur, it could be (i) because the relevant correspondence is not required in that circumstance, or (ii) because such correspondence is not penalized in that situation, or (iii) because dissimilating in that situation does not offer a viable escape from correspondence, or possibly (iv) because of some other interaction not yet known. It follows that the failure of dissimilation does not have a single, homogenous interpretation in the surface correspondence theory.

This range of possibilities is why the term "blocking" is not used in earnest – it does not straightforwardly correspond to any of these possibilities. Dissimilation can fail if (4b) doesn't hold, and this leads to blocking by bridging. Dissimilation can also fail if (4c) doesn't hold, which is the basis for double dissimilation. But, the role of the "blocker" segment is crucially not the same in these to interactions. From the view of the theory, there are no unifying properties that make consonants behave as "blockers". As such, I will use the term "blocker" as a purely descriptive convenience, to refer to the segments associated with the failure of dissimilation. It entails nothing about the resulting correspondence structure.

8.2.2. Blocking as "bridged" correspondence

One mechanism by which blocking effects can arise in the DBC theory is when the presence of the "blocker" consonant results in licensing of an otherwise-illicit surface correspondence relation. The interaction can be summarized as follows: in the normal case, dissimilation occurs because two segments X & Z are not in a sufficiently local configuration to correspond with each other. An intervening consonant, Y, 'blocks' dissimilation by bridging the gap between the two would-be dissimilators. If X & Y are sufficiently local to correspond, and Y & Z are also sufficiently local, then X & Z may be in the same correspondence class without violating the locality condition imposed by the limiter constraint.

As a schematic illustration of this interaction, consider a grammar with the ranking CC·SyllAdj, Corr·[Rhotic] » Ident-[lateral]. (The terms 'Rhotic' and 'Lateral' are used here to refer to [–lateral] and [+lateral] liquids, as in chapter 4.) Under this ranking, dissimilation is favored when two /r/s are in non-adjacent syllables (i.e. when correspondence between them violates the limiter constraint CC·SyllAdj). This is shown in the tableau below.

(5) CC•SyllAdj, Corr•[Rhotic] » Ident-[lateral] makes a basic dissimilation pattern

Input: ra.u.re Output: ra.u.le		CC•SyllAdj	Corr•[Rhotic]	Ident-[lateral]
☞ a.	ra.u.le, $\mathcal{R}$:{r}{l}	(0)	(0)	(1)
~ b.	ra.u.re, $\mathcal{R}$:{r r}	W (0~1)		L (1~0)
~ c.	ra.u.re, $\mathcal{R}$:{r}{r}		W (0~1)	L (1~0)

An intervening consonant can block this dissimilation by serving as an intermediate link between the two liquids that are required to correspond. With the intervening consonant in the same correspondence class as the two liquids, the two [r]s are not a pair of correspondents separated by an inert syllable – their correspondence class includes the intervening [m] rather than 'skipping over' it. Therefore, the two [r]s may correspond without violating CC•SyllAdj. The result is shown in the tableau below: when an [m] stands between the two [r]s, then all dissimilating candidates – conflated together as (b) – lose to the faithful candidate with correspondence between both [r]s and the intervening [m] (a). Thus, the intervening [m] 'blocks' the [–lateral] dissimilation.[5] Note that while the candidate in (a) does not violate any of the constraints shown here, it does not harmonically bound the other candidates in (b)–(d); this is because there are other constraints that do penalize the bridging configuration, such as CC•Ident constraints.

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[5] A subsequent distinction between intervening consonants that block dissimilation vs. those which are inert (a.k.a. 'transparent') can be made by using additional limiter constraints to prohibit correspondence between the /r/s and certain interveners. For instance, if undominated CC•Ident-[nasal] is added to this schematic case, then ⟨r,m⟩ correspondence will be forbidden. This renders [m] ineligible to bridge the gap to achieve correspondence between the two /r/s. The result is that intervening consonant will block dissimilation only if it agrees with the two /r/s for [±nasal].

(6) Dissimilation blocked when [m] bridges the gap between corresponding [r]s:

Input: ra.mu.re Output: ra.mu.re, *ra.mu.le		CC·SyllAdj	Corr·[Rhotic]	Ident-[lateral]
☞ a.	ra.mu.re, $\mathcal{R}$:{r m r}	(0)	(0)	(0)
~ b.	ra.mu.le, $\mathcal{R}$:{r}{m}{l} (≈$\mathcal{R}$:{r m}{l}, ≈$\mathcal{R}$:{r}{m l})			W (0~1)
~ c.	ra.mu.re, $\mathcal{R}$:{r}{m}{r} (≈$\mathcal{R}$:{r m}{r}, ≈$\mathcal{R}$:{r}{m r})		W (0~1)	
~ d.	ra.mu.re, $\mathcal{R}$:{r r}{m}	W (0~1)		

Blocking of dissimilation by bridging the gap between non-local segments is highly limited in its applicability: it can arise only if the Limiter constraint that favors dissimilation is one that can be improved upon by extraneous correspondence. So, blocking by bridging can emerge in a dissimilation system where the driving Limiter is based on locality, like CC·SyllAdj. But, this type of blocking does not arise in dissimilation driven by CC·Edge constraints, for example. This is because CC·Edge constraints assign violations for correspondence across the edge of a domain, not based on pure distance between correspondents. Consequently, recruiting extra consonants into correspondence cannot amend violations of CC·Edge constraints.

This is shown schematically in the tableau in (3), using a hypothetical input where two rhotics straddle the edge of the root, and with CC·Edge-(Root) instead of CC·SyllAdj. The candidate (b) has a bridged correspondence structure, where [m] is recruited into extraneous correspondence with the [r]s. This cannot beat the dissimilating alternative (a) (on this ranking), because having the bridged correspondence structure does not reduce violations of CC ▪ EDGE. And in fact, the extra correspondence leads to *more* violations of CC ▪ EDGE-(Root), so the bridging candidate in (b) is harmonically bounded on this constraint set.

(7) CC ▪ EDGE-based dissimilation is not affected by extraneous correspondents:

Input: /ra-re/		CC ▪ EDGE-(Root)	CORR ▪ [Rhotic]	IDENT-[lateral]
☹ a.	ram-le, $\mathcal{R}$:{r}{m}{l}	(0)	(0)	(1)
☠ b.	ram-re, $\mathcal{R}$:{r m r}	W (0~2)		L (1~0)
~ c.	ram-re, $\mathcal{R}$:{r r}{m}	W (0~1)		L (1~0)
~ d.	ram-re, $\mathcal{R}$:{r}{m}{r}		W (0~1)	L (1~0)

Recruiting the intervening [l] into correspondence with the [r]s does not block the dissimilation, since the limiter constraint which drives it is based on cross-edge correspondence, not locality. In the bridging interaction, correspondence can be supported by some intervening segments and not by others, and this can lead to segmental blocking – but not all Limiter constraints allow this behavior.

The blocking by bridging interaction has, as far as I know, no parallel in previous theories of dissimilation (e.g. where autosegmental associations are used in place of surface correspondence). It is a novel treatment of blocking effects made possible by the surface correspondence theory of dissimilation.

8.2.3. Blocking as double dissimilation

A second mechanism that can give rise to blocking of dissimilation is markedness constraints: dissimilation may fail – i.e. may "be blocked" – because the output violates some higher-ranked markedness constraint. When dealing with a prototypical system of liquid dissimilation where the alternation is strictly between two liquids, this is akin to treating the blocking effect as a second kind of dissimilation. In other words, the idea is that /r/-dissimilation is blocked by an intervening /l/ because dissimilation of /r…l…r/ to [r…l…l] violates a higher-ranked prohibition against the co-occurrence of two [l]s.

This 'double-dissimilation' interaction is not unique to the DBC theory. Previous analyses have drawn on this idea to explain blocking effects in Yidiny, Latin, and Sundanese (Dixon 1977:98; Walsh-Dickey 1997; Suzuki 1998, 1999). Walsh-Dickey (1997:160) further proposes that this is the explanation for all blocking of dissimilation in general: "Lack of dissimilation is not an intermediary blocking of the 'plus values' from seeing each other, but rather an output constraint on sequences of identical features in a word."

The schematic example of edge-based dissimilation sketched out in §8.2.2 above can be augmented to manifest the 'double-dissimilation' type of blocking, via the addition of Corr▪[Lateral]. This compound dissimilation system is depicted in the tableau in (8). If Corr▪[Lateral] dominates Corr▪[Rhotic], then the two dissimilating candidates (c) & (d) both lose to one of the faithful alternatives such as (a). That is, the presence of an /l/ has the effect of blocking the usual /r…r/→[r…l] dissimilation, because in this situation it results in an unacceptable [l…l] sequence. This [l…l] sequence is rendered unacceptable because the laterals are required by Corr▪[Lateral] to correspond, and because correspondence across the root edge is prohibited. Thus, [l…l] presents the same correspondence dilemma as [r…r], but involving a higher-ranked CORR constraint. On this ranking, doing /r/→[l] dissimilation in the presence of another [l] only makes things worse.

(8) CORR ▪ [Lateral] » CORR ▪ [Rhotic]: /r/-dissimilation blocked from producing [l...l]

Input: ralu-re Output: ralu-re		CORR ▪ [Lateral]	CC ▪ EDGE- (Root)	CORR ▪ [Rhotic]	IDENT- [lateral]
☞ a.	ralu-re, $\mathcal{R}$:{r}{l}{r}	(0)	(0)	(1)	(0)
~ b.	ralu-re, $\mathcal{R}$:{r r}{l}		W (0~1)	L (1~0)	
~ c.	ralu-le, $\mathcal{R}$:{r}{l}{l}	W (0~1)		L (1~0)	W (0~1)
~ d.	ralu-le, $\mathcal{R}$:{r l l}		W (0~2)	L (1~0)	W (0~1)

This schematic illustration of the double dissimilation interaction is quite similar to the analyses offered for blocking by Latin rhotics, as well as blocking in Yidiny, and in Georgian. In essence, the ranking has two distinct dissimilation systems, albeit with overlap between them: they share the same limiter constraint. The effect of one dissimilation system is preventing the other dissimilation from happening.

8.3. Yidiny: Blocking as double dissimilation

8.3.1. The Yidiny generalizations

Yidiny exhibits a segmental blocking pattern termed "double dissimilation" by Dixon (1977; see also subsequent discussion & analysis by Crowhurst & Hewitt 1995, Walsh-Dickey 1997, Suzuki 1998). The generalization, as pointed out by Dixon, is that a process of L-dissimilation is observed in suffixes in the language; but, this L-dissimilation fails to occur when it would result in a sequence of two rhotics. Dixon interprets this failure of dissimilation as a second dissimilatory effect – a pattern of R-dissimilation. Thus, rhotics block lateral dissimilation because the R-dissimilation pattern overrules L-dissimilation. The combined pattern is illustrated schematically in (9). In this schematization, L represents the lateral liquid [l], taken to be [+lateral]. R represents the two rhotics that exist in Yidiny [r ɻ], both of which I take to be [–lateral]. Laterality values for other consonants are not crucial.

(9) Yidiny Double dissimilation, schematized

	Input	Output
L-dissimilation	L…–L	R…–L
R-dissimilation (no overt alternations)	R…–R	(≈ R…–L)
R-dissimilation blocks L-dissimilation	R…–L…–L	R…–L…–L (*R…–R…–L)

The L-dissimilation & R-dissimilation patterns both hold crucially across morpheme edges, so I will treat both of them as cross-edge dissimilation (of the same sort encountered in Dahl's Law in Kinyarwanda in chapter 3). I assume Yidiny has the morphological structure in (10). A word is composed of a root, possibly followed by one or more suffixes. These suffixes are divided into two classes: 'inner' suffixes attach inside the stem domain, while 'outer' suffixes are outside of it.[6] A deeper and more nuanced analysis of Yidiny might necessitate a different or more complex structure, but the basic skeleton in (10) will be sufficient to illustrate how the double dissimilation interaction works in the surface correspondence theory. Stem edges are marked with angle brackets; within the stem, the boundary between roots and suffixes is marked with a dash.

[6] There may be independent evidence for splitting suffixes into these two classes. The form of the inner suffixes depends on the morphological class of the root. For example, the 'going' aspect suffix is /-:li/ for roots of the 'l-conjugation', but /-ŋali/ for roots of the 'n-conjugation' (examples below). The outer suffixes do not appear to vary in this way: the past tense suffix /-ɲu/ does not change depending on which conjugation the root belongs to. This suggests an asymmetry between these classes of affixes, which is independent of the dissimilation pattern.

(10) Morphological structure of Yidiny

Word =	⟨$_{\text{STEM}}$	Root	+	Inner suffixes	⟩ +	Outer suffixes
ex:	⟨	burwa	+	-ːli	⟩ +	-ɲu
		jump		'going' asp.		past
		'went jumping'				

The Yidiny L-dissimilation pattern (Dixon 1977:98-99) is an alternation between [l] & [r] seen in the "'going' aspect" suffix /-ːli/ ~/-ŋali/, induced by a following /l/ in the comitative formative /-ŋa-l/. This is illustrated in (11) below. The root in (a) is from the 'l-conjugation', the morphological class which normally takes [-ːli] as its form of the 'going' aspect suffix, as in (b). Adding the comitative /-ŋa-l/ (c) adds a second /l/, on the other side of the stem edge; adding this second /l/ causes the 'going' aspect suffix to surface as [-ːri] instead of [-ːli]. The examples in (d)–(f) show the same [r]~[l] alternation with a root of a different morphological class. As their form of the 'going' aspect, roots of the 'n-conjugation' (d) normally take the suffix [-ŋali] – also with an [l] – as in (e). However, the addition of the comitative /-ŋa-l/ (f) causes the 'going' aspect marker to surface as [-ːri] instead of [-ŋali] – with an [r], and not an [l].

(11) Yidiny L-dissimilation: /l…l/ → [r…l]

a. ⟨magi⟩ 'climb up' (root)
(root from *l*-conjugation)

b. ⟨magi–:li⟩-ɲu 'went climbing up' (root + 'going' + past)
('going' aspect suffix is /-:li/ for roots in the *l*-conjugation)

c. ⟨magi–:ri⟩ŋa:l 'went climbing up with' (root + 'going' + comit + past)
(L-dissimilation occurs: /-:li/ → [-:ri] before /-ŋal/; *⟨magi–:li⟩ŋa:l)

d. ⟨d̪uŋga⟩ 'run' (root)
(root from *n*-conjugation)

e. ⟨d̪uŋga–ŋali⟩:ɲ 'went running' (root + 'going' + past)
('going' aspect suffix is /-ŋali/ for roots in the *n*-conjugation)

f. ⟨d̪uŋga–:ri⟩ŋa:l 'went running with' (root + 'going' + comit + past)
(/l…l/→[r…l]: /-ŋali/ surfaces as [-:ri] before /-ŋal/; *⟨d̪uŋga–ŋali⟩ŋa:l)

The empirical basis for the blocking effect in Yidiny is Dixon's observation that L-dissimilation does not hold for roots that contain a rhotic consonant[7]. This is illustrated in (12). The form in (12a) has the root [burwa] 'jump', a root in the 'l-conjugation' like [magi] 'climb up' in (11a) above, but one that contains a rhotic consonant[8]. The presence of this rhotic consonant causes L-dissimilation to fail. The /l…l/ sequence created by the 'going' aspect suffix /-:li/ and the comitative suffix /-ŋal/ surfaces faithfully in (12a) as [l…l], and not as the dissimilated [r…l] seen in (11c) above. The form in (12b) shows the analogous failure of dissimilation for roots in the

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[7] Dixon (1977:100) notes that all of the relevant roots have the rhotic consonant in the last consonant cluster. This is probably not significant for the pattern: 95% of Yidiny words are bisyllabic (Dixon 1977:208), and liquids never occur root-initially (Dixon 1977:35). So, the chances of finding a root with a rhotic that isn't in the final consonant cluster are very slim.

[8] The rhotic in the root does not bear on the realization of the 'going' suffix otherwise. Dixon (1977:100) gives the form [⟨bu**r**wa–:li⟩ɲu] 'went jumping' (root + 'going' + past), which shows that the 'going' suffix does surface as [-:li] after roots with a rhotic, just like roots without one.

'n-conjugation'. The root [burgi] 'walk about' is like [d̪uŋga] 'run' in (11d), except that it contains a rhotic. Here too, the 'going' aspect suffix surfaces with [l] instead of the dissimilated [r] seen in (11f).

(12) Yidiny L-dissimilation blocked after rhotics: /r...l...l/ → [r...l...l] (not *[r...r...l])
 a. ⟨burwa–ːli⟩ŋaːl 'went jumping with' (root + 'going' + comit + past)
 (L-dissimilation *doesn't* occur: *burwa-ːri-ŋaːl; cf. (9c) above)

 b. ⟨burgi–ːli⟩ŋaːl 'went walkabout with' (root + 'going' + comit + past)
 (L-dissimilation is "undone": *burgi-ːri-ŋaːl, *burgi-*ŋali*-ŋaːl; cf. (9f) above)

Either of Yidiny's two rhotics – [r] & [ɻ] – can induce the blocking effect seen in (12). Dixon (1977:100) only gives the two examples in (12) to illustrate the blocking, but he reports that: 'the set of verbs which take -ːli before *-ŋa-l* is limited–it includes {warŋgi, d̪ari, gaɻba, daɻba, wiɻa}. It seems that if the (last) consonant cluster in the root involves a rhotic then allomorph -ːli is preferred over - ːri.'[9] Since 95% of Yidiny verb roots are bisyllabic (Dixon 1977:208), and since roots never begin with liquids (Dixon 1977:35), this generalization is nearly equivalent to saying that L-dissimilation fails when the root contains a rhotic consonant.

Note that the rhotics in the root that block L-dissimilation as in (12) do not intervene between the two non-dissimilating laterals. In other words, the blocking effect is seen in /r...l...l/ sequences, not /l...r...l/ ones. This is a configuration that Walsh-Dickey (1997) calls 'peripheral blocking'. This sets Yidiny apart from other well-known cases of dissimilation blocking, where the blocker segment always intervenes (e.g. Latin; see §8.4).

[9] This quote is from Dixon (1977:100). For simplicity, I have removed the glosses and conjugation diacritics that Dixon gives for each verb root in the list.

Dixon characterizes the surface [l…l] sequences in (12) as the result of 'double dissimilation' rather than "blocking" of dissimilation. On this interpretation, the forms in (12) reflect a second pattern of R-dissimilation, occurring within the stem and across the root edge. Dixon argues for this interpretation based on morphological alternations in the form in (12b). Roots in the 'n-conjugation' like [burgi] 'walk about' normally have [-ŋali] as the 'going' aspect suffix (as in (11f) above). The word in (12b), however, has [-ːli] instead. Dixon analyzes this as a serial derivation, with one dissimilation process happening after the other. The /r…l…l/ sequence undergoes L-dissimilation as usual to [r…r…l], which then dissimilates back to [r…l…l] due to R-dissimilation: /burgi-ŋali-ŋal/ → /burgi-ːri-ŋaːl/ → [burgi-ːli-ŋaːl]. The second dissimilation changes the [r] back to an [l], but does not undo the accompanying morphological change between /-ŋali/ and [-ːri].

The L-dissimilation pattern holds only between the 'going' aspect suffixes and the comitative formative /-ŋa-l/; thus, (i) it happens only across the stem edge, and (ii) it never affects consonants in the root. This is clear from examples like those in (13). In (13a-b), we see that suffixes containing /l/ do not trigger dissimilation in the root. The reduplicated form in (13c) shows that no dissimilation occurs root-internally, and/or stem-internally: this root /ŋalal/ has two /l/s, and reduplication of it yields a sequence of four [l]s – no dissimilation occurs. The form in (13d) shows that any root-internal /l/ resists dissimilation even when a suffixal [l] is present. (NB: Stem edges are not marked in (13a-b) because I don't know if these suffixes are inner or outer.)

(13) Yidiny: no dissimilation for /l...l/ sequences involving the root

a. dambula-la ‘two (loc.)’ (no L-dissimilation before locative suffix /-la/)

b. milba-ŋal-ɲu ‘made clever’ (no L-dissimilation before causative suffix /-ŋal/)

c. ⟨ŋalal-ŋalal⟩ ‘lots of big ones’ (no L-dissimilation root-internally)

d. ⟨gali-gali⟩ŋal-ɲum
go-RED-COMIT-Caus.Subord
‘...from being taken about so much’[10]

Since the L-dissimilation pattern holds only across the boundary identified in (10) as the stem edge, I will treat it as cross-edge dissimilation driven by CC▪Edge-(Stem).

It should be noted that the R-dissimilation effect is observed in Yidiny only in the double dissimilation blocking interaction. Sequences of two rhotics in other morphological contexts observably do not dissimilate, as the examples in (14) show.

(14) R-dissimilation is not evident except as blocking of L-dissimilation:

a. ⟨guriɲ⟩ŋuɻi ‘was good’ (no R-dissim between outer suffix & root)
*⟨guriɲ⟩ŋuli, *⟨guliɲ⟩ŋuɻi

b. ⟨buruḏu:-ɻ⟩ ‘padmelon-ABS’ (no R-dissim between inner suffix & root)
*⟨buluḏu:-ɻ⟩, *⟨buruḏu:-l⟩

c. ⟨muɻiɻ-damba⟩:ŋ ‘mosquito-lot.of-ERG’ (no R-dissim within root)
*⟨muliɻ-damba⟩:ŋ

The lack of dissimilation in (14) is puzzling for a double-dissimilation approach. If blocking is the result of R-dissimilation, it’s not clear why this dissimilation doesn’t generalize to these examples. Since the purpose of this section is to show how the double dissimilation approach to blocking works in the surface correspondence theory, I will abstract away from data like (14). My goal is not to propose an account of all the

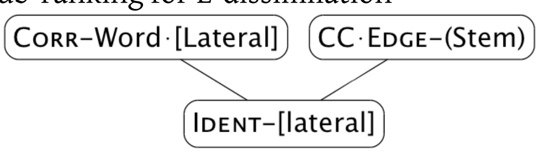
[10] Dixon (1977:235) gives this form in a sentence; I have extracted the portion of the gloss that seems appropriate to this word.

many facts of Yidiny; it is to show that the theory can generate the type of analysis Dixon suggests. Data like (14) are unexplained by the double dissimilation interpretation of blocking in Yidiny. This is an empirical issue about Yidiny specifically; it's separate from the question of how double dissimilation interactions emerge from the surface correspondence theory of dissimilation.[11]

8.3.2. The SCTD analysis

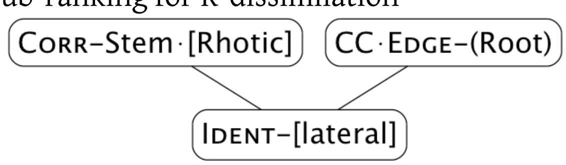
The Yidiny blocking pattern can be analyzed in the surface correspondence theory as the interaction of two dissimilation systems, building on Dixon's 'double dissimilation' intuition. L-dissimilation occurs only across the stem edge. It is analyzed as the result of CORR-Word▪[Lateral] and CC▪EDGE-(Stem) dominating faithfulness for [±lateral] (15).

(15) Sub-ranking for L-dissimilation



R-dissimilation occurs within the stem, across the root edge. It is analyzed as the result of CORR-Stem▪[Rhotic] and CC▪EDGE-(Root) dominating faithfulness for [±lateral], shown in (16).

(16) Sub-ranking for R-dissimilation



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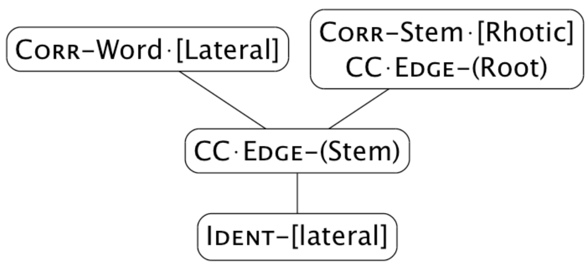
[11] Another class of unexplained examples involve an [r]~[ɻ] alternation in the 'going' aspect suffix for roots belonging to the 'ɽ-conjugation'. This alternation is conditioned by the comitative /-ŋal/, but it is not clearly dissimilatory in nature, and is not productive. An example is [⟨bajga-ːɻi⟩ɲu] 'feel sore while going' vs. [⟨bajga-ːri⟩ɲaːl] 'make feel sore while going', with [-ːri] instead of [-ːɻi]. See Dixon (1977:99) for details.

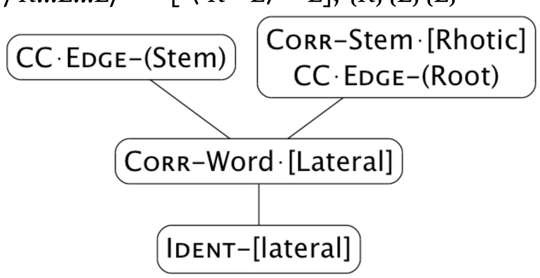
The blocking effect emerges from the surface correspondence constraints responsible for R-dissimilation dominating either of the constraints that drive L-dissimilation. The effect of this is that L-dissimilation will turn laterals into rhotics only when doing so does not produce a pair of rhotics that straddle the edge of the root – a configuration that necessarily violates either CORR-Stem▪[Rhotic] or CC▪EDGE-(Root). This is shown by the two disjunctive rankings in (17).

(17) Rankings for Yidiny:

a. Possibility #1: non-dissimilation is faithful correspondence
/R...L...L/ → [⟨ R - L⟩ – L], {R}{L L}



b. Possibility #2: non-dissimilation is faithful non-correspondence
/R...L...L/ → [⟨ R - L⟩ – L], {R}{L}{L}



Under both rankings, R-dissimilation trumps L-dissimilation; the difference between them rankings concerns only the surface correspondence structure of non-dissimilating laterals. When L-dissimilation is blocked due to the presence of a rhotic, the surface [l...l] sequence could have correspondence or not. The choice between these possibilities comes down to the relative ranking of CC▪EDGE-(Stem) & CORR-Word▪[Lateral], the correspondence constraints that drive L-dissimilation. If CC▪EDGE-(Stem) is ranked lower (17a), then non-dissimilating laterals will correspond –

correspondence across the stem edge will be tolerated. If CORR-Word▪[Lateral] is ranked lower (17b), then non-dissimilating laterals will not correspond; non-correspondence will be tolerated rather than cross-edge correspondence.

8.3.2.1. L-dissimilation in Yidiny

The tableau in (18) shows how L-dissimilation arises from CORR-Word▪[Lateral] and CC▪EDGE-(Stem). This ranking produces dissimilation (a) because faithful correspondence (b) violates CC▪EDGE-(Stem), and faithful non-correspondence (c) violates CORR-Word▪[Lateral], and both of these surface correspondence constraints dominate faithfulness, IDENT-[lateral].

(18) Yidiny L-dissimilation: CC▪EDGE-(Stem), CORR-Word▪[Lateral] » IDENT-[lateral]

Input: magi-:li-ŋal Output: ⟨magi–:**r**i⟩ŋal		CC▪EDGE-(Stem)	CORR-Word▪[Lateral]	IDENT-[lateral]
☞ a.	⟨magi–:**r**i⟩ŋal, ℛ:{m}{g}{**r**}{ŋ}{**l**}	(0)	(0)	(1)
~ b.	⟨magi–:**l**i⟩ŋal, ℛ:{m}{g}{**l l**}{ŋ}	W (0~1)		L (1~0)
~ c.	⟨magi–:**l**i⟩ŋal, ℛ:{m}{g}{**l**}{ŋ}{**l**}		W (0~1)	L (1~0)

8.3.2.2. Blocking from R-dissimilation

The blocking of L-dissimilation after roots that contain a rhotic is explained by the subsystem of CORR-Stem▪[Rhotic] & CC▪EDGE-(Root) dominating either of the correspondence-based markedness constraints involved in L-dissimilation.

The tableau in (19) shows how this ranking derives the surface failure of L-dissimilation after rhotics. The winning candidate (a) preserves the /r…l…l/ sequence of the input faithfully, with no correspondence: it has no L-dissimilation. The constraints CORR-Stem▪[Rhotic] & CC▪EDGE-(Root) ensure that this candidate beats the alternatives (b), (c) where L-dissimilation occurs. This is because the CORR-Stem▪[Rhotic] & CC▪EDGE-(Root) both dominate CORR-Word▪[Lateral], which demands the correspondence between laterals that L-dissimilation is based on.

(19) Yidiny R-dissimilation trumps L-dissimilation

Input: bu**r**wa-:**l**i-ŋa**l** Output: ⟨bu**r**wa–:**l**i⟩ŋa**l**		CC▪EDGE-(Root)	CORR-Stem▪[Rhotic]	CC▪EDGE-(Stem)	CORR-Word▪[Lateral]	IDENT-[lateral]
☞ a.	⟨bu**r**wa–:**l**i⟩ŋa**l**, $\mathcal{R}$:{b}**{r}**{w}**{l}**{ŋ}**{l}**	(0)	(0)	(0)	(1)	(1)
~ b.	⟨bu**r**wa–:**r**i⟩ŋa**l**, $\mathcal{R}$:{b}**{r r}**{w}{ŋ}**{l}**	W (0~1)			**L** **(1~0)**	L (1~0)
~ c.	⟨bu**r**wa–:**r**i⟩ŋa**l**, $\mathcal{R}$:{b}**{r}**{w}**{r}**{ŋ}**{l}**		W (0~1)		**L** **(1~0)**	L (1~0)
☛ d.	⟨bu**r**wa–:**l**i⟩ŋa**l**, $\mathcal{R}$:{b}**{r}**{w}**{l l}**{ŋ}			*W* *(0~1)*	*L* *(1~0)*	

The relative ranking of CORR-Word▪[Lateral] & CC▪EDGE-(Stem) is still not crucial for explaining the observed facts. Under the ranking CC▪EDGE-(Stem) » CORR-Word▪[Lateral], as shown in (17b), the winning output has no L-dissimilation, and no correspondence between the two [l]s. This satisfies CC▪EDGE-(Stem), but not CORR-Word▪[Lateral]. If the ranking of these two constraints is reversed, the grammar then picks the non-dissimilated candidate that *does* have [l]~[l] correspondence (d), marked as an alternative winner by the black pointing finger. Either way, the candidates where L-dissimilation yields a sequence of two rhotics (b, c) both lose to one where L-dissimilation does not occur.

8.3.3. Yidiny in the empirical landscape

At the observational level, the Yidiny case makes a very important empirical point: a segment may block dissimilation *without intervening between the dissimilators.* This observation has been previously noted (by Crowhurst & Hewitt 1995, Steriade 1995, Walsh-Dickey 1997:162, Suzuki 1998:100, 107), but is nonetheless frequently overlooked as a property of dissimilation (cf. Fukazawa 1999, Bye 2011). In Yidiny, the failure of L-dissimilation is associated with a segment (a rhotic) that precedes both of the Ls, and does not come between them. Consequently, the correct typological generalization is that segmental blocking effects are *not* intrinsically tied to linear intervention, and this is something that should follow from a successful theory of dissimilation. It also follows from the surface correspondence theory: because segmental blocking effects can be analyzed multiple ways, including those based on Dixon's 'double dissimilation' intuition, the SCorr theory – correctly – does not entail that blockers must be interveners. The analysis of Yidiny laid out here captures blocking as the interaction of two dissimilation patterns; it does not refer to relative linear order or intervention in any way.

8.4. Latin: two kinds of dissimilation blocking

Latin is a famous example of dissimilation blocking. It is also a complex example, where one dissimilation pattern is subject to two different blocking effects. The essential generalizations, previously noted in §8.1, are recapped in (20)[12].

(20) Latin dissimilation & blocking generalizations:

a. **L-dissimilation**: suffix /-alis/ → [-aris] after a lateral in the root
/sol-alis/ → [sol-aris] 'solar' *sol-alis
(cf. [nav-alis] 'naval'; no dissimilation)

b. **T-transparency**: L-dissimilation happens across intervening coronals {t n s d}
/milit-alis/ → [milit-aris] 'military' *milit-alis

c. **R-blocking**: no L-dissimilation happens across an intervening, root-final, /r/
/flor-alis/ → [flor-alis] 'floral' *flor-aris
(cf. [reticul-aris], 'of the net'; no blocking by initial /r/)

d. **BG-blocking**: no dissimilation happens across intervening labials or velars
/gleb-alis/ → [gleb-alis] 'of clods' *gleb-aris
/leg-alis/ → [leg-alis] 'legal' *leg-aris

The empirical support for these generalizations is presented in §8.4.1 below. There is a significant degree of 'fuzziness' that obscures these generalizations: all of them have exceptions, and the available data submits to multiple characterizations. This is true of (20c) in particular: previous work reports that *intervening* rhotics block L-dissimilation, but this generalization is confounded with the blocking effects of non-coronals (20d). When these confounded examples are set aside, the R-blocking effect is limited to root-final rhotics.

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[12] The Latin L-dissimilation pattern has long been known (since at least Kent 1945). The generalization that L-dissimilation fails to happen across an /r/ is famously attributed to Steriade (1987). As far as I know, Steriade was the first to characterize this as 'blocking', though the same observation was noted in previous work by Watkins (1970), Dressler (1971), and Jensen & Strong-Jensen (1979). The generalization that labials and velars block dissimilation was identified by Cser (2007/2010), though the relevant examples were noted in earlier work (Watkins 1970, Dressler 1971, Hurch 1991).

The aim of this section is to show how the surface correspondence theory of dissimilation offers analyses of the blocking effects in Latin. The R-blocking effect is analyzed in §8.4.2 as double dissimilation, the same approach proposed in some earlier work (Kenstowicz 1994, Steriade 1995, Walsh-Dickey 1997, Suzuki 1998). Upon close scrutiny of the data, the status of blocker rhotics as intervening is largely reducible to a positional generalization: rhotics block L-dissimilation only in root-final position, where they are in a CVC configuration with the suffixal /l/. This is explained by limiting the scope of the 'second dissimilation' system. L-dissimilation holds within the stem; the R-dissimilation system that leads to the R-blocking effect holds only in CVC sequences. Thus, non-intervening /r/s do not block L-dissimilation, because they are too far apart; no reference to intervention is needed in the analysis.

The double dissimilation approach does not extend to the BG-blocking effect. This is analyzed in §8.4.3 as a case of blocking by bridging – labials and velars stop dissimilation by supporting correspondence between non-local laterals. The bridging interaction is a novel approach to blocking offered by the surface correspondence theory of dissimilation. In this analysis, L-dissimilation arises due to CC·SYLLADJ, a constraint that limits the locality of correspondents. CC·SYLLADJ requires that correspondents are never separated by a full intervening syllable; it favors long-distance dissimilation only where correspondence with intervening consonants is ruled out. The asymmetry between the "opaque" labials & velars vs. the "transparent" coronals is explained as an agreement effect. The coronal non-laterals are specified as [–lateral], but labials and velars lack any [±lateral] specification because they cannot manifest the laterality distinction. Given this representational assumption, CC·IDENT-

[lateral] penalizes correspondence between [l] and the [–lateral] coronals {t n s d}, but allows correspondence between [l] and the labials & velars, since they do *not* bear the disagreeing value [–lateral]. The result is that labials & velars can serve to bridge the distance between two non-local /l/s: they are not required to correspond with [l]s, but such correspondence can happen to circumvent the need for L-dissimilation.

The blocking by bridging analysis offers new insights about the BG-blocking effect in Latin, but I will point out here that it does not lead to a complete explanation of dissimilation in Latin. The bridging interaction requires dissimilation to arise from a locality-based Limiter constraint, like CC·SYLLADJ. As such, it does not generate dissimilation when two /l/s are in adjacent syllables – the wrong result for words like *popul-aris* (*popul-alis) 'popular'. The crucial point I want to make is that both of Latin's blocking patterns can be explained using correspondence – this case is not explained in full by the theory, but neither type of blocking is a problem on its own.

8.4.1. The facts & generalizations of Latin

8.4.1.1. The basic L-dissimilation alternation: /-alis/ → [-aris] / l…_

The basic pattern of the L-dissimilation alternation is a change from /l/ to [r][13] in the adjectival suffix /-alis/. With roots that contain no liquids, the /-alis/ suffix shows up as the transparently faithful form [-alis], as shown by the examples in (21) below (from Cser 2007/2010).

[13] Latin has two liquid consonants, transcribed as ⟨l⟩ & ⟨r⟩. Descriptions from the classical period describe the ⟨r⟩ as "vibrating" (Allen 1978), which suggests it was a trilled /r/. Later confusion of ⟨r⟩ & ⟨d⟩ suggests a flapped articulation [ɾ] as well or instead. The ⟨l⟩ had "light" (=alveolar) and "dark" (=velarized) allophones, depending on the quality of adjacent vowels (Powell 2009). There are no other liquids, and no other laterals consonants.

(21) /-alis/ has /l/ underlyingly[14]
  a. nav-alis 'naval'
  b. hiem-alis 'winter'
  c. autumn-alis 'autumn'
  d. August-alis 'Augustan'

The /-alis/ suffix surfaces as its dissimilated form [-aris] after roots containing /l/; this is the L-dissimilation pattern. This is seen in forms like (22).

(22) L-Dissimilation after roots with final /l/: (Cser 2007/2010)
  a. sol-aris 'solar' (*sol-alis)
  b. popul-aris 'popular'
  c. consul-aris 'consular'
  d. stell-aris 'stellar'

The interpretation of this pattern is along the same lines as the traditional one: it's a case of dissimilation for the feature [+lateral]. Thus, the allomorphy arises because an underlying input with a sequence of two [+lateral] consonants maps to a surface form with a [–lateral] consonant (i.e. an input with /...l...l.../ maps to [...l...r...]).

8.4.1.2. T-transparency: Coronal non-liquids are "transparent"

The coronal non-liquids {t s n d} are "transparent" to dissimilation: the L-dissimilation pattern still holds when one of these consonants intervenes between the two /l/s (Dressler 1971, Jensen & Strong-Jensen 1979, Steriade 1987, a.o.). This is seen in the examples in (23)–(26) below: these roots have a coronal consonant intervening between the two laterals, but dissimilation happens just as in the roots with final /l/. (Examples

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[14] Latin data is presented in orthography except where noted otherwise. Notable deviations from IPA are ⟨c⟩ for [k], ⟨qu⟩ for [kw], and ⟨v⟩ or ⟨u⟩ for [w]. Vowel length is not indicated systematically, by me and also by my sources for this data. All examples are full stems, so stem edges are not marked; dashes mark morpheme boundaries; the first morpheme in all examples is the root. In the Latin data, angle brackets are used exclusively to designate orthographic forms (not stem domains).

from the Perseus Latin Dictionary (Crane et al. 2012); henceforth referred to as Perseus)[15].

(23) [t] does not block L-dissimilation
  a. milit-aris ‘military’ (*milit-alis)
  b. velit-aris ‘of the velites’
  c. insalut-aris ‘unhealthy’

(24) [n] does not block L-dissimilation
  a. lun-aris ‘lunar’ (*lun-alis)
  b. plan-aris ‘planar’
  c. lan-aris ‘wooly’

(25) [s] does not block L-dissimilation[16]
  a. clus-aris ‘(easily) closing’ (*clus-alis)

(26) [d] does not block L-dissimilation[17]
  a. lapid-aris ‘of stone’ (*lapid-alis)

The generalization that these consonants are “transparent” to the L-dissimilation entails that the dissimilation is not based on string adjacency. The examples in (20)–(23) above show that dissimilation can occur though the two /l/s are not adjacent segments, nor adjacent with respect to consonants (i.e. in a CVC configuration; cf. Gafos 1999, a.o.), nor even members of adjacent syllables (cf. Odden 1994). The L-dissimilation pattern is therefore a non-local interaction, the bread-and-

[15] In my search of the Perseus dictionary, I compiled lists of all words ending in the orthographic strings <alis> and <aris>, and searched in these lists for all forms with a consonant intervening between the suffix and an <l> or <r> in the root.

[16] Examples with intervening [s] are scarce, because historical rhotacism changed intervocalic *s to /r/. *Clus-aris* is the only example I found in the Perseus dictionary that contains an intervening [s], and none of the consonants that block dissimilation.

[17] There are relatively few examples of intervening [d]. Cser (2007, 2010) reports no available data. The Perseus Latin dictionary gives three examples of intervening [d]s: *lapidaris* listed above; *Claudialis* ‘of Claudius’ which appears to be an exception, and *Kalendalis* ~ *Kalendaris*, which is attested with both forms. Since *lapidaris* is the only example among these where the root is an ordinary noun, I take this to be the most accurate representation of the generalization.

butter of the Surface Correspondence framework (Rose & Walker 2004, Hansson 2001/2010).

8.4.1.3. R-blocking: root-final R is "opaque"

The well-known and widely-reported R-blocking generalization is that L-dissimilation does not occur when /r/ intervenes between the two laterals (Dressler 1971, Jensen & Strong-Jensen 1979, Steriade 1987, Cser 2007/2010, a.o.). This is illustrated by the examples in (27). In these roots, there is an /l...r/ sequence, and the /-alis/ suffix surfaces faithfully as [-alis]: dissimilation does not occur. These examples are taken from Cser (2007/2010); the same data is also cited in earlier work (e.g. Steriade 1987). The failure of dissimilation in (c)-(g) is attributed to the intervening [r] and not the intervening [t s], since [t] does not otherwise show blocking effects (see §8.4.1.2 above).

(27) L-Dissimilation is blocked by [r]:

a.	flor-alis	'floral'	(*flor-aris; L-dissimilation fails)
b.	plur-alis	'plural'	
c.	later-alis	'lateral'	
d.	litor-alis	'of the shore'	
e.	lustr-alis	'lustral'	
f.	claustr-alis	'claustral'	
g.	flatur-alis	'containing air'	

Two further observations are significant. First, the presence of an /r/ leads to the failure of L-dissimilation only if it intervenes between the two /l/s, as noted by Steriade (1987:351), and in much subsequent work[18]. Thus, an /l...r/ sequence in the root causes L-dissimilation to fail (27), but L-dissimilation occurs as normal when an /r/

[18] Relevant citations include Kenstowicz (1994), Walsh-Dickey (1997), Suzuki (1998).

precedes both /l/s (28a-b), or follows both /l/s (28c-d). The R-blocking generalization holds only in forms where a rhotic follows one /l/, and precedes the other /l/.

(28) Non-intervening [r] does not block dissimilation

a.	proeli-aris	'of a battle'	(Dressler 1971:598)[19]
b.	reticul-aris	'of the net'	
	(*reticul-alis; dissimilation as normal after /r/)		
c.	singul-ar-iter	'exceedingly; one by one'	
d.	vulg-ar-iter	'in a common way'	
	(*vulg-al-iter; dissimilation as normal before /r/)		

The second noteworthy observation is that these examples of R-blocking all have the /r/ in root-final position. This generalization has not been noted in previous descriptions, because it is confounded with the generalization that labials and velars also block dissimilation. Since labials and velars block L-dissimilation, words with an intervening /r/ and an intervening labial or velar do not necessarily bear on the R-blocking generalization. That is, R-blocking is crucially demonstrated only by words where (i) /r/ is the only intervening consonant, or (ii) all other intervening consonants are transparent coronals {t n s d}. In my search of the Perseus Latin dictionary, I found only one word like this: *Vulturnalis*, 'of Vulturnus'[20]. This form is derived from the name of a deity, and may be exceptional on those grounds.[21] So, there is little evidence that

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[19] Dressler notes that the form *proeliāris* coexists with *proeliālis*; both variants are attested.

[20] I found 5 other words where there is an intervening non-final rhotic, and L-dissimilation is blocked – words with the sequence [...l...r...C...-alis]. They are: *clericalis* 'clerical', *camelopard-alis* 'camelopard, giraffe', *largitionalis* 'treasury officer', *larvialis* 'ghostly' (var. of *larvalis*), *latrocinalis* 'of robbers' All have an intervening non-coronal, so they aren't valid as evidence that non-final [r] blocks L-dissimilation; cf. Cser's (2007/2010) observation that dissimilation fails when there is both an intervening [r] and an intervening non-coronal, irrespective of their relative order. I also found one example where non-final [r] fails to block dissimilation: *lucernaris* 'of a lantern'.

[21] Compare to *Vulcanalis* 'of Vulcan', also derived from the name of a deity, in which L-dissimilation also appears to be blocked where it shouldn't be. See §8.4.3.4 for further discussion.

non-final rhotics block L-dissimilation; R-blocking is only clearly supported by the data for rhotics in root-final position.

The generalization that only root-final rhotics seem to block L-dissimilation is significant for building an analysis: it means the pattern can be characterized in terms of the distance between the root /r/ and the suffix /l/, without reference to intervention. Since the blocker rhotics are always root-final, they are always in a CVC configuration with the /l/ of the /-alis/ suffix (i.e. the [..ra.l...] in forms like [flo.**r**-a.**l**is]). The CVC configuration is one possible domain of scope for CORR constraints. The analysis of the R-blocking effect makes use of this: blocking is treated as double dissimilation, with the CORR constraint in the "second dissimilation" system being CORR-CVC·[rhotic]. This constraint demands correspondence between a root-final [r] and the [r] in the dissimilated *-aris* form of the suffix, which gives rise to the dissimilatory blocking effect. A preceding [r] in the root is will never be in the same CVC domain as the suffixal r/l, so CORR-CVC·[rhotic] does not lead to blocking with non-final rhotics. In this way, the analysis proposed in §8.4.2 reduces the intervention effect to a locality condition.

8.4.1.4. BG-blocking: Labials & velars are "opaque"

Latin L-dissimilation fails to occur across consonants other than /r/ (Watkins 1970, Dressler 1971, Hurch 1991, Cser 2007/2010), a fact often overlooked[22]. The generalization observed by Cser (2010:36) is that *all non-coronal consonants* "block" the L-

[22] cf. Steriade's (1987:351) claim that "dissimilation fails *only* when the stem /l/ is separated from the suffix by an intervening /r/" (emphasis mine). This observation appears to be correct only when intervening non-coronals are ignored.

dissimilation. Some examples of this are given below (Cser 2007/2010, Dressler 1971, Perseus dictionary).

(29) No L-dissimilation across intervening labials: /L...B...L/ → [L...B...L]

a.	gleb-alis	'of clods'	(*gleb-aris; L-dissimilation fails)
b.	plum-alis	'feathered'	
c.	fluvi-alis	'of the river'	
d.	flavi-alis	'of Flavius'	
e.	pluvi-alis	'rainy'	
f.	congluvi-alis	(no gloss)	

(30) No L-dissimilation across intervening velars: /L...G...L/ → [L...G...L]

a.	leg-alis	'legal'	(*leg-aris; L-dissimilation fails)
b.	loc-alis	'local'	
c.	collegi-alis	'collegial'	
d.	glaci-alis	'icy'	
e.	cloac-alis	'of the sewer'	
f.	umbilic-alis	'umbilical'	

These examples show that at least /m b g k w/ block L-dissimilation when they intervene between the two laterals. I have not found any examples of the other non-coronals {p f ŋ h} in intervening positions, but the apparent generalization is still clear. When the intervening consonant is a non-coronal, L-dissimilation does not occur.[23]

The BG-blocking generalization is highly significant, since it does not follow from previous OCP-based analyses. Steriade (1987) explains R-blocking as intervention on the [±lateral] tier: an intervening [r] blocks L-dissimilation because its [–lateral] feature disrupts the melodic-level adjacency between the [+lateral] values of the two /l/s. In this account, T-transparency is explained by coronal non-laterals like [t] having no specification on the [±lateral] tier; however, labials like [m] also have no

[23] When there are multiple intervening consonants, the generalization is somewhat different; these cases are considered in the bridging analysis in §8.4.3.

representation on BG-blocking is not explained because labials and coronals block dissimilation even though they also have no contrastive [±lateral] specification. Non-autosegmental OCP theories (Walsh-Dickey 1997, Suzuki 1998) have approached the R-blocking as double dissimilation, but these face a similar problem. In order for [k] and [m] to block L-dissimilation, there must be some feature that {k m l} all share with each other, that isn't shared with any of the coronals {t s n d} that don't block dissimilation. I know of no possible candidates for such a feature. Explaining BG-blocking as double dissimilation doesn't work because the dissimilating laterals are more similar to the "transparent" coronal consonants than they are to the non-coronal "opaque" consonants.

8.4.1.5. Other Empirical Addenda & Caveats

This section notes additional empirical details about the quality of the evidence that supports the L-dissimilation & blocking generalizations. These details are not crucial to the proposed analyses; they are provided here for reference, and the reader is welcome to skip to the analyses in §8.4.2 & 8.4.3.

8.4.1.5.1. Exceptions to all of the generalizations

The Latin generalizations presented above are robust, but not absolute. There are counter-examples that run in all conceivable directions; some examples are given below (31). In some cases, the *-aris* form of the suffix appears spuriously, when there is no /l/ in the root (a).[24] In addition, there are numerous forms that show variation, where both *-aris* and *-alis* occur (b). There are also examples of the usually "transparent" coronals blocking dissimilation (c), and examples of dissimilation happening across each the different kinds of "blocking" consonants (d-f).

(31) Latin generalizations have exceptions in all directions:

a.	pegm-aris	'of the pegma'	(spurious dissimilation: no /l/ in root)
	sescen-aris	'of one and a half years old'	
b.	Lati-aris ~ Lati-alis	'of Latium'	(variation between *-aris* & *-alis*)
	aquilon-aris ~ aquilon-alis	'northern'	
c.	let-alis	'lethal'	(coronal *blocks* L-dissimilation)
	Claudi-alis	'of Claudius'	
d.	lucern-aris	'of a lantern'	(/r/ *doesn't* block L-dissimilation)
	palpebr-aris	'of the eyelids'[25]	
e.	vulg-aris	'vulgar'	(velar *doesn't* block L-dissimilation)
f.	palm-aris	'of palms'	(labial *doesn't* block L-dissimilation)

The target generalizations laid out at the start of this section (20) are the ones that are most robust and least unclear. Other generalizations have also been reported, but the data I examined does not clearly bear them out.[26]

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[24] Hurch (1991) reports 7 words with spurious dissimilation, but does not list them. In a search through the Perseus Digital Library Latin dictionary (Crane et al. 2012) I found 11 words where the string *-aris* occurs without a preceding *l*, though it is possible that some of these words are not actually examples of the /-alis/ suffix.

[25] Perseus also lists the non-dissimilated form *palpebr-alis*

[26] Hurch (1991), for instance, claims that dissimilation is tied to distance between the /l/s, counted in moras. This generalization is not clearly supported by the data because it largely reduces to a distinction between the LVL case, where one mora and no consonants intervene between the two /l/s, vs. nearly all of the LVCVL cases, where the /l/s are separated by three moras, and an intervening consonant.

8.4.1.5.2. Morphological limitations

The L-dissimilation pattern in the -alis/-aris alternation does not generalize to all of Latin phonology. Cser (2007/2010) reports that the same [r]~[l] alternation is found in just one other suffix, the nominal suffix -al/-ar, which historically related to /-alis/ (Cser 2010:37). Some examples are given in (32).

(32) Dissimilation in -ar/-al suffix:

a.	anim-al	'animal'	([-al] for roots with no /l/s)
b.	vectig-al	'toll'	
c.	tribun-al	'judgement seat'	
d.	capit-al	'head-dress'	
e.	cubit-al	'cushion'	
f.	quadrant-al	(unit of measure)	
g.	calc-ar	'spur'	([-ar] for roots containing /l/)
h.	exempl-ar	'copy'	
i.	nubil-ar	'barn	
j.	lacun-ar	'panelled ceiling'	
k.	pulvin-ar	'cushion'	
l.	laque-ar	'panelled ceiling'[27]	

This suffix does *not* exhibit the same "blocking" generalizations as -alis/-aris. Forms like (32g-l) have labials and/or velars intervening between the /l/s, but they *do* show the dissimilation (contrary to forms like *leg-alis* above)[28]. A search of the Perseus Latin dictionary turns up no examples of the -ar/-al suffix with an intervening /r/, so I do not know if the blocking generalization for /r/ extends to this morpheme or not. Since this suffix does not exhibit any blocking effects, I will not consider it here.

Other Latin suffixes with /l/s do not show any trace of the L-dissimilation pattern. Some examples of suffixal /l/ with no L-dissimilation are given in (33) & (34).

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[27] This repetition of the gloss 'panelled ceiling' is not an error, at least on my part. These are the glosses given by Cser (2007); the Perseus dictionary glosses *laquear* as 'a panelled'.

[28] Cser (2010:37) notes two exceptions. *Lupercal*, the name of a grotto on the Palatine hill, appears to show blocking; *iubar* 'beam (of light)', has spurious dissimilation.

(33) No L-dissimilation for adjectival /-ilis/ suffix: (Cser 2010:39)

a. flex-ilis	'pliable'	(*flex-iris)
b. lab-ilis	'slippery'	
c. plect-ilis	'plaited'	

(34) No L-dissimilation for various diminutive suffixes with /l/: (Cser 2010:41)

a. cell-ula	'small room, cell'
(*cell-ura)	(< cella 'small room' + -ula dim.)
b. fili-ola	'young daughter'
	(< fīlia 'daughter' + -olus/-ola dim.)
c. calc-ulus	'pebble'
	(< calx 'limestone, game counter' + -ulus diminutive)

8.4.1.5.3. No root-internal L-dissimilation

There is no evidence for root-internal L-dissimilation. Roots with multiple /l/s are not common in Latin, but they are attested (35).[29]

(35) Multiple /l/s may co-occur within the root (Cser 2010:35)

a. lolligo	'squid'
b. lalisio	'wild donkey'
c. ululo	'to bark'
d. lolium	'darnel'
e. lilium	'lily'

8.4.1.5.4. Scant evidence for R-dissimilation

There is some historical evidence for rhotic dissimilation, though it is highly tentative. Historically, Latin had intervocalic *s > r rhotacism (36) (Kent 1945, Watkins 1970, among others). This rhotacism is reported not to apply to intervocalic *s in roots containing a following /r/ (37) (Kent 1945:153, Dressler 1971, Walsh-Dickey 1997; see

[29] It is perhaps worth noting that in all of the root-internal examples of L~L co-occurrence in (37), the two [l]s are in a CVC configuration. From the data available to me, it is not clear whether this is a significant observation or merely a coincidence.

also Gorman 2011). The failure of *s > r rhotacism in these examples has been interpreted (by Dressler 1971, Walsh-Dickey 1997, a.o.) as the result of a dissimilatory restriction against [r...r] sequences – evidence for a pattern of R-dissimilation.

(36) Latin intervocalic s-rhotacism

a.	*flōsis > flōris	'flower (gen.sg)'	(*not* flosis; *s>r between Vs)
b.	*Numasioi > Numerio	(personal name)	
c.	*iouesat > iūrat	'swears'	

(37) No intervocalic s-rhotacism before another r in the root

a.	miser	'wretched'	(*mirer; *s>r blocked by following r)
b.	caesar	'head of hair'	
c.	aser	'ritual mixture of blood & wine'	
d.	bāsiāre	'to kiss'	
e.	crīsāre	'to grind (as of sexual partner)'	
f.	quaesere	'to bed'	

The validity of examples like (37) as evidence for R-dissimilation is dubious, however. Gorman (2011) reports 22 non-derived Latin VsV sequences where intervocalic s-rhotacism does not happen. The 6 examples in (37) are the only ones with a following /r/. This means that in the other 16 words where rhotacism fails, it has nothing to do with dissimilation. This source of evidence for R-dissimilation has more counter-examples than examples, by a factor of nearly 3 to 1. So, the independent evidence for R-dissimilation is meager at best.[30]

[30] Cser (2007/2010) also reports a co-occurrence restriction tied to vowel length: the generalization is that [rVr] sequences are prohibited non-finally, while [rV:r] sequences are prohibited word-finally. This restriction results in vowel length alternations before affixes (*furor ~ furōr-is* 'rage'), but never /r/→[l] dissimilation. There are also significant exceptions, as Cser notes, e.g. *ūreris*, *morerer*, and others.

8.4.2. Latin Rs: blocking as double dissimilation

This section analyzes the blocking of Latin L-dissimilation by root-final rhotics. It does not explain the BG-blocking generalization, where L-dissimilation fails across intervening non-coronals – analysis of this blocking effect is taken up in §8.4.3.

8.4.2.1 Proposal for R-blocking

The proposed analysis of dissimilation blocking by /r/ in Latin approaches it in the same fashion as the Yidiny pattern, as 'double dissimilation' (along the same lines suggested by Kenstowicz 1994[31]). The ranking obtained for Latin R-blocking is disjunctive; both possibilities are given in (38). Both of these rankings consist of two essential components: a basic dissimilation system that causes L-dissimilation to happen in the general case, and a second sub-system that favors R-dissimilation to produce the blocking effect. As in Yidiny, the choice between these rankings determines only the correspondence structure of non-dissimilating /l…l/ sequences. If CORR-CVC·[rhotic] dominates the CORR constraint, CORR-Stem·[Lateral], as in (38a), then non-dissimilating laterals will not correspond; if it dominates CC·EDGE-(Root) instead as in (38b), then non-dissimilation laterals *will* correspond. Both rankings produce the right outputs to capture the L-dissimilation, T-transparency, and R-blocking generalizations; the disjunction reflects a choice between equally-correct SCorr interpretations of the data.

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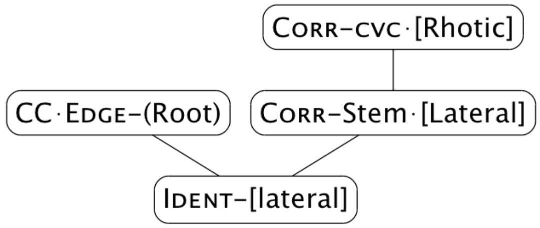
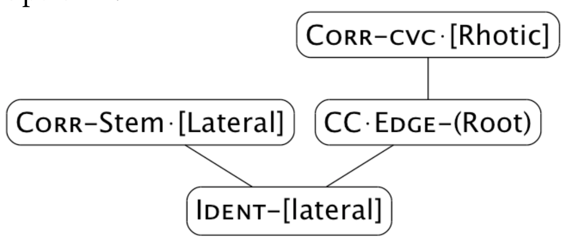
[31] The double dissimilation approach to Latin R-blocking is also advocated by Steriade (1995), Walsh-Dickey (1997), and Suzuki (1998).

(38) Rankings for Latin root-final /r/ to block L-dissimilation

a. Option 1:

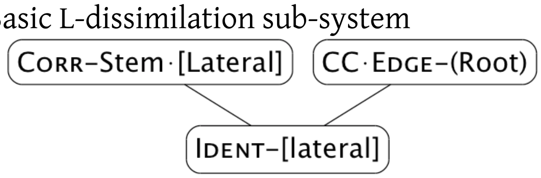


b. Option 2:



The sub-ranking in (39) is responsible for the background L-dissimilation pattern. This ranking configuration favors dissimilation when two laterals are in the same stem, but straddle the edge of the root. This pair of edge-straddling laterals is exactly the scenario that arises when the suffix /-alis/ attaches to a root containing another /l/, as in /sol-alis/, /lun-alis/, etc..

(39) Basic L-dissimilation sub-system



The inclusion of Corr-cvc·[rhotic] in the rankings in (38a,b) sets up a second dissimilation sub-system, shown in (40). This sub-system shares the same limiter and faithfulness constraints as the L-dissimilation sub-ranking in (39) above; the only difference is the Corr constraint – Corr-cvc·[rhotic] instead of Corr-Stem·[lateral].

(40) Latin R-dissimilation sub-system

CC·Edge–(Root)   Corr–cvc·[Rhotic]

Ident–[lateral]

The sub-ranking in (40) favors R-dissimilation in CVC configurations that span across the root edge. This has the effect of requiring correspondence between the *output* of L-dissimilation and another, root-final, rhotic. Thus, it penalizes L-dissimilation after a root-final /r/, because it would result in an [...r-ar...] sequence: *[flor-aris].

The double dissimilation effect arises from the relation between the two sub-rankings. When Corr-cvc·[rhotic] dominates one of the surface correspondence constraints that drive L-dissimilation, the result is that R-dissimilation trumps L-dissimilation. Thus, an dissimilation will happen for any /...l...-alis/ input sequence, except in those cases where it would create an [...r-aris] sequence. Put differently, ranking Corr-cvc·[rhotic] over Corr-Stem·[lateral] or CC·Edge-(Root) means that /l/→[r] dissimilation after a root-final [r] does not offer

8.4.2.2. Latin Rs: explaining the basic L-dissimilation pattern

On the double-dissimilation account of R-blocking, the basic dissimilation of laterals is explained by Corr-Stem·[Lateral] and CC·Edge-(Root) dominating faithfulness for laterality, as shown in (41). The consequence of this ranking is dissimilation within the stem, across the root edge (like that seen in Zulu in chapter 7). When a root with an /l/ is followed by the /-alis/ suffix, Corr-Stem·[Lateral] penalizes faithfulness with non-correspondence (c), while CC·Edge-(Root) penalizes faithfulness with correspondence (b). Together, this pair of correspondence constraints favors the L-dissimilation candidate with non-correspondence (a).

(41) Latin L-dissimilation, the basic case

Input: popu**l**-a**l**is Output: popu**l**-a**r**is		CORR-Stem ▪ [Lateral]	CC ▪ EDGE-(Root)	IDENT-[lateral]
☞ a.	popu**l**-a**r**is, ℛ:{p}{p}**{l}{r}**{s}	(0)	(0)	(1)
~ b.	popu**l**-a**l**is, ℛ:{p}{p}**{l l}**{s}		W (0~1)	L (1~0)
~ c.	popu**l**-a**l**is, ℛ:{p}{p}**{l}{l}**{s}	W (0~1)		L (1~0)

The L-dissimilation produced by this sub-ranking is not sensitive to the distance between two /l/s, and it is not affected by any intervening consonants. The T-transparency generalization follows from this. CORR-Stem ▪ [Lateral] requires that if two laterals are in the same stem, they correspond. This requirement does not refer to adjacency – tier-wise or otherwise – and it does not affect non-laterals. Thus, it still produces dissimilation when there are other intervening consonants – the correct result for forms like /milit-alis/ → [milit-aris] 'military'. This is shown in (42).

(42) Long-distance L-dissimilation is derived in exactly the same way:

Input: mi**l**it-a**l**is Output: mi**l**it-a**r**is		CORR-Stem ▪ [Lateral]	CC ▪ EDGE-(Root)	IDENT-[lateral]
☞ a.	mi**l**it-a**r**is, ℛ:{m}**{l}**{t}**{r}**{s}	(0)	(0)	(1)
~ b.	mi**l**it-a**l**is, ℛ:{m}**{l l}**{t}{s}		W (0~1)	L (1~0)
~ c.	mi**l**it-a**l**is, ℛ:{m}**{l}**{t}**{l}**{s}	W (0~1)		L (1~0)
~ d.	mi**l**it-a**l**is, ℛ:{m}**{l t l}**{s}		W (0~2)	L (1~0)

The candidates (42a)-(42c) are parallel to (41a)-(41c) above. Note that the winning, dissimilating, candidate in (42a) has no correspondence between the laterals and the intervening [t]. Such correspondence is neither required nor beneficial here: no constraints favor it. The candidate with extraneous correspondence (62d) is harmonically bounded on this subsystem of constraints.

8.4.2.3. Blocking by root-final rhotics

The double dissimilation analysis of blocking by root-final rhotics layers on top of the basic L-dissimilation sub-system (from 39) a second system of R-dissimilation (40), in such a way that R-dissimilation trumps L-dissimilation. The second dissimilation system comes into play when a root contains a lateral *and* a root-final rhotic. In this scenario, L-dissimilation favors the suffix form [-aris] over [-alis] (because of the root /l/), but R-dissimilation favors [-alis] over [-aris] (because of the root /r/). In intuitive terms, changing /l/→[r] after a rhotic-final root does not offer a viable 'escape' from the required [l]~[l] correspondence, because in this situation [r]~[r] correspondence is also required, and is even more important. So, when R-dissimilation over-rules L-dissimilation, the effect is blocking of lateral dissimilation in the presence of a rhotic. Since R-dissimilation is enforced only in the CVC domain, the blocking is produced only for /r/s in root-final position. This derives the R-blocking generalization: L-dissimilation fails for *lateralis*, but not *reticularis*.

The blocking of L-dissimilation by root-final /r/ is shown in (43). The input here is /later-alis/, and the observed output has no dissimilation: [later-alis], *[later-aris]. The crucial comparison is between the dissimilating candidates (b) & (c) and one of the faithful alternatives, such as (a) or (d). The faithful and correspondent option (a) is shown as the winner here, which arises from CORR-CVC·[rhotic] » CC·EDGE-(Root) (38a). The faithful and non-correspondent candidate (d) wins if CORR-CVC·[rhotic] instead dominates CORR-Stem·[lateral] (38b).

(43) No L-dissimilation after root-final rhotics (root-final rhotics are blockers)

	Input: later-alis Output: later-alis	CORR-CVC· [rhotic]	CORR-Stem· [Lateral]	CC·EDGE -(Root)	IDENT- [lateral]
☞ a.	later-alis, ℛ:{l l}{t}{r}{s}	(0)	(0)	(1)	(0)
~ b.	later-aris, ℛ:{l}{t}{r r}{s}			e (1~1)	W (0~1)
~ c.	later-aris, ℛ:{l}{t}{r}{r}{s}	W (0~1)		L (1~0)	W (0~1)
~ d.	later-alis, ℛ:{l}{t}{r}{l}{s}		W (0~1)	L (1~0)	

If the suffixal /l/ dissimilates to [r], it either corresponds with the root-final [r] (b), or it does not (c). Having the [r]~[r] correspondence as in (b) incurs a faithfulness violation on IDENT-[lateral], without any corresponding improvement on the markedness constraints. The [r]~[r] correspondence in across the root edge in (b) violates CC·EDGE-(Root) just like the [l]~[l] correspondence in the faithful competitor (a). Having dissimilation and non-correspondence between the two [r]s as in (c) is ruled out by CORR-CVC·[rhotic]. Under the ranking shown here, neither of the dissimilating candidates can beat (a), the faithful candidate with the minimum [l]~[l] correspondence needed to satisfy CORR-Stem·[Lateral]. Under the alternative ranking, both of the dissimilating candidates lose to (d) instead of (a), but observable output is the same – L-dissimilation is still blocked.

CORR-CVC·[rhotic] has the CVC configuration as its domain of scope; this is what limits the R-blocking effect to only root-final rhotics. A rhotic anywhere else in the stem will never be in a CVC configuration with the liquid in the -alis/-aris suffix. As such, L-dissimilation obtains as usual when a root has a non-final rhotic. This is illustrated in (44) below, for the input /reticul-alis/.

(44) L-dissimilation is not blocked by rhotics earlier in the root

Input: **r**eticul-a**l**is Output: **r**eticul-a**r**is		CORR-CVC· [rhotic]	CORR-Stem▪ [Lateral]	CC▪EDGE -(Root)	IDENT- [lateral]
☞ a.	**r**eticul-a**r**is, $\mathcal{R}$:**{r}**{t}{c}**{l}{r}**{s}	(0)	(0)	(0)	(1)
~ b.	**r**eticul-a**l**is, $\mathcal{R}$:**{r}**{t}{c}**{l l}**{s}			W (0~1)	L (1~0)
~ c.	**r**eticul-a**l**is, $\mathcal{R}$:**{r}**{t}{c}**{l}{l}**{s}		W (0~1)		L (1~0)
~ d.	**r**eticul-a**r**is, $\mathcal{R}$:**{r r}**{t}{c}**{l}**{s}			W (0~1)	e (1~1)

The winning candidate (a) exhibits L-dissimilation, and has no correspondence between the dissimilated suffixal [r] and the other, root-initial, [r]. Non-correspondence between these rhotics incurs no violation of CORR-CVC·[rhotic] because they are not in the same CVC domain. Having this [r]~[r] correspondence (d), on the other hand, violates CC▪EDGE-(Root), and so is sub-optimal. The result is that rhotics block L-dissimilation only when in root-final position – a position where they necessarily intervene between the two laterals. This derives Steriade's (1987) observation that an intervening [r] blocks L-dissimilation as in *lateralis*, while the non-intervening [r] in *reticularis* does not induce the blocking effect.

8.4.2.4. Latin Rs in the big picture

The analysis of the R-blocking effect in Latin L-dissimilation shows that blocking of dissimilation by intervening consonants does not necessarily need to be explained as a consequence of linear intervention. Some previous (and oft-repeated) analyses of Latin L-dissimilation hold that intervening rhotics block dissimilation *because they intervene*. In the analysis proposed here, this intervention is epiphenomenal. An /r/ blocks L-dissimilation in the /-alis/ suffix only when it is in the same CVC domain as the suffixal liquid. It follows from this that any /r/ that blocks L-dissimilation must be root-final, which in turn entails that it intervenes between the two non-dissimilating /l/s. Dissimilation fails in this situation not because the /r/ intervenes, but because of its position relative to the suffix /l/.

Just because a blocker consonant intervenes between the two dissimilators doesn't mean that intervention is crucial for explaining the pattern. This is a significant conceptual point, and one that extends beyond the surface correspondence theory of dissimilation. The double dissimilation mechanism can produce blocking by just intervening consonants, when the 'second dissimilation' sub-system has tighter locality restrictions than the basic dissimilation sub-system. Since the double dissimilation interaction is not unique to the surface correspondence theory (cf. Kenstowicz 1994, Walsh-Dickey 1997, Suzuki 1998, a.o.), the same conclusion also holds for these other theories.

Finally, the analysis presented here leaves two areas of Latin unexplained. First, the lack of corroborating evidence for R-dissimilation elsewhere in Latin is puzzling and unexpected. Under the analysis of R-dissimilation formulated here, we expect to find root-straddling [...r-Vr...] sequences to be prohibited everywhere in Latin, but this is clearly not the case, as evidenced by words like *vir-ōrum* 'man-gen.pl' and *err-āre* 'to err'. Second, this double dissimilation account does explain the BG-blocking generalization: it produces blocking of L-dissimilation after a root-final rhotic, but does not derive blocking across non-coronals. CORR-CVC·[rhotic] requires only that rhotics correspond with each other, and CORR-Stem·[lateral] requires only that laterals do; neither constraint favors correspondence with other consonants. The prediction is that all non-liquids should behave as inert: this is correct for the coronals {t n s d}, but wrong for the labials and velars.

8.4.3. Latin non-coronals: blocking by bridging

The double dissimilation approach to blocking can explain the R-blocking generalization in Latin, but it does not extend to blocking by non-coronals; this is because the non-coronals that block dissimilation are less similar than the transparent coronals that don't block it. The double dissimilation approach works for [r] as a blocker because it shares a feature, [rhotic] (≈ [–lateral]), with the output of dissimilation. This shared feature is the basis for CORR-CVC·[rhotic] to require correspondence, which is where the 'second dissimilation' effect comes from. Labials and coronals, on the other hand, don't consistently share any features with the [r] produced by dissimilation. The only conceivable features shared between the non-coronal blockers {k g m b w} and the dissimilated [r] are [+consonantal], and [–lateral] – both features that [r] also shares with {t n s d}. Consequently, there is no featural basis for [...B...r] sequences to dissimilate to [...B...l] (to produce blocking) that does not also apply to non-dissimilating [...T...r] sequences in the same way.

In the blocking by bridging interaction, dissimilation fails because correspondence is *supported* by the blocker consonant. Intuitively speaking, in double dissimilation, the presence of the blocker consonant makes dissimilation *worse*; in bridging, the presence of the blocker makes faithful correspondence *better*. The interpretation of the data in the bridging approach is as follows. Where dissimilation occurs, it is because correspondence is not permitted. Where dissimilation *fails*, it is because correspondence *is* permitted in that situation.

Blocking by bridging emerges from "extraneous" correspondence with the blocker consonant(s). The CORR constraints demand correspondence only between the would-be dissimilators, and this minimally-demanded correspondence is penalized by some limiter constraint. What the blocker consonant does is make available another faithful and correspondent structure, which meets the limiting condition. Corresponding with each other *and* with the blocker allows the would-be dissimilators to be faithful and correspondent, while also satisfying the limiter constraint that spurs dissimilation.

The blocking by bridging interaction is best understood as an outcome of locality-based Limiter constraints like CC·SYLLADJ. CC·SYLLADJ requires that if consonants correspond, they are in adjacent syllables. One way to meet this requirement is by dissimilation (cf. Sundanese in ch. 4). Another way is extraneous correspondence: the similar consonants correspond not just with each other, but also with at least one consonant of each syllable that stands between them. Thus, intervening consonants affect dissimilation not because they share features with the dissimilators, but just because they are in the right positions to allow the desired correspondents to count as local for CC•SYLLADJ.

8.4.3.1. The blocking-by-bridging proposal

In the blocking by bridging approach, the failure of dissimilation is interpreted as faithfulness with correspondence. The labial & velar consonants in Latin stop L-dissimilation from happening by enabling correspondence between the [l]s that does not violate the limiter constraint which drives dissimilation. This is represented by the set of mappings in (45). When dissimilation occurs across an intervening coronal, the dissimilating /l/s do not correspond with each other, or with the transparent intervener (a). When an intervening consonant stops dissimilation from occurring (b, c), the two [l]s correspond with each other, and with the blocker.[32]

(45) Input-output mappings that derive T-transparency & BG-blocking

	Input	Output form	SCorr classes	Remarks
a.	milit-alis	milit-alis	{m}{l}{t}{r}{s}	Across coronals, dissimilation & non-correspondence
b.	leg-alis	leg-alis	{l g l}{s}	Across velars, faithfulness and correspondence
c.	gleb-alis	gleb-alis	{g}{l b l}{s}	Across labials, faithfulness and correspondence

This constellation of input-output mappings is generated by the interaction of three surface correspondence constraints. Correspondence between laterals in the stem is demanded by CORR-Stem•[Lateral], as in the analysis of R-blocking in §8.4.2

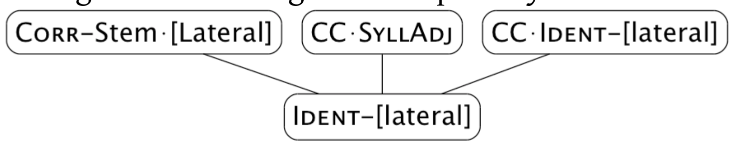
[32] In this bridging account, L-dissimilation in cases with no intervening consonants must be explained by some other means. See §8.4.3.4 for further discussion of this point.

above. Two constraints limit this correspondence: CC·SyllAdj, and CC▪Ident-[lateral]. CC·SyllAdj prohibits exclusive correspondence between two /l/s in non-adjacent syllables – i.e. whenever there is an intervening consonant. The combination of CC·SyllAdj & Corr-Stem▪[Lateral] is satisfied in two ways: by L-dissimilation, and by excessive correspondence. Blocking reflects the latter. Where dissimilation fails, it is because the two [l]s correspond with the intervening consonant. In this correspondence structure, each correspondent is syllable-adjacent to the next, so CC·SyllAdj does not favor dissimilation.

The distinction between the transparent coronals and the non-coronal blockers is made by CC▪Ident-[lateral]. Crucial to this account is the assumption that all and only coronals have [±lateral] specifications. Labials and velars cannot manifest the lateral vs. non-lateral distinction, so are neither [+lateral] nor [–lateral]; only the discernably non-lateral coronals can be [–lateral]. Given this assumption, CC▪Ident-[lateral] prohibits correspondence between [l] and {t n s d}, because [l] is [+lateral] and {t n s d} are [–lateral]. CC▪Ident-[lateral] does *not* penalize correspondence between [l] and the labials or velars, because they do not disagree in laterality. The non-coronals {p b m w k g} do not have any [±lateral] specification at all, so they necessarily do not have the [–lateral] one needed to incur violations for disagreeing with [l]. Thus, when the intervening consonant is labial or velar, CC▪Ident-[lateral] allows it to “support” correspondence between the [l]s: CC·SyllAdj can be satisfied by correspondence with these interveners rather than by dissimilation. When the intervening consonant is a [–

lateral] coronal, CC▪Ident-[lateral] prohibits [l] from corresponding with it: CC·SyllAdj must be satisfied by dissimilation, rather than correspondence with the intervener.

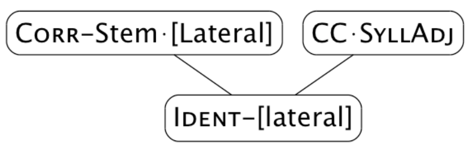
(46) Ranking for BG-blocking & T-transparency in Latin L-dissimilation:



8.4.3.2. Explaining the basic L-dissimilation pattern in bridging

In the blocking-by-bridging approach, the basic L-dissimilation pattern arises from the sub-ranking in (47). In order for intervening consonants to exhibit the bridging effect, the limiter that favors dissimilation must be a locality constraint like CC·SyllAdj; it cannot be a CC▪Edge constraint (cf. analysis of R-blocking in §8.4.2 above).

(47) Corr-Stem▪[Lateral], CC·SyllAdj » Ident-[lateral]



The combined preference of the 'ranking particle' in (47), is that /l/s in non-adjacent syllables either (i) correspond not just with each other, but also with at least one consonant of each syllable that stands between them, or (ii) dissimilate. This is shown in the tableau in (48) below. The candidate in (a) illustrates the latter possibility: here the two [l]s correspond with each other, as demanded by Corr-Stem▪[Lateral]; they also with the [g] of the intervening syllable. This correspondence structure satisfies both Corr-Stem▪[Lateral] and CC·SyllAdj, because the [l]s are in the same correspondence class, and because each member of that class has another correspondent in an adjacent syllable. The candidate in (b) illustrates the dissimilation alternative. This also satisfies both CORR-Stem▪[Lateral] and CC·SYLLADJ, because there are no [+lateral] consonants that fail to correspond, and there are no correspondents in non-adjacent syllables. It incurs one more violation of faithfulness, IDENT-[lateral], than the faithful & correspondent option (a).

(48) Corr, CC·Limiter » Ident: the basic configuration that favors dissimilation[33]

Input: leg-alis Output: leg-alis		CORR-Stem▪ [Lateral]	CC·SYLLADJ	IDENT-[lateral]
☞ a.	leg-alis, $\mathcal{R}$:{l g l}{s}	(0)	(0)	(0)
☛ b.	leg-aris, $\mathcal{R}$:{l}{g}{r}{s}	**e (0~0)**	**e (0~0)**	W (0~1)
~ c.	leg-alis, $\mathcal{R}$:{l l}{g}{s}		W (0~1)	
~ d.	leg-alis, $\mathcal{R}$:{l}{g}{l}{s}	W (0~1)		

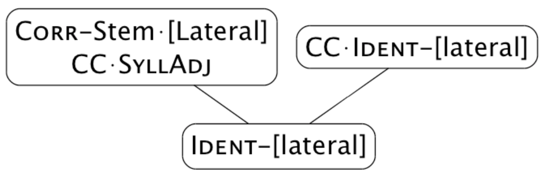
The significant point here is that while the surface correspondence constraints do not fully decide between dissimilation (b) and bridged correspondence (a), they *do* rule out the faithful alternatives in (c) & (d). The candidate in (c) is the faithful alternative with minimal correspondence, and the one in (d) shows faithful non-correspondence. Eliminating these faithful candidates is the crucial role this sub-ranking plays: it winnows the set of output options to dissimilation or correspondence with the intervener. This is what makes the quality of the intervening consonant matter for dissimilation.

[33] About the tableaux: blank cells have the value “e, (0~0)”. Where “e” values are included, it is for visual emphasis.

8.4.3.3. Explaining T-transparency and BG-blocking

The interaction of the basic ranking (47) with the constraint CC▪Ident-[lateral] is what controls the success of the 'blocking by bridging' outcome. The crucial ranking conditions are shown in (49). CC▪Ident-[lateral] crucially dominates Ident-[lateral], and is crucially not dominated by Corr-Stem▪[Lateral] and CC·SyllAdj.

(49) Corr-Stem▪[Lateral], CC·SyllAdj; CC▪Ident-[lateral] » Ident-[lateral]



The effect of the ranking in (49) is that the [–lateral] coronals {t n s d} may not correspond with the [+lateral] consonant [l]. This means that two /l/s in non-adjacent syllables may use the 'bridging' interaction to achieve a "chainwise-local" surface correspondence structure, but only if this does not involve correspondence with intervening coronal consonants. Intervening coronals are unacceptable bridging consonants, so they support L-dissimilation – they behave as inert, or transparent. Velars and labials, on the other hand, *are* acceptable bridging consonants, so they *do not* support L-dissimilation – they function as blockers.

The tableauxs in (50) & (51) illustrate the two sides of the bridging interaction. In (50), the input is /milit-alis/, where the intervening consonant is a [–lateral] coronal, /t/. Here, CC▪Ident-[lateral] forbids correspondence between the [l]s and the [t]; this rules out the 'bridged' candidate with no dissimilation (b). As such, dissimilation (a) is optimal.

(50) CC▪IDENT-[lateral] prohibits bridging with coronals:

Input: /milit-alis/ Output: [milit-aRis]		CC▪IDENT-[lateral]	CORR-Stem▪[Lateral]	CC▪SYLLADJ	IDENT-[lateral]
☞ a.	milit-aris, $\mathcal{R}$:{m}**{l}{t}{r}**{s}	(0)	(0)	(0)	(1)
~ b.	milit-alis, $\mathcal{R}$:{m}**{l t l}**{s}	**W (0~2)**			L (1~0)
~ c.	milit-alis, $\mathcal{R}$:{m}{l l}{t}{s}			W (0~1)	L (1~0)
~ d.	milit-alis, $\mathcal{R}$:{m}{l}{t}{l}{s}		W (0~1)		L (1~0)

In the tableau in (51), the input is /leg-alis/, with a non-coronal intervener [g], which is *not* [–lateral] – it has no [±lateral] value at all. In this case, correspondence between the [l]s and the intervening [g] does not violate CC▪IDENT-[lateral], because [g] & [l] do not disagree in laterality. So, the choice between faithfulness with 'bridged' correspondence (a) vs. dissimilation (b) is not made by any of the surface correspondence constraints. This leaves IDENT-[lateral] to pick between them; since it prefers the faithful form with [-alis] in (a), dissimilation does not emerge as optimal for this input.

(51) CC▪IDENT-[lateral] permits bridging with non-coronals:

Input: /leg-alis/ Output: [leg-aLis]		CC▪IDENT-[lateral]	CORR-Stem▪[Lateral]	CC▪SYLLADJ	IDENT-[lateral]
☞ a.	leg-alis, $\mathcal{R}$:{l g l}{s}	(0)	(0)	(0)	(0)
~ b.	leg-aris, $\mathcal{R}$:{l}{g}{r}{s}	**e (0~0)**			**W (0~1)**
~ c.	leg-alis, $\mathcal{R}$:{l l}{g}{s}			W (0~1)	
~ d.	leg-alis, $\mathcal{R}$:{l}{g}{l}{s}		W (0~1)		

The blocking effect works in precisely the same way for labial interveners. Like the velar [g], the labials have no [–lateral] specification, so they exhibit the same blocking effect.

8.4.3.4. Bridging over multiple interveners

In order for the blocking by bridging outcome to be optimal, the "bridge" must be complete. That is, two [l]s must be in the same correspondence class, and any syllable that comes between them must contain at least one member of that correspondence class. This has consequences for forms with multiple intervening consonants. In the blocking by bridging analysis, the labials and velars are *not* "opaque"[34] to L-dissimilation: they induce blocking simply by being tolerable correspondents of [l] that happen to be in the right position to achieve chainwise-local correspondence between two [l]s. When there are multiple intervening syllables, extraneous correspondence with one intervening consonant may not be enough to achieve this correspondence structure. The resulting prediction of the bridging analysis is that L-dissimilation will occur across an intervening labial and/or velar if there is another intervening syllable that does not contain another blocker.

Latin *-alis/-aris* forms with multiple intervening consonants largely fit with this prediction. When there is an intervening labial or velar, and also an intervening

[34] cf. Steriade's (1987) treatment of R-blocking as intervention on the [±lateral] tier

coronal, L-dissimilation can occur. This is shown in (52). These examples are taken from the Perseus dictionary, and are an exhaustive list of stems with this shape.[35]

(52) Intervening non-coronal & coronal: L-dissimilation can occur

a.	co.lum.n-a.ris	'a pillar of fire'[36]
b.	lac.t-a.ris	'of suckling'
c.	la.pi.d-a.ris	'of stone'
d.	li.mi.t-a.ris	'path between two fields'
e.	li.mi.n-a.ris	'ceiling beams'
f.	lu.pa.n-a.ris	'of brothels'
g.	pul.men.t-a.ris	(no gloss)
h.	pul.vi.n-a.ris	'sitting on a cushion'

So, the generalization is that the BG-blocking effect does not hold when there is another intervening syllable that contains only coronal consonants. An intervening non-coronal doesn't give rise to the "blocking" effect on L-dissimilation when there is an intervening syllable that contains only a coronal consonant. If the "bridging" consonant is not in the intervening syllable (a,b), or if there is a second intervening syllable with only coronals (c-f), this is not sufficient to bridge the gap between the /l/s, and so dissimilation occurs.

The potential for failure of blocking by bridging is shown in the tableau in (53). Here, the input is /lapid-alis/, with an intervening coronal and non-coronal. While non-coronals like /p/ do behave as blockers for dissimilation (see above), blocking is not the result obtained here. The winning candidate (a) exhibits lateral dissimilation, surfacing with [-aris] instead of [-alis]. Dissimilation wins because recruiting the

[35] That is, forms where the root contains an /l/, and both a coronal and a non-coronal stand between it and the /-alis/ suffix. Note that in all of these examples, the coronal follows the non-coronal. This does not seem to be meaningful: I found no -alis/-aris forms in the Perseus dictionary where the coronal intervener precedes the non-coronal one.

[36] Glosses in (52) are from the Perseus online dictionary. I suspect they reflect usage of specific instances of the word, since the adjectival meaning of the /-alis/ suffix is not systematically in the gloss.

intervening labial [p] into correspondence with the two [l]s is not enough to chain the two [l]s together. The partially-bridged candidate in (b) still incurs a CC·SYLLADJ violation because the suffix [l] is separated from the other members of its correspondence class by the syllable [.da.]. Extending the bridged correspondence structure to reach all the way to the suffix [l], as shown in (c), runs afoul of CC·IDENT-[lateral], because the [–lateral] [d] disagrees with the lateral [l]s.

(53) Intervening coronals & non-coronals: L-dissimilation if one σ has *only* coronals

Input: lapid-alis Output: **l**apid-a**r**is		CC·IDENT-[lateral]	CORR-Stem·[Lateral]	CC·SYLLADJ	IDENT-[lateral]
☞ a.	la.pi.d-a.**r**is, $\mathcal{R}$:**{l}**{p}{d}**{r}**{s}	(0)	(0)	(0)	(1)
~ b.	la.pi.d-a.lis, $\mathcal{R}$:**{l p l}**{d}{s}			**W** **(0~1)**	L (1~0)
~ c.	la.pi.d-a.lis, $\mathcal{R}$:**{l p d l}**{s}	W (0~2)			L (1~0)
~ d.	la.pi.d-a.lis, $\mathcal{R}$:**{l}**{p}{d}**{l}**{s}		W (0~1)		L (1~0)

There are also some -alis/-alis forms that have both intervening coronals & non-coronals, but *don't* exhibit L-dissimilation – they *do* exhibit the BG-blocking effect. Some examples are given in (54) (from Perseus dictionary unless noted otherwise). Note that Classical Latin orthography did not make a consistent distinction between the round vowel [u] and the glide [w]; the orthographic ⟨u⟩ handed down in these forms is phonetically [w] (Powell 2009).

(54) Intervening non-coronals & coronals: L-dissimilation may be blocked
a. lectu-alis 'confining one to bed' IPA: [lek.tw-aː.lis][37]
b. intellectu-alis 'sensible' IPA: [in.te.lek.tw-aː.lis]
c. Palatu-ālis (no gloss) (Dressler 1971:598) IPA: [pa.la.tw-aː.lis]

The forms in (54a-c) present an interesting contrast to the data in (55) above. Forms like *lapid-aris*, with intervening coronals & non-coronals, do show L-dissimilation (**lapid-alis*) if at least one syllable contains just coronal consonants. In the examples in (54), there are both coronal and non-coronal interveners, but each syllable contains a non-coronal: the labials and velars are in a distribution that allows for 'fully bridged' correspondence. They show the BG-blocking effect: as expected, L-dissimilation fails. This outcome is illustrated in the tableau in (58).

(55) L-dissimilation is blocked if each intervening syllable contains a non-coronal

	Input: lektu-alis Output: **l**ektw-a**l**is	CC▪Ident-[lateral]	Corr-Stem▪[Lateral]	CC▪SyllAdj	Ident-[lateral]
☞ a.	lek.tw-a.**l**is, ℛ:**{l w l}**{k}{t}{s}	(0)	(0)	(0)	(0)
~ b.	**l**ek.tw-a.**r**is, ℛ:**{l}**{k}{t}{w}**{r}**{s}				W (0~1)
~ c.	**l**ek.tw-a.**l**is, ℛ:**{l l}**{k}{t}{w}{s}			W (0~1)	
~ d.	**l**ek.tw-a.**l**is, ℛ:**{l}**{k}{t}{w}**{l}**{s}		W (0~1)		
~ e.	**l**ek.tw-a.**l**is, ℛ:**{l k t w l}**{s}	W (0~2)			
☛ f.	**l**ek.tw-a.**l**is, ℛ:**{l k w l}{t}**{s}	e (0~0)	e (0~0)	e (0~0)	e (0~0)

The winning candidate in (a) has a bridged correspondence structure: Corr-Stem▪[Lateral] requires only that the laterals correspond with each other, but in this

[37] I have done these IPA transcriptions myself, based on Powell's (2009) explanation of the orthography. Any errors are my own.

candidate they also correspond with the intervening labial [w] (orthographically ⟨u⟩). The extraneous correspondence with [w] allows the laterals to correspond with each other without violating CC•SyllAdj, as in the comparison of (a)~(c). The faithful bridged candidate thus ties with the dissimilating alternative (b) on all of the surface correspondence constraints; the choice between them falls down to Ident-[lateral], which favors the faithful candidate over the dissimilating one.

The candidate in (a) is not the only viable bridged correspondence structure; the candidate in (f) is another plausible winner, indicated by the shaded finger. This candidate differs from (a) by also including the intervening [k] in the same correspondence class as the laterals. This extra correspondence incurs no CC•Ident-[lateral] violations, since labials and velars have no [±lateral]. However, it offers no improvement either: as long as the [l]s correspond with the intervening [w], they satisfy CC•SyllAdj. Adding another member to that correspondence class does not improve on its locality. CC•SyllAdj favors excessive correspondence only insofar as it results in a bridged correspondence structure.[38]

The words in (56) are the only remaining examples known to me that have both a coronal intervener and a non-coronal intervener. All have the /-alis/ form of the suffix; L-dissimilation does not occur. The lack of dissimilation in these forms is not explained in the bridging account of BG-blocking.

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[38] It is worth noting that the extraneous correspondence which underpins the blocking by bridging interaction does not produce interactions that are 'strictly local' in the sense of spreading-based theories (cf. Gafos 1999, Ní Chiosáin & Padgett 2001, a.o.). Candidate (55e) shows a forcibly-local structure, which can't win because no constraint favors it.

(56) Unexplained data under the bridging account of Latin BG-blocking:
   a. fulmin-alis   'of lightning'
   b. flamin-alis   'one who has been a *flamen* (type of priest)'
   c. Vulcan-alis   'of Vulcanus'   (Cser 2010:36)

The words in (56) have shapes very similar to the examples in (52), but do not pattern the same with respect to dissimilation. Compare (56b) *flamin-alis* vs. (52d) *limin-aris*: both contain the sequence /...lVmin-alis/, but L-dissimilation occurs in one and not in the other. Given this structural similarity, it's unlikely that these exceptions can be characterized in any coherent way, even in terms of factors that don't play any role in the analysis, such as foot structure.

8.4.3.5. Known Issues with the bridging account of Latin

The blocking-by-bridging interaction can only arise when dissimilation is driven by certain types of limiter constraints. In order for bridging to be optimal, the bridged correspondence structure that has an extraneous correspondence with an intervener must incur fewer limiter constraint violations than the alternatives with the bare minimum correspondence. This is possible with limiter constraints that require locality between correspondents, like CC·SYLLADJ. It is not possible with constraints of the CC▪EDGE family, such as CC▪EDGE-(Root) used in the analysis of R-blocking in §8.4.2 – no amount of extraneous correspondence can result in correspondents being on the same side of the root edge.

The dependence of bridging on CC·SYLLADJ makes it problematic to reconcile the bridging interaction with the full L-dissimilation pattern in Latin. The problem is that dissimilating /l/s are not always in non-adjacent syllables. Inputs with the sequence /...l-alis/ undergo L-dissimilation: *sol-aris* (**sol-alis*). In these cases, correspondence between the [l]s does not violate CC·SyllAdj, so this constraint does not favor dissimilation; this is shown in (57). The problematic result is that the desired, dissimilated, candidate (a) loses to the faithful & correspondent alternative (b).

(57) CC·SyllAdj as the limiter in L-dissimilation does not produce /LVL/→[LVR]

Input: sol-alis Output: sol-aris		CC·Ident-[lateral]	Corr-Stem·[Lateral]	CC·SyllAdj	Ident-[lateral]
☹ a.	so.l-a.**r**is, ℛ:{s}**{l}{r}**{s}	(0)	(0)	**(0)**	**(1)**
☠ b.	so.l-a.**l**is, ℛ:{s}**{l l}**{s}	e (0~0)	e (0~0)	**e (0~0)**	**L (1~0)**

None of the constraints posited in the bridging analysis of BG-blocking can favor L-dissimilation when there are no interveners. As such, dissimilation in LVL cases must be explained by some other constraint. It is far from obvious what might be the additional limiter constraint to force dissimilation in LVL cases. Obtaining the correct surface outcomes requires a constraint that would penalize [l]~[l] correspondence in [...l-alis] forms, but *not* penalize such correspondence when the [l]s are separated by other consonants. This is because the bridging correspondence structures win by having that correspondence: /leg-alis/ surfaces as [leg-alis], {l g l}{s} – with correspondence between the [l]s, and also between the suffix [l] and the root [g].

The other known issue with the blocking-as-bridging account proposed here is that it does not explain why rhotics block lateral dissimilation. Under the bridging analysis, {t n s d} are unacceptable bridges because they are [–lateral]; this means they are bad as correspondents of [l], because this violates CC·Ident-[lateral]. Because these consonants are bad as bridges, and so they support L-dissimilation. However, /r/ is also [–lateral], but it does *not* support L-dissimilation. The generalization that /r/ patterns with the *non*-coronals, and does not pattern with the other [–lateral] coronals, remains to be explained, and must also be analyzed in some other way.

8.4.3.6. Latin non-coronals in the big picture

Blocking of Latin L-dissimilation by intervening non-coronals reveals a hugely important empirical fact about segmental blocking: it is *not* necessarily tied to similarity. In Latin, the basic dissimilation pattern holds between /l/s – coronal lateral liquids. The labial & velar segments that block this dissimilation are not coronals, nor laterals, nor liquids. Consequently, it seems like it's not sufficient to have a theory of dissimilation that derives segmental blocking effects from similarity of blockers and dissimilators – a common theme in previous analyses (cf. Jensen & Strong-Jensen 1979, Steriade 1987, Odden 1994, Suzuki 1998, Krämer 1998, among others). It is not enough to say that dissimilation can be blocked by similar segments, e.g. in the way that rhotic liquids block L-dissimilation in Latin (see §8.6 for analysis). What we see with non-liquids in Latin is that the *more similar* intervening consonants – the coronals {t s n d} – are transparent for dissimilation, and it is the *less similar* consonants – the labials and velars – that act as blockers. The point is that segmental blocking of dissimilation is *not* intrinsically connected to similarity.

8.5. Georgian: blocking where intervention is crucial

This section considers the case of segmental blocking of dissimilation in Georgian (Fallon 1993), a pattern that the surface correspondence theory of dissimilation does not obviously explain. The segmental blocking effect seen in Georgian is a picture-perfect example of the type of blocking predicted by melodic-level OCP theories – the sort of account Steriade (1987) initially proposed for Latin. In other words, Georgian actually exhibits the kind of pattern that Latin L-dissimilation frequently – though erroneously, as Cser (2007/2010) points out – has been claimed to exhibit.

The dissimilation in Georgian is rhotic dissimilation, schematically represented in (58a). What happens is suffixal rhotics surface as laterals when attached to roots that contain another rhotic. The blocking generalization is observed for intervening laterals: if there is a lateral anywhere between two rhotics, then the dissimilation does not obtain. This blocking effect is schematized in (58b) below, and both blocking and dissimilation are exemplified in (59).

(58) Georgian, schematized (⟨⟩ mark stem edges; within the stem, – marks root edges)

a. R-dissimilation:

⟨...R...	–...R...⟩	→	⟨...R...	–...L...⟩

b. L-blocking (by intervening /l/ only):

⟨...R...L...	–...R...⟩	→	⟨...R...L...	–...**R**...⟩

(59) Georgian: illustrative data (Fallon 1993)

a.	⟨svan-uri⟩	'Svan (adj.)'	(*svan-uli; suffix is /-uri/)
b.	⟨asur-uli⟩	'Assyrian (adj.)'	(*asur-uri; /r...r/ → [r...l] dissimilation)
c.	⟨kartl-uri⟩	'Kartvelian (adj.)'	(*kartl-uli; R-dissimilation blocked)

What makes the Georgian case hard to explain in the surface correspondence theory is that the blocking effect cannot be framed in terms other than intervention. The Georgian data presented by Fallon (1993) clearly shows that intervention, in terms of linear order, is the crucial factor that determines whether dissimilation occurs. A sequence of two rhotics never exhibits R-dissimilation when there is a lateral intervening anywhere between them. These blocking laterals do not submit to any further generalizations: the intervening blocker /l/s cannot be characterized in terms of relative locality or position. This sets Georgian apart from the Latin R-blocking case analyzed in §8.4.2, where intervention can be reduced to a locality condition.

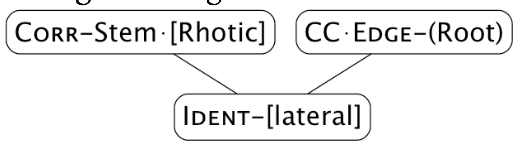
Section 8.5.1 presents the Georgian R-dissimilation pattern in more detail, and shows that it receives a straightforward analysis in the surface correspondence theory advanced here. Section 8.5.2 presents the empirical basis for the L-blocking effect, and shows that it is not explained by the basic analysis of the basic R-dissimilation pattern. Section 8.5.3 considers the blocking by bridging mechanism, and explains why it is not a plausible analysis of the blocking pattern in Georgian. Section 8.5.4 considers double dissimilation, the other known way that segmental blocking arises from surface correspondence. This approach can correctly derive blocking by intervening Ls, but at the cost of predicting 'peripheral blocking' (in the sense of Walsh-Dickey 1997) by *non*-intervening Ls as well. The problem, summarized in §8.5.5, is about directionality – a known issue in surface correspondence theory that this dissertation has not taken up.

8.5.1. Georgian R-dissimilation

8.5.1.1. The SCorr theory, applied to Georgian R-dissimilation

The Georgian R-dissimilation pattern receives a straightforward analysis in terms of surface correspondence, very similar to the analysis of Zulu labial dissimilation in chapter 7. The dissimilation alternation happens across the boundary between the root and a suffix containing /r/. This outcome is derived from correspondence being required within the stem, but Limited by the edge of the root. Thus, the relevant constraints are Corr-Stem▪[Rhotic], CC▪Edge-(Root), and Ident-[lateral], and the ranking obtained for the dissimilation is that in (60).

(60) Ranking for Georgian R-dissimilation



8.5.1.2. The R-dissimilation facts

Georgian has two liquid consonants, a rhotic /r/ and a lateral /l/[39]. Fallon (1993) observes that a number of suffixes display alternations between these two consonants, conditioned by the presence and distribution of liquids in the root. Chief among these alternating morphemes is the suffix /-uri/, which forms adjectives from nationalities and other nouns. This suffix is sufficient to illustrate the dissimilation pattern for our purposes, and some examples are given below. This data shows the basic dissimilation pattern, leaving aside the matter of blocking (taken up in §8.5.3).

The suffix /-uri/ emerges faithfully as [-uri] after roots containing no liquids, as well as roots containing /l/s but no /r/s. This is shown below in (61).

(61) Georgian: adjectival suffix /-uri/ (Fallon 1993)

a.	svan-uri	'Svan'	(*svan-uli; suffix has /r/, not /l/)
b.	p'olon-uri	'Polish'	
c.	kimi-uri	'chemical'	

After roots that contain an /r/, the same suffix surfaces as [-uli], manifesting the /r/→[l] dissimilation pattern. This is shown below in (62)-(66). As Fallon very astutely

[39] According to Fallon's (1993:106) review of previous work on Georgian, the segment transcribed here as ⟨l⟩ varies between [l] & [ɫ] (a velarized l), depending on the quality of the following vowel. The segment transcribed as ⟨r⟩ is generally produced as an alveolar tap, [ɾ].

points out, the R-dissimilation happens regardless of the distance between root /r/ and the suffix /r/, and regardless of the positions of the /r/s within their respective syllables. The two may be in adjacent syllables (62), or separated by one intervening syllable (63)–(65), or even more (66). And, as the examples in (63)–(66) also demonstrate, the /r/ in the root triggers dissimilation irrespective of its syllable role: it can be an onset (63), a coda (64), or one member of a complex onset (65), and the dissimilation occurs all the same. (Examples from Fallon 1993).

(62) Georgian: R-dissimilation between onsets of adjacent syllables

a.	asur-uli	‘Assyrian’	(*asur-uri; /r…r/ → [r…l])
b.	ungr-uli	‘Hungarian’	
c.	gmir-uli	‘heroic’	
d.	bulgar-uli	‘Bulgarian’	

(63) Georgian: R-dissimilation between onsets of non-adjacent syllables

a.	arab-uli	‘Arab’	(*arab-uri)
b.	amerik’-uli	‘American’	

(64) Georgian: R-dissimilation between coda and onset

a.	kart-uli	‘Georgian’	(*kart-uri)
b.	sp’ars-uli	‘Persian’	
c.	berd͡zn-uli	‘Greek’	
d.	part’i-uli	‘(of a) political party’	

(65) Georgian: R-dissimilation between onset cluster & head of onset[40]

a.	prang-uli	‘French’	(*prang-uri)
b.	ebra-uli	‘Jewish’	
c.	aprik’-uli	‘African’	

[40] The characterization of the two /r/s in terms of syllables is done assuming a basic “onsets first” algorithm for building syllables, with one exception: intervocalic [pr] & [br] clusters are assumed to be complex onsets. This is relevant only for the examples in (65), and is supported by the occurrence of [pr] as a word-initial onset in (65a).

(66) Georgian: R-dissimilation across multiple intervening syllables

a.	german-uli	'German'	(*german-uri)
b.	p'rusi-uli	'Prussian'	
c.	tʃerkez-uli	'Cherkessian'	
d.	ast'ronomi-uli	'astronomical'	
e.	gramat'ik'-uli	'grammatical'	

This one suffix /-uri/ is sufficient to demonstrate the dissimilation pattern of interest for the present purposes. However, Fallon (1993:108) provides a list of some half-dozen suffixes that also exhibit the same dissimilatory /l/→[r] alternation[41]. It is therefore empirically quite well-supported, and seems to be a productive case of long-distance dissimilation. Fallon also notes that there is a prohibition against the co-occurrence of multiple /r/s in native roots, though this will not be discussed in detail here.

Fallon (1993) also observes that there are some suffixes containing rhotics, which never show the alternation. An example is the first-person singular marker /-var/, derived from 'I am'; this suffix consistently surfaces with [r], even when it follows a root that contains another [r] (67). This is not the only non-dissimilating suffix (Fallon 1993:107 lists 10 others that also contain /r/ and do not alternate with [l]).

(67) Georgian non-dissimilating 1.sg. suffix /-var/: (Fallon 1993:107)

a.	/v-u-q'var-var/	→ v-u-⟨q'var⟩-var	'loves me'	*v-u-⟨q'var⟩-val
b.	/v-varg-i-var/	→ v-⟨varg-i⟩-var	'I am worth'	*v-⟨varg-i⟩-val

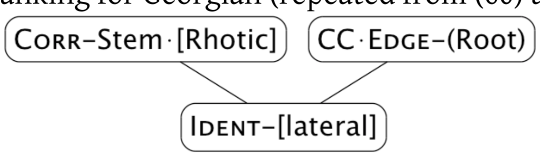
[41] Fallon's (1993:108) list gives 12 other dissimilating affixes besides -uri/-uli. However, some are circumfixes that contain the same suffixal component /-ari/. Interpreting these circumfixes as combinations of the same suffix with various prefixes reduces the number of dissimilating morphemes to about 5 (with the exact number depending on how many different senses of /-uri/ suffix are counted as the same suffix).

In Fallon’s account, these non-alternating suffixes are outside the scope of dissimilation. His analysis is framed in terms of level-ordered morphology[42], but the core intuition translates straightforwardly into the surface correspondence theory as a domain effect. Dissimilation happens only within the stem; these non-alternating affixes are explained as being outside the stem (parallel to the division between ‘inner’ and ‘outer’ suffixes made in Yidiny in §8.3).

8.5.1.3. Accounting for the R-dissimilation pattern

The basic ranking for Georgian is repeated in (68). The tableau in (69) gives the support for this ranking. It results in the correct background pattern of dissimilation presented above: /r/ in an affix dissimilates to [l] when the root contains /r/, regardless of how many segments or syllables stand between them.[43]

(68) Ranking for Georgian (repeated from (60) above)



(69) Core Ranking conditions: CORR-Stem▪[Rhotic], CC▪EDGE-(Root) » IDENT-[lateral]

Input: gramat’ik’-uri Output: ⟨gramat’ik’-uli⟩		CC▪EDGE-(Root)	CORR-Stem▪[Rhotic]	IDENT-[lateral]
☞ a.	⟨**gr**amat’ik’-u**l**i⟩, 𝓡:{g}**{r}**{m}{t’}{k’}**{l}**	(0)	(0)	(1)
~ b.	⟨**gr**amat’ik’-u**r**i⟩, 𝓡:{g}**{r}**{m}{t’}{k’}**{r}**		W (0~1)	L (1~0)
~ c.	⟨**gr**amat’ik’-u**r**i⟩, 𝓡:{g}**{r r}**{m}{t’}{k’}	W (0~1)		L (1~0)

[42] On Fallon’s account, the non-alternating suffixes are attached at a later derivational stage, after R-dissimilation occurs.

[43] This sketch of an analysis does not explain why the dissimilation happens from left to right (or from root to suffix). This is prelude to the issue of directionality, discussed later, which is what makes the blocking tricky to account for.

So, the basic pattern of Georgian R-dissimilation is simple fare for the Surface Correspondence Theory of Dissimilation. The dissimilatory alternation in itself poses no problem, and involves constraints & ranking conditions familiar from other analyses developed previously (in this chapter, and earlier, e.g. Zulu). Now, let's turn to the L-blocking effect.

8.5.2. Blocking by intervening L

8.5.2.1. Empirical basis for blocking

The blocking generalization Fallon (1993:110) observes is that an /r…r/ sequence fails to dissimilate if there is an /l/ between the two /r/s; that is, an input of the form /r…l…r/ surfaces as [r…l…r] (i.e. faithfully), not as [r…l…r] (the expected result of /r/-dissimilation).

The 'blocking' effect is observed when the /-uri/ adjectival suffix is attached to roots containing an /r…l/ sequence. After these roots, the suffix appears as [-uri], not the dissimilated alternative [-uli], as shown in (70). This is in contrast to the pattern seen in (63)–(66), where consonants other than /l/ intervene between the /r/s, but have no effect on the dissimilation. It is crucially only an *intervening* /l/ that prevents dissimilation.

(70) Georgian: intervening /l/ blocks R-dissimilation

a.	kartl-uri	'Kartvelian; of Kartli'	(*kartl-uli; no R-dissimilation)
b.	ast'ral-uri	'astral, of the stars'	
c.	avst'rali-uri	'Australian'	
d.	ant'iimp'erialist'-uri	'anti-imperialist'	
e.	moral-ur-	'moral'	
f.	parlament'-uri	'parliamentary'	
g.	ʧrdilo-uri	'northern'	
h.	mk'rexel-uri	'(church)-robbing'	

The examples in (70) also show that the blocking effect exhibited by /l/ is independent of the proximity of /l/ relative to either /r/. In other words, the generalization is not something like "/r/ fails to dissimilate when the previous syllable contains an /l/". The forms above show that the blocking /l/ may be directly adjacent to the /r/ in the root, or separated from it by other segments (compare, e.g. [pa**rl**ament-uri] vs. [ka**r**t**l**-uri]). Similarly, the /l/ blocks dissimilation when it is in a syllable adjacent to one of the /r/s, but also blocks in exactly the same way when it is separated by one or more intervening syllables. This is evident in forms like [par**l**<u>ament-u</u>**r**i], and [mk'**r**<u>exe</u>**l**-uri]. There is no apparent generalization about how close /l/ must be to either of the /r/s in order to block dissimilation between them.

The failure of dissimilation *is* dependent on the linear order, though. An /l/ blocks dissimilation only when it intervenes between the two /r/s. This can be seen in the contrast between (70) above, and (71)–(72) below. When the root /l/ stands between the two /r/s, the blocking happens – there is no dissimilation (70). But, there *is* dissimilation as normal – and no blocking – when an /l/ precedes both of the /r/s (71). By the same token, an extra preceding /l/ does nothing to stop a second /l/ from blocking dissimilation, as seen in (72) - the absolute number of /l/s and /r/s does not matter in and of itself, it's not anything like a majority rules situation.

(71) Georgian: non-intervening /l/ does not affect blocking of R-dissimilation

a.	bulgar-uli	'Bulgarian'	(=(62a); no blocking by non-intervening /l/)
b.	liberal-ur-	'liberal'	(blocking not 'un-blocked' by 2^{nd} /l/)

Roots containing /r…l…r/ further confirm that the 'blocking' interaction is based on relative linear order of the liquids: in roots of this shape, the suffix /r/ *does* dissimilate, as normal (72). This shows that the mere presence of an /l/ in the root is not sufficient to prevent dissimilation. Dissimilation fails only for those /r/s which have an /l/ intervening between them; it does not fail for the entire word.

(72) Georgian: R-dissimilation not blocked for /r…l…r…-r/ sequences

a.	t͡sremlmire-uli	'to be in tears'	(dissimilation 'un-blocked' by later /r/)
b.	p'arlament'ar-uli	'parliamentary'	
c.	rd͡ʒul-ieri	'canonical'	(suffix /-ieri/; same pattern)

To recap: the generalization is clearly that R-dissimilation in Georgian fails if, and only if, an /l/ intervenes anywhere between the two /r/s. The available data clearly show that /l/ prevents two /r/s from dissimilating only when it stands between them: the presence of an /l/ in a word is not enough to block R-dissimilation (71)–(72). Beyond intervention in the linear string, the position of the blocker /l/ is not significant.

8.5.2.2. Blocking by L does not follow from the basic analysis

The basic Surface Correspondence account of Georgian R-dissimilation sketched out in §8.5.1 fails to capture the blocking generalization. The ranking given in (68) above predict that the suffix /-uri/ should dissimilate to [-uli] after *any* root containing an /r/. The two /r/s face the same conflicting surface correspondence demands even when an /l/ intervenes between them. This is shown in the tableau in (74): the ranking necessary to favor dissimilation in the basic case still favors dissimilation when an intervening /l/ is present, picking the dissimilated candidate (a) over both of the faithful candidates (b) & (c).

(73) The basic ranking's prediction: /l/ shouldn't block dissimilation

Input: ka**r**tl-u**r**i Pred: *ka**r**tl-u**l**i		CC • EDGE- (Root)	CORR-Stem • [Rhotic]	IDENT- [lateral]
☹ a.	ka**r**tl-u**l**i, 𝓡:{k}**{r}**{t}{l}**{l}**	(0)	(0)	(1)
~ b.	ka**r**tl-u**r**i, 𝓡:{k}**{r}**{t}{l}**{r}**		W (0~1)	L (1~0)
~ c.	ka**r**tl-u**r**i, 𝓡:{k}**{r r}**{t}{l}	W (0~1)		L (1~0)

Thus, the basic analysis of the Georgian R-dissimilation pattern is inadequate, because it does not explain the blocking effect. The constraints responsible for the dissimilatory interaction between the two /r/s are not sensitive to the presence of an intervening /l/; it is treated in exactly the same way as the other inert consonants (that is, the intervening [l] in [kartl-uri] is treated in exactly the same way as the intervening [t]). The fact that intervening [l] does not behave like intervening [t] in the actual data is left unexplained.

8.5.3. Georgian blocking does not work as bridging

The blocking by bridging approach doesn't work as an explanation for the Georgian blocking pattern. The bridging interaction can lead to blocking in cases where the dissimilation is spurred by a locality-based limiter constraint, but not with all limiters. Specifically, the bridging mechanism can*not* lead to blocking of the sort observed in Georgian, which is dependent *only* on linearity, and not at all on locality (as noted above).

The tableau in (75) illustrates the problem, based on (74) above. Candidates (a) through (c) are the same as in (74); the added candidate in (d) forces the intervening /l/ to interact with the /r/s, by partitioning it into the same correspondence class as both of them. This candidate is harmonically bounded by (c) on these constraints: it incurs an additional CC▪EDGE violation, and offers no improvement on any other constraint.

(74) Edge-based dissimilation is not affected by extra intermediate correspondents:

Input: kartl-uri Obsv'd.: kartl-uri		CC▪EDGE-(Root)	CORR-Stem▪[Rhotic]	IDENT-[lateral]
☹ a.	kartl-uli, $\mathcal{R}$:{k}**{r}**{t}{l}**{l}**	(0)	(0)	(1)
~ b.	kartl-uri, $\mathcal{R}$:{k}**{r}**{t}{l}**{r}**		W (0~1)	L (1~0)
~ c.	kartl-uri, $\mathcal{R}$:{k}**{r r}**{t}{l}	W (0~1)		L (1~0)
☠ d.	kartl-uri, $\mathcal{R}$:{k}**{r l r}**{t}	**W** **(0~2)**		L (1~0)

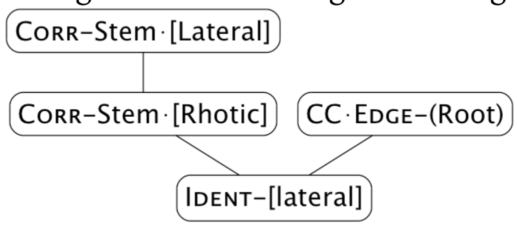
Recruiting the intervening [l] into correspondence with the [r]s does not block the dissimilation, since the limiter constraint which drives it is based on cross-edge correspondence, not locality. In the bridging interaction, correspondence can be supported by an intervening segment, and this can lead to blocking – but it can't do so not in Georgian, where the dissimilation is obviously not dependent on locality considerations, and therefore is presumably not driven by a locality-based Limiter constraint.

There is a further problem for a bridging analysis of the blocking pattern in Georgian: there doesn't appear to be any way to characterize the strings of interveners that allow bridging vs. those that do not. The blocking by bridging interaction requires that some constraint(s) favor a bridged correspondence structure in the situations where dissimilation is blocked, and disfavor the bridged structure where dissimilation occurs. In Georgian, the generalization is that a string of intervening material blocks R-dissimilation if it contains an [l] *anywhere inside it*. In a blocking by bridging approach, this means that some constraint(s) must favor [r]~[r]~[l] correspondence in sequences like [r…l…m…n…r] (as seen in (70e), [parlament'-uri]), while disfavoring [r]~[r] correspondence in very similar sequences like [r…n…m…r] (as in (66d) [ast'ronomi-uli]). It is far from obvious what constraint(s) might play this role in Georgian. If two [r]s correspond with an intervening [l], the result is a correspondence structure that necessarily *violates* CC▪IDENT-[lateral], but it's not a structure that necessarily *satisfies* anything. A bridging analysis of blocking in Georgian is implausible because no constraint systematically favors the requisite {r l r} correspondence.

8.5.4. Georgian blocking does not work as double dissimilation

The Georgian L-blocking pattern also cannot be explained as double dissimilation. This is because /l/ blocks R-dissimilation if and only if it intervenes between the (non)-dissimilating /r/s; however, no interaction between two dissimilation derives this type of intervention condition. To illustrate the problem, let us suppose a double-dissimilation treatment of blocking along the same lines as Latin (§8.4), where a second CORR constraint, CORR-Stem▪[Lateral], together with the same Limiter constraint, CC▪EDGE-(Root), forms a second system of lateral dissimilation. This is shown in (75).

(75) Ranking obtained for Georgian blocking as double dissimilation[44]



This double dissimilation ranking correctly handles a portion of the L-blocking generalization. It results in the failure of R-dissimilation when, and only when, it results in a stem that contains two laterals. Thus, it correctly handles data like (70).

Where the ranking in (75) goes wrong is the treatment of *non*-intervening /l/s. The empirical generalization is that blocking occurs only when an /l/ intervenes between the two [r]s; non-intervening /l/s do not lead to blocking: /bulgar-uri/ → [bulgar-uli] (71a), *bulgar-uri. But, the outcome of the ranking in (75) is that an /l/ *anywhere in the stem* will block R-dissimilation. The surface correspondence constraints involved in this system make no reference to relative linear order (neither directly nor indirectly). This is problematic for the analysis of Georgian, since the relative order of the liquids is empirically significant. The incorrect result is shown in the tableau in (76).

[44] Not all of these dominance relations are crucial; for simplicity, I have presented just one of two disjunctive possibilities.

(76) Corr-Stem▪[Lateral] » Corr-Stem▪[Rhotic]: /r/-dissimilation blocked by non-intervening /l/

Input: bulgar-uri Obsv'd: bulgar-uli		Corr-Stem▪ [Lateral]	CC▪Edge- (Root)	Corr-Stem▪ [Rhotic]	Ident- [lateral]
☹ a.	bulgar-uri, ℛ:{b}{l}{g}{r}{r}	(0)	(0)	(1)	(0)
☹ b.	bulgar-uri, ℛ:{b}{l}{g}{r r}		W (0~1)	L (1~0)	
☠ c.	bulgar-uli, ℛ:{b}{l}{g}{r}{l}	W (0~1)		L (1~0)	W (0~1)
☠ d.	bulgar-uli, ℛ:{b}{l l}{g}{r}		W (0~1)	L (1~0)	W (0~1)

The ranking from (75) predicts that dissimilation should fail for the input /bulgar-uri/ in (71), since dissimilation leads to a form with two [l]s on opposite sides of the root edge. The dissimilating candidates in (c) & (d) match the observed output form [bulgar-uli]. However, candidate in (c) is ruled out by the undominated Corr▪[Lateral] constraint (the alternative option in (d) is not ruled out by Corr▪[Lateral], but it is harmonically bounded by (b)). The inescapable prediction is that if dissimilation is blocked by an intervening /l/ as in (70), then it must be blocked here as well: a prediction at odds with the empirical reality.

It should be noted that this prediction about blocking is not inherently problematic. The result derived in (76) represents what Walsh-Dickey (1997:158) calls 'peripheral blocking', dissimilation is blocked by a non-intervening segment. This phenomenon is actually attested in Yidiny (as analyzed above in §8.3), so the prediction that blocking can happen without linear intervention is by no means a "pathology of the theory". However, it happens not to be the right prediction for the particular case of segmental blocking found in Georgian.

8.5.6. Georgian in the empirical landscape

In Georgian, R-dissimilation is blocked by just non-rhotic liquids – /l/s – and is blocked by all & only /l/s that intervene between the dissimilators. In other words, Georgian actually exhibits the kind of pattern that Latin L-dissimilation is purported to exhibit (cf. Jensen & Strong-Jensen 1979, Steriade 1981, but also Cser 2007/2010). The blockers have the same feature that defines the dissimilators, but with the opposite value (i.e. [+lateral] vs. [–lateral]). And, the blocking effect is demonstrably conditioned by just linear intervention: it cannot be reduced to locality, or position, or any other factor I know of. As such, it defies explanation by both bridging and double dissimilation, the two known mechanisms that produce blocking in SCTD.

The problem Georgian poses is, at its core, a matter of linear directionality asymmetries among correspondents. Directionality is a much more general issue in surface correspondence theory. The problem is *not* that the type of dissimilation pattern seen in Georgian cannot be explained by the surface correspondence theory – it can (and in fact it *is*). The problem is also not that intervening consonants behave as blockers for dissimilation – this too can be explained with slight modification to the theory (i.e. the addition of new constraints). What the problem *is*, is that intervening laterals block R-dissimilation *but non-intervening laterals do not*; it is the combination of these two patterns. The theory advanced here does not offer any obvious and sensible way to formulate constraints that refer to linear order directly. In other words, the crux of the issue is how the surface correspondence constraints can separate inputs of the form /R…L…–R/ from /L…R…–R/, without referring to locality, or domains, or syllable roles, etc.

Unfortunately, I do not know of any promising means of making surface correspondence constraints sensitive to linear order relations in the way needed to get the right combination of blocking effects for Georgian. The surface correspondence theory is, by nature, rooted in the similarity between consonants instead of their linear order – the theory has been constructed specifically not to be able to produce this type of sensitivity to intervening material.

One final point worth noting is that the problem posed by Georgian L-blocking is not unique to the particular formalization of the surface correspondence relation proposed in ch. 2. Specifically, the problem of directionality is not tied to correspondence being a symmetric relation, a significant difference between the theory advanced here and some previous work (cf. Walker 2000b, 2001; Hansson 2001/2010). Treating correspondence as an asymmetric relation does not make the CORR constraints sensitive to intervening consonants; and, as Rose & Walker (2004) point out, this insensitivity to intervening material is a highly desirable property of the theory in any case.

Two other empirical observations are worth noting. First, Georgian is probably not a one-off case of blocking by only interveners. Second, these cases show that blocking by interveners is not a necessity. A number of other Kartvelian languages have comparable patterns of R-dissimilation (Svan – Tuite 109; Mingrelian – Harris 1991), and there is reason to think Georgian may not be the only one with blocking effects. Tuite (1997:18) reports that Svan has cross-dialectal variation for how R-dissimilation works after roots with both /r/ & /l/: some dialects have dissimilation after /r…l/ sequences, while others do not.[45] As such, it's reasonable to expect that some of these languages have the same kind of blocking effects as Georgian. Others, however, would seem not to have the L-blocking pattern. This means that in at least some languages, R-dissimilation can occur across an intervening /l/. This is a problem for intervention-based theories of dissimilation blocking. If rhotics and laterals are represented as [–lateral] & [+lateral] on the same tier, then the classical OCP approach has an easy time explaining blocking of R-dissimilation by an intervening /l/; but it does not offer an explanation for languages where no such blocking occurs.

8.6. Conclusion

In this chapter, I have considered the issue of segmental blocking of dissimilation, a topic of much interest in the previous literature on dissimilation. I have shown that segmental blocking of dissimilation can be analyzed using the surface correspondence theory of dissimilation developed in this dissertation. The theory is by no means "incompatible" with blocking effects (cf. Hansson's 2007 parallel observation about correspondence & harmony).

The surface correspondence theory offers at least two plausible interpretations of blocking patterns. In the blocking by bridging interaction, dissimilation fails because extraneous correspondence with the blocker segment remedies violations of the Limiter constraint. This offers a way to analyze the blocking of lateral dissimilation by non-coronals in Latin (§8.4). This is a significant point of progress: alternative OCP-

[45] The one example Tuite gives is [zural-eːl] 'women' in the Lashx dialect, compared to [zural-æːr] in the Upper Bal dialect. From these two examples, it appears that /r…l…r/ surfaces with dissimilation as [r…l…l] in one dialect, but as [r…l…r] in the other, with dissimilation being blocked.

based theories of dissimilation offer no explanation for why [k] blocks dissimilation of /l/ to [r], despite sharing no features with [l] or with [r].

The other mechanism by which blocking can be derived is double dissimilation. This is not a new idea; the point made here is that this interaction can happen in the surface correspondence theory as in OCP-based approaches. And, because different dissimilation systems can have CORR constraints with different domains, and can be based on different Limiter constraints, the surface correspondence theory can produce double dissimilation systems with various different properties. Thus, it offers an explanation for the "peripheral" blocking in Yidiny, where the blocker does not intervene between the dissimilators, but also allows double dissimilation to be more restricted, using locality limits to derive blocking by only intervening consonants as seen with Latin rhotics.

The one hanging problem is the relationship between segmental blocking and intervention - a problem tied to the broader issue of directionality effects. The Yidiny case (§8.3) shows that blocking segments do not intrinsically need to be interveners. But, the Georgian case shows that they *can* be. This result is not demonstrably out of reach of the correspondence theory of dissimilation, but I don't have an explanation for it here. The puzzle is how the theory can impose asymmetries on correspondence-driven phenomena based on the relative order of the segments involved – a problem not taken up in this dissertation.

8.7. Appendix: the typology of segmental blocking

Segmental blocking of dissimilation appears to be a relatively rare phenomenon. The three cases that have been analyzed in this chapter are the only clear known examples of segmental blocking of a long-distance, consonant-to-consonant dissimilation pattern by another consonant. Some other cases of segmental blocking are reported, but they are either not consonant-to-consonant interactions, or are empirically tenuous (or both). These other reported cases of blocking effects are summarized in (77), and discussed below.

(77) Known cases of long-distance dissimilation with segmental blocking effects

Language	*Dissim. type*	*Blocking segment(s)*	*Source*
Latin	Lateral	intervening root-final rhotics *and* intervening non-coronals	Jensen & Strong-Jensen 1979, Steriade 1987, Hurch 1991, Cser 2007/2010
Yidiny	Lateral	preceding, non-intervening, rhotics	Dixon 1977, Walsh-Dickey 1997, Suzuki 1998
Georgian (and others)	Rhotic	intervening laterals	Fallon 1993
Akkadian	Labial	root-initial /u w/ (sometimes deleted; *not* surface [u w])	Barth 1887, Hume 1992, Odden 1994, Suzuki 1998
Gurindji (and others)	NC cluster dissimilation	intervening non-continuants (all stops and all nasals)	McConvell 1988, Odden 1994
Tzutujil (diachronic)	Backness? (velar fronting before dorsals)	intervening /o/, when segment-adjacent to both dissimilators	Ohala 1993, Campbell 1977
Dahl's Law	Voiceless	everything but [k]	Suzuki 1998, Davy & Nurse 1982

8.7.1. Akkadian: /u w/ blocks labial dissimilation

Akkadian is not analyzed here for two reasons: because the "blocker" segments are vowels and not consonants, and because the validity of the generalization is suspect. The Akkadian pattern is labial dissimilation: the prefix /ma-/ (78a) normally surfaces as [na-] before a root containing a labial (78b). The reported blocking generalization (Odden 1994:321; see also Hume 1994:113, Suzuki 1998:112)[46] is that the /ma-/ prefix surfaces with the non-dissimilated form [m] when there is an intervening [u] or [w].

[46] Hume, Odden & Suzuki all attribute the Akkadian data to Von Soden (1969:64-66). I consulted Von Soden's book, but failed to locate these examples.

This is illustrated by the examples in (78c) (examples from Hume 1994, originally from Von Soden 1969).

(78) Akkadian: Labial dissimilation: /ma-...B/ → [na-...B]

a.	ma-ʃkanu-m	'place'		
b.	me-ereʃu-m	'plantation'		
c.	mi-i-ʃaru-m	'justice'		
d.	ma-zuukt	'mortar'		
	(prefix /ma-/)			
e.	/ma-rkabt/	→ na-rkabt	'chariot'	
f.	/ma-lmenu/	→ ne-lmenu	'loss, damage'	
g.	/ma-raamu-m/	→ na-raamu-m	'favourite'	
	(/m/→[n] dissimilation before [b p m]; *[ma-rkabt], etc.)			

(79) Akkadian: Labial dissimilation blocked by intervening /u/? (data from Hume 1994:113)

a.	mu-ʃeepiu-m	'work leader'
b.	mu-uʃabu-m	'seat'
c.	mu-ʃpalu-m	'deep'
d.	mu-nnab(it)tu-m	'fugitive'
e.	mu-ʃteepiʃtu	'to leave one baffled'
f.	ma-amiitu-m	'oath' (</ma-wmii-t-u-m/?)
	(dissimilation blocked by [u]; *[nu-ʃeepiu-m], etc.)	

Unfortunately, it is not clear that the Akkadian blocking pattern is adequately supported. The six examples in (79) appear to be the entirety of the supporting data that supports the blocking generalization. In literature on Akkadian, I have found no mention of this blocking effect.[47] Barth (1887) was, I believe, the first to point out the dissimilatory [m]~[n] alternation; he describes it as a generally systematic pattern, and makes no mention of systematic failure of dissimilation related to [u], or any other segment. Barth (1887:116) does note two exceptions, [mu-šab] and [ma-mit] (no glosses given). One of these, [mu-šab], has the [u] which is reported to block dissimilation;

[47] The Akkadian sources I consulted include Barth (1887), Berkooz (1937), Caplice & Snell (1988), Ungnad et al. (1992), Miller & Shipp (1996), and Huehnergard (2005).

however, Berkooz (1937:52) notes that in the Nuzi dialect of Akkadian, this form *does* dissimilate (to [nu-šab-]), so its quality as an example of blocking may be suspect. The other exception noted by Barth, [ma-mit], is the same root as in [ma-amiitu-m] 'oath' (79f). Odden (1994) analyzes this root as /wmii/, with the blocking of dissimilation being attributed to an underlying round segment /w/. Blocking in this form obviously cannot be explained by surface correspondence, since the alleged blocker is not realized in the surface form.

For the remainder of the examples in (79), it is worth noting that the blocker [u] is always directly adjacent to the prefix /m/, and is in the prefix rather than the root. There are no forms like [ma-ʃulib], where labial dissimilation is blocked by an [u] in the root that is not directly adjacent to the prefixal /m/. As such, it's not really evident that Akkadian exhibits labial dissimilation that is blocked by intervening [u]. The only generalization that's evident from (79) is that a prefix [mu-] does not dissimilate, and even this generalization seems to be supported by just five examples in total. From the data in (78)-(79), it is nearly as accurate to say that [ʃ] blocks labial dissimilation as it is to say that [u] blocks it. For these reasons, I do not consider Akkadian to be a legitimate example of segmental blocking of dissimilation.

If the Akkadian case *is* treated as genuine, it poses an obvious problem for a surface correspondence analysis: it's not a consonant-to-consonant interaction. If [u] blocks dissimilation, it cannot be because [u] is required to correspond with [m], or is permitted to correspond with [m], or anything of the sort. The surface correspondence relation holds over surface consonants, so the SCTD has no bearing on interactions between consonants and vowels like this.

8.7.2. Gurindji: Nasals & Stops block NC-cluster dissimilation

Blocking in Gurindji is not analyzed here in detail because the dissimilation is not between single consonants, but rather between clusters. The dissimilation generalization in Gurindji (and shared by a number of related languages; see appendix for details) is that Nasal + Consonant clusters alternate with either singleton non-nasal consonants, or with clusters of two non-nasals, when they follow another Nasal + Consonant cluster. This is illustrated schematically in (80). When the second NC sequence is homorganic, the nasal is deleted (81), (82) (examples from McConvell 1988:137-138). When the second NC cluster is heterorganic, its nasal may change to a non-nasal stop instead of deleting (83). In both cases, a sequence of two NC clusters surfaces with only one such cluster.

(80) Gurindji NC dissimilation

a.	NC…NC	→	NC…ØC	(if second cluster is homorganic)
b.	NC…NC	→	NC…CC	(if second cluster is heterorganic)

It should be noted that there are some assorted minor differences between these two alternation patterns; the distinction is not strictly between homorganic and heterorganic clusters. McConvell (1988) notes that the N~C alternation in (80b) may occur across word boundaries, whereas its deletion counterpart (80a) does not. It also depends on the quality of the second consonant in the second NC cluster: all speakers do the N~C alternation (80b) when the second cluster is a nasal + stop sequence; some speakers also do it when the second cluster is a nasal + liquid or nasal + glide sequence; and, some speakers also apply denasalization in nasal + nasal clusters.

(81) Gurindji NC dissimilation results in deletion of second N[48]
   a. [lutcu-ŋka] ‘on the ridge’
      (locative suffix /-ŋka/)

   b. /pinka-ŋka/ → [pinka-ka] ‘at the river’
   c. /wiɲci-ŋka/ → [wiɲci-ka] ‘at the spring’
      (dissimilatory loss of suffix /ŋ/ after /...nk.../; *[pinka-ŋka], etc.)

(82) Gurindji NC dissimilation yields N-deletion in other suffixes as well
   a. /kaɲcu-mpal/ → [kaɲcu-pal] ‘across below’
      (NC dissimilation in suffix /-mpal/ ‘across’)

   b. /tanku-ɳʈaɳ/ → [tanku-ʈaɳ] ‘always eating’
      (NC dissimilation in suffix /-ɳʈaɳ/ ‘always consuming X’)

   c. /cunpa-ŋku/ → [cunpa-ku] ‘with a song’
      (NC dissimilation in ergative/instrumental suffix /-ŋku/)

   d. /paɳku-ŋkuɾa/ → [paɳku-kuɾa] ‘towards a cross-cousin’
      (NC dissimilation in allative suffix /-ŋkuɾa/)

(83) Gurindji NC dissimilation yields nasal ~ stop alternations in heterorganic contexts
   a. /ɲampa-n-pula/ → [ɲampa-t-pula] ‘what [did] you two [see]?’
      (NC dissimilation changes second NC to CC; *[ɲampa-n-pula], *[ɲampa-Ø-pula])

   b. /ɲatcaŋ-pa-n-pula/ → [ɲatcaŋ-pa-t-pula] ‘how many [did] you two [see]?’
      (*[ɲatcaŋ-pa-n-pula], *[ɲatcaŋ-pa-Ø-pula])

   c. /ɲuntu-waɻiɲ-cu/ → [ɲuntu-waɻic-cu] ~ [ɲuntu-waɻiɲ-cu] ‘you alone (erg.)
      (optional NC dissimilation: /nt...nc/ → [nt...cc])

The Gurindji data presented by McConvell clearly shows that this is an interaction involving clusters, and not single segments (as McConvell astutely points out throughout). In the cases where both NC sequences are homorganic, they could be interpreted as prenasalized stops, and the dissimilation would thus be a consonant-to-

[48] I have converted McConvell’s transcriptions into IPA. Gurindji does not make a distinction between voiced and voiceless stops; I have shown them all as voiceless. The consonants McConvell describes as ‘lamino-palatal’ are given here as palatal [c ɲ].

consonant interaction. But, the forms in (81b), (82b-d) have *heterorganic* NC sequences [nk np ɳk], which offer no such interpretation as single consonants. The examples in (84) also show that this dissimilation occurs following NC clusters formed by morpheme concatenation – clusters that are not systematically present underlyingly. Finally, the examples in (85) show that no dissimilation happens for nasals that are not in clusters. The pattern is *not* straightforward dissimilation of nasality: it's dissimilation of nasal+stop clusters exclusively. The example in (85b) also shows that the domain of scope for this dissimilation is the word[49].

(84) Gurindji NC dissimilation is induced by derived clusters (McConvell 1988:139)
  a. /ŋaɻin-kuɲca/→ [ŋaɻin-kuca] 'lacking meat' (*[ŋaɻin-kuɲca])
     (NC dissimilation in suffix /-kuɲca/ 'lacking', when after root-final nasal)

  b. /ɲin-kumpalŋ/ → [ɲin-kupalŋ] 'to avoid drowning' (*[ɲin-kumpalŋ])
     (NC dissimilation in suffix /-kumpalŋ/ 'lest', when after root-final nasal)

(85) Gurindji NC dissimilation does *not* affect lone nasals
  a. /ŋawa-ɳʈaɳ/ → [ŋawa-ɳʈaɳ] 'always drinking'
     (*[ŋawa-ɳʈaØ]; NC dissimilation happens only to Ns in clusters)

  b. /tampaŋ kaɾi-ɲa/ → [tampaŋ kaɾi-ɲa] 'he died'
     dead be-PAST
     (*[tampaØ kaɾiɲa], *[tampaŋ kaɾica], [tampaŋ kaɾiØa])
     (NC dissimilation happens only to NC clusters, and only those in the same word)

The blocking generalization reported for Gurindji (McConvell 1988:140; see also Odden 1994:303) is that NC dissimilation in Gurindji fails in the context of intervening non-liquids. Thus, dissimilation occurs when liquids or glides intervene between the

[49] Following McConvell (1988), the word consists of the root, prefixes and suffixes, and pronominal enclitics.

two NC sequences (86), even across numerous syllables (e.g. 86c). But, NC dissimilation does not occur across an intervening stop (87), or an intervening nasal (88).

(86) Gurindji NC dissimilation occurs across intervening liquids & glides

a. /kankula-mpa/ → [kankula-pa] 'on the high ground'
   (NC dissimilation happens across intervening [l]; *[kankula-mpa])

b. /waɲci-waɭa-ŋku/ → [waɲci-waɭa-ku] 'which (foc.) is [yours]?'[50]
   (NC dissimilation across intervening morpheme [waɭa]; *[waɲci-waɭa-ŋku])

c. /ɲampa-wu-waɭa-ji-nta/ → [ɲampa-wu-waɭa-ji-nta]
   'why [did] you lot [look] at me?'
   (NC dissimilation across 4 syllables; *[ɲampa-wu-waɭa-ji-nta])

(87) Gurindji NC dissimilation does *not* occur across an intervening stop

a. /waɲci-ŋka-nta/ → [waɲci-ka-nta] 'where are you lot?'
   (*[waɲci-ka-ta]; no NC dissimilation across intervening [k])

b. /nampijita-wuɲca/ → [nampijita-wuɲca] '(animal) lacking a female'
   (*[nampijita-wuca]; no NC dissimilation across intervening [t])[51]

c. /paɳku-ʈi-ŋkuɾa/ → [paɳku-ʈi-ŋkuɾa] 'towards as cross-cousin'
   (*[paɳku-ʈi-kuɾa]; no NC dissimilation across intervening [ʈ])

d. /ŋu-ŋantipa-ŋkulu/ → [ŋu-ŋantipa-ŋkulu] 'they [saw] us'
   (*[ŋu-ŋantipa-kulu]; no NC dissimilation across intervening [p])

[50] The examples in (88) are words extracted from full sentence examples that McConvell gives. The portions of the glosses in square brackets are not contributed by these words.

[51] The suffix in this example is the same morpheme as [-kuɲca] in (84a) above. McConvell notes that [p k] generally lenite to [w] intervocalically in suffixes.

(88) Gurindji NC dissimilation does *not* occur across an intervening nasal

a. /kuja-ŋka-ma-ŋku/ → [kuja-ŋka-ma-ŋku]
'it was for that reason that he [hit] you'
(*[kuja-ŋka-ma-Øku]; no NC dissimilation across [m])

b. /ŋu-n-cunu-ŋkuɭa/ → [ŋu-n-cunu-ŋkuɭa] 'you [put] it on yourself'
(*[ŋu-n-cunu-Økuɭa]; no NC dissimilation across [n])

c. /ŋanta-ɳa-ŋku/ → [ŋanta-ɳa-ŋku] 'I want [to go] to you'
(*[ŋanta-ɳa-Øku]; no NC dissimilation across [ɳ])

d. /ɲampa-ŋala-ŋkulu/ → [ɲampa-ŋala-ŋkulu] 'what [will] they [give] us?'
(*[ɲampa-ŋala-Økulu]; no NC dissimilation across [ŋ])

The Gurindji blocking pattern is clearly different from the segmental blocking effects in Latin, Georgian, and Yidiny: in the Gurindji case, the dissimilators are not a class of consonants, but rather a class of clusters. And, what the dissimilation changes is a property of clusters, and not of individual segments. So, the pattern cannot be characterized as an interaction between two dissimilator segments, with failure due to blocker segments. This is because the dissimilation is contingent on the presence of another consonant after each nasal. It requires reference to more than 4 classes of segments, and also to particular structural arrangements among them. It is not clear to me how any theory of segmental dissimilation, including the one advanced in this dissertation, can explain this kind of cluster-to-cluster interaction.

8.7.3. Tzutujil: [o] blocks backness dissimilation

The dissimilatory generalization for Tzutujil is that the Proto-Quichean velars *k & *k' became palatalized velars in Tzutujil when followed by another velar or a uvular (Ohala 1993). This diachronic palatalization is seen in forms like (89). Ohala interprets this as dissimilation for the feature "BACK-VELAR" – the velars are fronted before another back consonant in a CVC root.

(89) Tzutujil: diachronic "backness" dissimilation (Campbell 1977, via Ohala 1993)

	*Proto-Quichean		Tzutujil		
a.	*keːx	>	kʲeːx	'horse'	(not keːx; velar fronted)
b.	*k'aq	>	k'ʲaq	'flea'	(not k'aq)

The blocking generalization for the Tzutujil case is that this dissimilatory fronting of velars does not occur when the intervening vowel is [o]. This is illustrated in (90).

(90) Tzutujil: no backness dissimilation across [o]

	*Proto-Quichean		Tzutujil		
a.	*koxl	>	kox	'cougar'	(not kʲox; *no* fronting, cf. 89a)
b.	*k'ox	>	k'oːx	'mask'	(not k'ʲoːx)

Like the Akkadian case, this blocking pattern is not obviously explainable by the surface correspondence theory of dissimilation because the blocking segment is crucially a vowel. I don't consider this a problem because it's a diachronic pattern, not a synchronic one. Ohala proposes that it's the result of hyper-correction (cf. also Ohala 1981), and this offers a perfectly reasonable explanation of the change. It's not dissimilation produced by a synchronic grammar, so it doesn't need any synchronic explanation, and so it's not a problem that the surface correspondence theory doesn't readily offer such an explanation.

8.7.4. *Dahl's Law: only [k]* **doesn't** *block voiceless dissimilation*

Suzuki (1998:107) also reports blocking in Dahl's Law in "many Bantu languages"; I do not include this in the table of known segmental blocking cases because it is not necessarily a case of segmental blocking. The significant generalization (Davy & Nurse

1982) is that in at least Embu and Kuria, voiceless dissimilation is normally restricted by syllable adjacency, but *may* apply over sequences of three consecutive /k/s. Suzuki's characterization of the pattern is that [k] is transparent to dissimilation, and all consonants *other than* [k] are "blocker" consonants. This characterization is confounded with the fact that /k/ is voiceless, and the pattern is one of voiceless dissimilation. This means any situation in which [k] could be interpreted as a "transparent" consonant, it can also be interpreted as a consonant that triggers dissimilation.

The characterization of Dahl's Law as a case of blocking is questionable for Embu: the generalization that Davy & Nurse (1982:166) observe is that input /k...k...k...-$C^{voiceless}$/ sequences may surface as either [k...ɣ...ɣ...-$C^{voiceless}$] or [ɣ...k...ɣ...-$C^{voiceless}$]. In both outputs, there are no sequences of two voiceless consonants in adjacent syllables, and neither of the acceptable options shows voiceless dissimilation crucially applying across an intervening [k]. The pattern can be characterized just as accurately in terms of [–voice] consonants (the dissimilators) and [+voice] consonants (the rest); it does not require the descriptive analyst to recognize distinct classes of "transparent" and "blocker" consonants.

The blocking characterization of Dahl's Law is also questionable for Kuria, the other language observed by Davy & Nurse (1982) where Dahl's Law is allegedly blocked by just [k]. The generalization in Kuria (Davy & Nurse 1982:166) is that input sequences of the form /k...k...k...-$C^{voiceless}$/ can surface with any and all of the /k/s turned into voiced [ɣ] – all 8 logical possibilities are possible surface forms, from [ɣ...ɣ...ɣ...-$C^{voiceless}$] to [k...k...k...-$C^{voiceless}$] and everything in between. Consequently, the claim that [k], and only [k], is transparent dissimilation is anything but clear: output sequences like [k...k...k...-C^{voiceless}] show that dissimilation need not occur across an intervening [k], and ones like [ɣ...ɣ...ɣ...-C^{voiceless}] show that dissimilation does not occur exclusively across [k], but also [ɣ].

There are plausible several ways to interpret these patterns. The view Suzuki apparently takes is that dissimilation is always triggered by the stem-initial consonant, irrespective of distance. Lombardi (1995) argues for a different approach, though: she proposes that there is spreading of [+voice] – i.e. voicing assimilation – happening among the /k/s in prefixes. Under this interpretation, there is no segmental blocking of dissimilation: dissimilation occurs only from the stem-initial voiceless consonant to the nearest prefixal /k/; the other /k/→[ɣ] mappings reflect agreement triggered by the [ɣ], and not dissimilation triggered by the stem-initial consonant. This view has one extremely appealing characteristic: Dahl's Law is canonically an interaction between adjacent syllables (cf. its occurrence in Kinyarwanda, considered in ch. 3). Lombardi's approach sticks to this in spirit: the interactions are always between consonants in adjacent syllables. Suzuki's view, on the other hand, requires a significant abstraction away from this observation. Treating Dahl's Law as an example of segmental blocking of dissimilation presupposes that the dissimilation *can* happen across an intervening consonant, but this is not clearly evident from the original descriptions (cf. Davy & Nurse 1982, a.o.).

Chapter 9
Typological Survey of Dissimilation

9.1. Introduction

9.1.1. The Mismatch property

The Surface Correspondence Theory of Dissimilation (defined in chapter 2) entails that constraints which penalize correspondence favor dissimilating to avoid it. Dissimilation adjusts one or more consonants so that non-correspondence between them does not violate the relevant CORR·[αF] constraint.

The dissimilation-out-of-correspondence interaction leads to a general consequence for the relationship between dissimilation and consonant harmony – the Mismatch property of the SCTD, identified in chapter 2. The Mismatch property is stated in general form in (1).

(1) Mismatch property of SCTD:
Dissimilation and harmony are related in a consistently *mismatched* way.

The idea is as follows: since harmony is based on having correspondence, and dissimilation is based on *non*-correspondence, the constraints that refer to surface correspondence play different roles in each case. In a typical harmony system, a CORR constraint determines which segments are required to correspond (and therefore to agree), and a CC·IDENT constraint determines what feature they must agree for. Thus, the CORR constraints define preconditions for harmony, and the CC·IDENT constraints determine what kind of harmony it is. In a dissimilation system, the situation is reversed. The CORR constraint is what determines what kind of dissimilation it is: consonants dissimilate to escape from a correspondence requirement in situations where correspondence is penalized. CC·IDENT constraints, on the other hand, only define preconditions on dissimilation: they can determine where correspondence is penalized, but not where it is required. Thus, the constraints that determine preconditions for harmony are the ones that determine the alternations in dissimilation, and vice versa Because dissimilation happens to avoid penalized correspondence, the CC·Limiter constraints have the effect of *limiting* harmony, but *favoring* dissimilation: the two outcomes are related, but in a mismatched way.

The tableau in (2) gives a simple illustration of how this mismatch emerges. The constraint CORR·[Labial] demands that labials are in correspondence, and CC·IDENT demands that correspondents agree in voicing. This pair of demands can be met either by having labials that correspond and agree in voicing (a), or by having non-labials that don't correspond, even if they disagree in voicing (b). What CORR·[Labial] and CC·IDENT-[voice] crucially *do not favor* are the candidates in (c) & (d). The candidate in (c) represents harmony for [Labial], rather than [±voice]: it has two consonants that correspond, and agree for [Labial]. The candidate in (d) represents voicing dissimilation: it has two consonants that don't correspond, and disagree in [±voice]. Neither of these candidates is favored by the Surface Correspondence constraints.

(2) CORR·[Labial] & CC·IDENT-[voice] favor voicing harmony or labial dissimilation

		CORR·[Labial]	CC·IDENT-[voice]	Remarks
☞ a.	b_1 a b_1, $\mathcal{R}$:{b b}			Correspondence, agreement for [±voice]
☞ b.	b_1 a k_2, $\mathcal{R}$:{b}{k}			Non-correspondence, dissimilation of [Labial]
c.	b_1 a p_1, $\mathcal{R}$:{b p}		*	Corr., agreement for [Labial]
d.	b_1 a p_2, $\mathcal{R}$:{b}{p}	*		Non-corr., disagreement for [±voice]

While CORR·[Labial] & CC·IDENT-[voice] can produce both assimilation and dissimilation, these alternations are necessarily based on different features. The system in (2) favors voicing agreement (a), but not voicing dissimilation (d). It also favor labial dissimilation (b), but not agreement in labiality (c). The choice between the two viable candidates is *not* a choice between agreement for one feature and dissimilation for that same feature. Thus, the SCTD predicts that harmony and dissimilation are related, but *not* in a parallel way. This is strikingly different from much previous work, which conceives of dissimilation and assimilation as parametric opposites – patterns that should mirror each other.

The Mismatch property of the SCTD entails that any constraint which assigns violations based on surface correspondence structures has paired consequences for both harmony and dissimilation. The table in (3) summarizes these effects of each type of constraint. Extrapolating from these paired effects leads to the two specific typological predictions in (4).

(3) Consequences of Mismatch property, across constraint types:

Constraint type	Effect in harmony	Effect in dissimilation
CORR-(D)·[αF]	Harmony *among* [αF] consonants (in domain D)	Dissimilation *for* [αF] (in domain D)
CC·IDENT-[F]	Harmony with *agreement* for [±F]	Dissimilation contingent on *disagreement* for [±F]
CC·EDGE-(Dom)	Harmony *except across* the edge of Dom	Dissimilation *only across* the edge of Dom
CC·SROLE	Harmony *only* from onset to onset (but not onset to coda)	Dissimilation *except* from onset to onset
CC·SYLLADJ	Harmony only for groups of *syllable-adjacent* consonants	Dissimilation only between *non-adjacent* syllables

(4) Specific typological predictions that stem from the Mismatch property:

a. Dissimilation *for* [αF] → Harmony *among* [αF] consonants
For any feature specification [αF], if there exists a constraint CORR ·[αF], it can produce dissimilation of [αF], and agreement (for some other feature) among [αF] consonants

b. Structural *conditions* in dissimilation → Structural *limits* in harmony
For any set of structural conditions, if there exists a CC ·Limiter constraint that penalizes correspondence under those conditions, it can produce both dissimilation that occurs under those conditions, and harmony that fails under those conditions

The first prediction (4a) follows from the set of CORR constraints as a whole. The existence of any given CORR·[αF] constraint leads to the possibility of dissimilation for the feature it refers to, *and* the possibility of some kind of agreement among consonants that bear that feature. Because the two patterns are consequences of the same constraint, the SCTD predicts an implicational relationship between them. If a feature can dissimilate, then it can also define a class of consonants that are required to agree for some feature.[1] The second prediction (4b) follows from the CC·Limiter

[1] Note that this implication does not go in both directions: harmonizing classes are not determined by CORR constraints along; they can also be restricted by CC·Limiter constraints. The notion of 'contingent correspondence' raised in chapter 6 is an example of this.

constraints in a parallel way. CC·Limiter constraints impose restrictions on surface correspondence structures: they penalize correspondence under certain specified conditions. This has paired consequences, just like the CORR constraints: penalizing correspondence restricts the scope of agreement in a harmony system, and provides the impetus for dissimilation to occur. Therefore, the SCTD predicts that structural factors that cause dissimilation to occur can also cause harmony to fail.[2]

The Mismatch property of the SCTD leads to a much different relationship between harmony & dissimilation than what has been posited in previous work. Dissimilation has traditionally been conceived of as the reverse of assimilation (see, among others, Kent 1936, Mester 1986, Yip 1988, Shaw 1991, Alderete 1997, Nevins 2004, Mackenzie 2009, Gallagher 2010; see also Rose 2011b for discussion). The idea is that they are fundamentally parallel interactions, just working in opposite directions. This interpretation predicts that the patterns we find in dissimilation should be the same ones we find in harmony, and vice versa. They should both involve the same features, and be affected by the same structural factors, in the same ways. Call this the 'Match hypothesis', stated informally in (5).

(5) ***Match Hypothesis***: (to be refuted)
Dissimilation is the mirror image of assimilation, so the typology of long-distance dissimilation should be the same as the typology of long-distance assimilation.
  a. Dissimilation *for* [αF] ↔ Harmony *for* [αF]
  b. *Limits* on dissimilation ↔ *Limits* on harmony

[2] This implication also runs only in one direction. As noted in chapter 2, limits on correspondence can result from CC·Limiter constraints, or from domain of scope restrictions on CORR constraints. The latter does not have the effect of favoring dissimilation.

The SCTD, by contrast, predicts that harmony & dissimilation are related in a mismatched way. For instance, the set of features that dissimilate should match up *not* with the set of agreement features found in harmony, but instead with the features that define classes of harmonizing consonants. This follows from agreement being an interaction based on correspondence, while dissimilation is based on non-correspondence. Because the two patterns have crucially different correspondence properties, they relate to the surface correspondence constraints in crucially different ways. They are therefore expected not to be the same, but instead to be consistently different; features and structural factors that affect one also affect the other, but *not* in the same way.

9.1.2. Goals and structure of this chapter

To see whether the SCTD's prediction are supported, we need to compare the typologies of long-distance consonant harmony and long-distance dissimilation. Previous work on the typology of consonant harmony (Hansson 2001/2010, Rose & Walker 2004) has made a wealth of information on this issue available. Relatively little is known about the dissimilation side, though. Previous investigations (Suzuki 1998, Fukazawa 1999, Bye 2011) are limited in scope, and do not address long-distance consonant dissimilation separately from segment-adjacent interactions. To get a more detailed assessment of the empirical landscape, I have undertaken a broad cross-linguistic survey of long-distance consonant dissimilation specifically. The purpose of this chapter is to present the findings discovered in this survey, to use them to evaluate the typological predictions stemming from the SCTD's Mismatch property, and to compare them to other predictions about the typology of dissimilation (such as the Match hypothesis).

The chapter is structured in the following way. §9.2 gives an overview of the crosslinguistic survey, including size, methodology, and criteria for including cases. §9.3 presents the main results, the observed typology of dissimilation. §9.4 considers the Match hypothesis, which is seen to be clearly not supported by the survey findings. §9.5 evaluates the Mismatch property's predictions, and §9.6 examines other typological predictions made by other proposed theories of dissimilation. Section §9.7 presents the empirical support for the typology observed, and discusses the details of how robustly attested different types of dissimilation are. Section §9.8 recaps the main findings and conclusions; these are also summarized in §9.1.3 below.

9.1.3. Summary of major findings

An unexpected finding is that the featural typology of dissimilation is strikingly limited. Synchronic dissimilation is attested robustly for only a few features; many other types of dissimilation are attested, but only weakly. This adds significant complexity to the task of evaluating the Mismatch property and the SCTD's predictions. For many features, the status of dissimilation as attested or not depends heavily on subjective judgments about how substantiated the generalizations are, and how the data is interpreted. For features where dissimilation is not clearly attested, empirical details of the relevant cases, and my interpretation of their validity as genuine dissimilation (or not), are reviewed in §9.7.

The Mismatch property leads to some predictions that are clearly correct, and others that are not clearly supported. The findings of this survey suggest they are probably more good than bad. For structural factors, the predicted mismatch is strongly borne out. The situation for the features that dissimilate is less clear. Some types of attested dissimilation are also attested as classes in harmony, but others seem not to be. Similarly, the Mismatch property correctly predicts some of the gaps in the dissimilation typology, but not all of them.

One quite clear finding are that the features that do long-distance dissimilation are not the same as the features on which agreement is required in harmony systems; in other words, the Match hypothesis is very clearly not borne out in the typology. The agreement features involved in the most well-attested forms of consonant harmony are nearly all unattested types of dissimilation. This disparity is an indication that the SCTD makes more correct predictions than the obvious, intuitive, notion that harmony and dissimilation are two sides of the same coin (they aren't).[3] The typology also doesn't match predictions made by other theories of dissimilation that connect it to markedness (Alderete 1997) or perceptual cue location (Ohala 1981).

Finally, an additional finding is that the typology of long-distance dissimilation is substantially different from the typology of strictly segment-adjacent dissimilation. While I have not attempted to survey local dissimilation cases in detail, some cases that were discovered incidentally clearly show that some unattested kinds of long-distance dissimilations actually are possible as strictly local dissimilation. This finding is contrary to the common presumption that local dissimilation and long-distance

[3] Another alternative hypothesis is that there is no relation between harmony and dissimilation at all. The analyses of Kinyarwanda (ch. 3) and Sundanese (ch. 4) are clear evidence against this. In these languages, dissimilation and harmony are observably in complementary distribution – a significant observation left totally unexplained if dissimilation has no connection to harmony. This also fails to explain the abundance of cross-edge dissimilation patterns, which are correctly predicted by CC·Edge constraints.

dissimilation involve all the same features (cf. Suzuki 1998, Frisch & Alderete 2007, Bye 2011, a.o.). It is also consistent with the observation made in the Agreement by Correspondence literature that local and long-distance assimilation are empirically different – a parallelism that further supports the surface correspondence theory of dissimilation.

9.2. Scope of the inquiry

9.2.1. The phenomenon: long-distance consonant dissimilation

Our topic of interest is long-distance consonant dissimilation. The surface correspondence theory makes specific predictions about the typology of this phenomenon – predictions different from those made by other theories of dissimilation such as the OCP.

A pattern is taken to be dissimilation if it's an interaction crucially tied to shared properties of the participating segments. That is, there must be some feature shared by the segments that "undergo" dissimilation, and that is *not* shared with the outputs resulting from the dissimilation. This standard is important, as the term 'dissimilation' is occasionally applied to neutralization and other patterns that have little or nothing to do with the similarity of the segments involved.

A pattern of consonant dissimilation is taken to count as 'long-distance' if it is observed for two consonants which are separated by at least one vowel. Dissimilation that occurs only in consonant clusters is also attested, but not explored here in detail. This is because interactions between string-adjacent consonants are affected by same constraints responsible for non-dissimilatory reduction patterns. Long-distance dissimilation patterns are not subject to this interference from other constraints, so they should produce a more accurate representation of what the surface correspondence theory is responsible for explaining.

Dissimilation which occurs only between adjacent segments is not explored here in detail. No general principle in the theory of surface correspondence prevents two segmentally adjacent consonants from interacting (via correspondence) in the same way they would when other material intervenes between them. However, there are good reasons (discussed in §9.2.2 below) to think that strictly segment-adjacent dissimilation could – and should – behave differently from long-distance dissimilation. So, leaving aside cases with this restriction gives a clearer picture of the empirical landscape that the theory makes predictions about.

9.2.2. Why leave out segment-adjacent dissimilation?

Taking all dissimilation to be the same is not a trivial assumption, nor is it a safe one. There are numerous of factors which affect segment-adjacent consonants, but not distance consonants, ranging from phonetic issues like the perceptual consequences of co-articulation of adjacent consonants to phonological ones like sonority sequencing. These factors can give rise to apparent dissimilation between adjacent consonants, but not over longer distances. They can also obscure local dissimilation generalizations, to the point that the observed generalizations are a gross misrepresentation of what's happening in the grammar. As such, conflating strictly-local and long-distance dissimilation would skew the findings of the survey, and obscure the facts about what kinds of long-distance dissimilations are possible.

9.2.2.1. Local dissimilation is not always dissimilation

Modern Greek illustrates how restrictions on the form of consonant clusters can, by simple coincidence, look like dissimilation. Modern Greek is reported (Suzuki 1998, Bye 2011; see also Kaisse 1989, Tserdanelis 2001) to have a pattern of dissimilation for [±continuant]. The empirical generalization is that medial obstruent-obstruent clusters (excluding clusters with /s/[4]) always surface as a fricative followed by a stop (6). Examples like (6c) show that this is actually not a case of dissimilation: it's just a restriction on the shape of consonant clusters (as Kaisse 1989 suggests).

(6) Modern Greek [±continuant] "dissimilation" (Kaisse 1989)[5]

a. /filax-θika/ → [filaxtika] 'it was honored'
b. /ek-timo/ → [extimo] 'I esteem'

c. /plek-θike/ → [plextike] 'it was knitted'

In all of the forms in (6), the clusters surface as a fricative-stop sequence, irrespective of the continuancy of the underlying segments. This change looks like continuancy dissimilation when the cluster consists of two underlying fricatives (6a) or two underlying stops (6b): it maps segments with matching values of [±continuant] to segments with mismatching values of that feature. But, similarity is clearly not what makes this alternation happen. When the cluster consists of an underlying stop plus fricative sequence, it also surfaces as a fricative followed by a stop (6c). Here, the underlying consonants have different values of [±continuant], but they change anyway, producing exactly the same output structure as the apparent dissimilations in (a) & (b).

[4] excluding /s/; clusters with [s] exhibit a different set of generalizations, and they do not show the alleged dissimilation effect.

[5] NB: Modern Greek clusters with [s] behave differently than those with other fricatives. This discrepancy does not bear on the point I wish to illustrate here (though see Kaisse 1989 for further details).

The Modern Greek continuant alternations show that cases previously characterized as dissimilation are not necessarily linked to phonological similarity in any significant way (a point also made by Ohala 1981:188). While this somewhat inappropriate use of the term 'dissimilation' is not exclusive to segment-adjacent interactions[6], my impression is that it is most common in such cases. Leaving aside segment-adjacent dissimilation avoids lumping these confounded cases in with actual dissimilation patterns.

9.2.2.2. Local interactions can hide dissimilation

Tamashek Berber illustrates also how interactions between adjacent consonants may contravene regular long distance dissimilation. The dissimilation in Tamashek, and in various other Berber varieties, is long-distance labial dissimilation (Heath 2005). This is illustrated by alternations in prefixes, in examples like those in (7). However, in nasal + obstruent clusters, Heath (2005:45) observe that there in place agreement: /n/ surfaces as [ŋ] before velars & uvulars, and as [m] before bilabials and labio-dentals. This assimilation leads to visible alternations depending on the vocalism of an inflected stem, such as the pairs in (8).

(7) Tamashek Berber: long-distance labial dissimilation (Heath 2005:46)

a.	æ-m-ájrad	'one who can disappear'	(agentive N prefix has /m/)
b.	a-n-ánam (< root -VnVm- 'be fond')	'one who is fond'	(prefix dissimilates to [n])

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[6] cf. Jurgec (2010:80) on Dutch retroflex "dissimilation", a neutralization of retroflex and uvular rhotics that occurs in roots followed by a suffix. None of the relevant suffixes include another rhotic consonant, and the apparent generalization is that the segmental quality of the suffix plays no role whatsoever in the alternation. See also Gallagher (2010), who uses 'dissimilation' to refer to a class of output configurations, regardless of the mappings that derive them.

(8) Tamashek Berber: segment-adjacent nasal place assimilation (Heath 2005:45-46)[7]

a. –nɑ́qq– ‘kill (imperf.)’
–əŋʁɑ– ‘kill (perf.)’
(/n/→[ŋ] before dorsals)

b. -nɑ́bbær– ‘be taken to pasture at night (imperf.)’
-əmbær– ‘be taken to pasture at night (imperf.)’
(/n/→[m] before labials)

The local place agreement in NC clusters yields exceptions to the long distance generalization: labial dissimilation seemingly obtains between a prefix labial and another subsequent labial anywhere in the stem, *except in* clusters formed between a root-initial labial obstruent and a prefix labial nasal. As Heath (2005:472) observes, this exception is shown by pairs like (9). In the imperative form (9a), the medio-passive prefix /m-/ is separated from the labial /b/ in the root by a vowel, and it exhibits the same long-distance labial dissimilation as illustrated in (7) above. But, in the perfective form (9b), there is no vowel intervening, so the prefix /m-/ and the root /b/ form a cluster, which surfaces as [mb].

(9) Tamashek Berber: nasal place assimilation counter-exemplifies dissimilation

a.	n-əbə̀ləḍwəj	‘fall over (Imprt)’	(dissim from /m-...b/)
b.	–æm-bæ̀læḍwæj-	‘fall over (PerfP)’	(assim in N-b cluster)
c.	n-ə̏bəbb	‘carry each other (imprt)’	(dissim. from /m-...b/)
d.	-æ̀m-bæbbɑ–	‘carry each other (PerfP)’	(assim in N-b cluster)

Forms like (9b,d) follow the generalization about nasal agreement in clusters (8); this obscures the long-distance dissimilation generalization. The generalization about labial dissimilation in Tamashek is *not* that adjacent labials do not dissimilate. This is

[7] Heath (2005:45) states that nasal place assimilation holds only for /n/; it does not happen to /m/, as evidenced by forms like [ɑ-m-kə̀jkəj] ‘be full of milk’. That /m/ doesn’t do place assimilation isn’t especially unusual. Zulu & Xhosa exhibit the same generalization: NC clusters are either homorganic, or the nasal is [m].

clear from looking at nasal-nasal clusters, where there is no place assimilation. This is shown in (10). The reciprocal medio-passive imperative form in (10a) has two prefixal /m/s, one of which surfaces as [n] in accordance with the labial dissimilation pattern. In the corresponding imperfective form (10b), there is no intervening vowel; the two /m/s are in a cluster, *and they dissimilate as usual.* This is not limited to this particular combination of prefixes: the form in (10c) shows the same result from a prefix /m/ and root-initial /m/.

(10) Tamashek Berber: In clusters with no agreement, dissimilation obtains as normal

a.	n-ə̀m-ədəd	'bite each other (imprt)'	(dissim. from /m-Vm-…/)
b.	–ə̀n-m-ədəd (H:477)	'bite each other (Imprf)'	(dissim. from /m-m/ cluster)
c.	ɑ-n-məʁútɑr (H:479)	'need each other (VblN)'	(dissim. from /m-m/ cluster)

The lack of labial dissimilation in /m-b/ clusters (9) does *not* mean that clusters are not immune to the long-distance dissimilation pattern. The long-distance dissimilation pattern *does* apply in clusters: it's not as if the dissimilation holds only for non-adjacent consonants. Rather, another phenomenon – segment-adjacent nasal place assimilation – obscures the output of the dissimilation in some clusters. The long-distance generalization is fodder for the theory. The exceptionality of the [mb] clusters in is something to be explained by the theory of consonant clusters, and perhaps by its interaction with surface correspondence – but not by the theory of surface correspondence itself.

The point here is that phonotactic impositions on consonant clusters may obscure dissimilation patterns; this interference can be avoided only in long-distance dissimilation. In the Tamashek case above, it is still possible to probe the edges of the generalization: by controlling for adjacent segments, we can avoid interference from local phonotactics effects. But, if dissimilation is itself a local phonotactic effect, this interference cannot be controlled for. If we imagine a segment-adjacent locality condition imposed on Tamashek labial dissimilation, it would dramatically change the observable generalizations. Since nasal + obstruent clusters undergo agreement, only /m+m/ clusters would be able to manifest labial dissimilation.

The more restricted the distribution of dissimilation, the more likely it is that the facts under-determine the generalization about what's actually going on in the grammar. Segment-adjacent dissimilation thus offers murky data, with significant room for interpretation. This is not what we want to test the accuracy of the SCorr theory's typological predictions.

9.2.2.3. Local dissimilation is not necessarily driven by correspondence

There is no reason that strictly adjacent dissimilation should display the same set of generalizations as long-distance dissimilation, and numerous reasons to expect that it will not. If the goal is to evaluate the predictions of the surface correspondence theory, then our primary interest is in the long-distance cases, and not the adjacent ones. There is no principle or assumption that *prevents* the surface correspondence theory from applying to adjacent consonants in the same way it applies to non-adjacent ones. But, for interactions in clusters of adjacent consonants, the theory of consonant clusters – whatever it may be – will offer counter-analyses, which do not involve surface correspondence. These counter-analyses may or may not line up with the surface correspondence theory. As such, the behavior of segmentally-adjacent consonants may *or may not* illustrate the effects of surface correspondence. If the surface correspondence theory of dissimilation is correct, then its predictions *must* emerge in long-distance dissimilation. This is not the case in clusters, where other factors are relevant, and can conceivably contradict the predictions of the SCorr theory. Addressing strictly local dissimilation is, in a sense, a misuse of the theory: the domain to evaluate it most appropriately is long-distance dissimilation interactions.

Note that the same issue arises in agreement, as Rose & Walker (2004:494, f.n.) observe. No principle prevents Agreement By Correspondence from applying in consonant clusters, but it's also not the only basis for agreement in clusters to occur. As such, it doesn't make sense to seek an ABC explanation for all local agreement; agreement that arises from other factors need not have the same empirical properties as long-distance harmony. Just because the two phenomena share empirical overlap doesn't mean that the same theory can, should, or must explain both of them from the same set of assumptions.

9.2.2.4. Local dissimilation is empirically different

There are also notable asymmetries at the raw empirical level between segment-adjacent dissimilation and long-distance dissimilation. Certain features participate in dissimilation in consonant clusters, but as long-distance dissimilation are either highly questionable or completely unattested. Some examples are noted in (11) below. This is not an exhaustive list: I have not systematically tried to include segment-adjacent dissimilation cases in my database, and a more thorough survey of adjacent dissimilation patterns might yield more disparities like this.

(11) Some dissimilation types attested for adjacent segments, but not over distance

Dissimilating Feature	***Languages***
[±continuant]	+: Osage, Tsou (Bye 2011:19) –: Mandan (Mixco 1997:9), Luiseño (Davis 1976:199)
[±anterior] (in non-liquids)	+: Chumash lgs. (Applegate 1972:117; Beeler 1970; Klar 1977:47) –: Punjabi, various Dravidian lgs (Hamann 2003:119)
Labialization	Imdlawn Berber, Moroccan Arabic (Elmedlaoui 1995a, 1995b)
Sibilance	Shangzhai Horpa (Sun 2007:216)

Previous literature on dissimilation generally presupposes that the typologies of long-distance and local dissimilation are not distinct (Odden 1994, Suzuki 1998, Alderete & Frisch 2007, Bye 2011, a.o.). The findings of this survey suggest they're different. This disparity accords with the expectations noted above: local & long-distance dissimilation aren't necessarily the same phenomenon, so the facts of one aren't the same as the facts of the other. Leaving aside the strictly local cases therefore seems to be empirically warranted.

9.2.3. Survey methodology

9.2.3.1. Types of cases included

Dissimilatory effects manifest in a variety of ways: for instance, dissimilation may be observed in synchronic alternations, or detected by the effects it exerts on other patterns, or it may be deduced from static co-occurrence restrictions. The theory does not make any a priori distinction between these (a point also noted for harmony by Hansson 2001/2010, and Rose & Walker 2004). Whether visible alternations occur or not depends heavily on whether the lexicon makes available the right combinations of pieces to give rise to those alternations: a dissimilation system in the grammar could conceivably manifest in any of these ways.[8]

The goal of this survey is to make an approximate determination of what kinds of long-distance consonant dissimilation can occur in the synchronic grammar of human languages. Not all dissimilatory effects are on equal footing in terms of shedding light on this question. In my survey, I have included a range of consonant-to-consonant[9] dissimilation effects, and coded for the apparent activeness of the pattern.

The best-case evidence that a given kind of dissimilation is possible is when it manifests with visible synchronic alternations. Within these cases, there is also a range of robustness: dissimilatory alternations may occur productively, in many different contexts (e.g. Dahl's Law in Kinyarwanda in ch. 3, or rhotic dissimilation in Georgian in ¢8), or they may be found only with some morphemes, or certain combinations of segments, etc. (e.g. Latin & Yidiny liquid dissimilation in ch. 8).

If dissimilation does not give rise to observable alternations, it may still be detected through effects it has on other synchronic patterns, i.e. blocking effects. In these cases, a systematic alternation fails to occur when the result would be the co-occurrence of similar consonants. The logic is that if a dissimilatory restriction interferes with observed synchronic patterns, it must be active in the synchronic grammar, even if we have no opportunity to observe it triggering alternations.

[8] Recall Sundanese (ch. 4), for instance: this language has rhotic dissimilation, but only one productive affix contains a rhotic. If we were to excise the plural infix /al/ from the Sundanese lexicon, no alternations would be observable – even though the grammar would be exactly the same.

[9] Consonant-vowel dissimilation effects are outside the scope of the surface correspondence theory. For instance, some languages prohibit the combination of a round vowel and a labial consonant; restrictions of this sort are found, e.g., in Cantonese (Yip 1988), Yao (Purnell 1965), and Māori (de Lacy 1997). The Surface Correspondence relation holds over output consonants only; it does not hold over vowels, so the theory has little to say about these cases. I also do not know of any examples of long-distance consonant-vowel dissimilation; in Cantonese & Māori, the restriction holds only for adjacent segments.

Japanese is a famous example of this (Itô & Mester 1986, 1996, 1998; Alderete 1997, a.o.): systematic voicing of an initial obstruent in the final root of a compound – a pattern known as 'rendaku' or 'sequential voicing' – systematically fails to occur when that root contains another voiced obstruent already. This implies a system of voicing dissimilation lurking in the grammar. While we can't see any alternations directly, it is detectable through its influence on other phenomena, and thus it must be a real part of the synchronic grammar (see also Kawahara 2012 for experimental evidence for this dissimilation).

The most impoverished evidence for dissimilation comes from static co-occurrence restrictions. In these cases, dissimilation is inferred based on gaps in the lexicon. No alternations are visible, nor does the posited dissimilation system influence other regular processes. As noted in chapter 6, these cases present an ambiguity of analysis: if similar but non-identical consonants never co-occur, this gap in the lexicon could be the result of assimilation rendering them identical or dissimilation rendering them non-similar.

Finally, a notable source of non-evidence for synchronic dissimilation is gradient co-occurrence restrictions. These patterns have received a lot of attention in previous work (Greenberg 1950; McCarthy 1986; Mester 1986; Pierrehumbert 1993; Berkley 1994; Suzuki 1998; Frisch et al. 2004; Coetzee & Pater 2006; Rose & King 2007; Pozdniakov & Segerer 2007; Gallagher 2008, 2010; Graff & Jaeger 2009, among others). Suzuki (1998) even argues that a major shortcoming of the classical OCP is its inability to explain gradient effects. However, gradient similarity avoidance doesn't tell us anything that bears on the surface correspondence theory of dissimilation.

9.2.3.1.1. *Why gradient similarity avoidance is uninformative*

Static co-occurrence restrictions are informative about surface correspondence only insofar as they approximate real alternations. If we observe a language where multiple voiced consonants don't co-occur (such as Japanese), we can infer that this gap results from a dissimilatory mapping that we can't see on the surface. In other words, the absence of roots with two voiced obstruents is attributed to a constellation of actual dissimilation mappings like /d...d/ → [d...t], /b...d/ → [b...t], (etc.). These mappings are not evident on the surface; the basis for positing them is that the inputs that *would* dissimilate are never observed on the surface. So, interpreting static co-occurrence restrictions as the result of covert dissimilation rests on extra assumptions, but it yields an analysis that is fully consistent with the facts.

Gradient similarity avoidance patterns are uninformative because this reasoning depends on there being a gap in the output. When a particular combination of similar consonants is less common than statistically expected, it does not follow that it's disallowed by the grammar. There is no basis for positing dissimilation when the co-occurrences that *would* dissimilate are combinations that actually *do occur* on the surface. It's not valid to infer unobservable dissimilation for inputs that – observably – do not dissimilate: it's an analysis that isn't consistent with the facts it's meant to explain.

The SCTD is a theory of dissimilation, not a theory of all similarity avoidance. Not all generalizations about the relative frequency of simlmedlailar segments is necessarily the result of dissimilation. It's appropriate to apply the theory to cases where dissimilation is observed synchronically. By extension, it can be applied to cases that are plausibly interpreted as the result of active dissimilation, like absolute or near-absolute caps. Gradient similarity avoidance – of the sort found in Semitic languages and elsewhere – is clearly not like that. The generalization in gradient similarity avoidance is not that similar consonants never co-occur; it's that they *do* co-occur, just less often than statistically expected. It's not appropriate to interpret this as the result of active, synchronic, dissimilation; the data shows that similar consonants do co-occur, so they must not dissimilate. These similarity avoidance effects are tendencies in the lexicon, not mappings produced by the grammar; they are outside the scope of the theory.

Excluding gradient similarity avoidance is also warranted on empirical grounds: the findings in much previous work show that these patterns are characterized by a cluster of properties that are *not* shared by active dissimilation. First, there are typically gradient distance effects: the closer the similar consonants are, the more strongly they are avoided. This is not a general property of dissimilation with alternations: dissimilation over greater distance does not imply dissimilation over shorter distances. In fact, cases like Sundanese & Zulu show, absolutely, the opposite effect: closer segments *don't* dissimilate, while more distant ones do. Second, gradient similarity avoidance comes with gradient similarity effects: the more similar two consonants are, the more strongly their co-occurrence is avoided. This is also not the norm with dissimilatory alternations, and we find plenty of actual dissimilation cases that clearly counter-exemplify this trend. Across numerous Berber languages, for instance, labial dissimilation applies to /m…f/, but not to /m…w/, even though [m] is more similar to [w] than it is to [f]. Third, gradient co-occurrence restrictions overwhelmingly show avoidance based on major place of articulation. By contrast, I have found no languages with active dissimilation of Major Place (i.e. where labials dissimilate from labials, coronals from coronals, and dorsals from dorsals). So, I consider gradient similarity avoidance a different empirical phenomenon than actual dissimilation (though possibly the two are ultimately related – a question left to future research).

9.2.3.1.2. Treatment of segment-adjacent dissimilation

I have not attempted to include a wide range of segment-adjacent cases of dissimilation. Some cases were encountered incidentally in reports that did not note this locality restriction, but the list of segment-adjacent dissimilation cases in the appendix is by no means an exhaustive list of those documented in the literature.

9.2.3.1.3. Diachronic dissimilation

Dissimilatory historical sound change appears to be rather frequent, but such cases are very often sporadic. For instance, Lloret (1997) observes a wealth of dissimilation among sonorants in Iberian Romance languages. These include alternations among liquids (e.g. coll. Catalan frare > flare 'friar'), nasal-to-liquid alternations (e.g. So. Catalan monument > moliment 'monument'), and various other interchanges (e.g. Lat. animalia > Port. alimária 'vermin'). But, these cases of dissimilation are thoroughly sporadic. None of them represent systematic sound changes, nor do any appear to be connected to robust synchronic restrictions. They also involve a variety of alternations among sonorants, rather than any single consistent shift. So, these and other dissimilatory examples in sound change have been generally excluded. Our interest is not all dissimilatory effects, only the types of dissimilation that synchronic grammars can (and do) produce.

One class of diachronic dissimilations *is* informative and has not been excluded: these are cases where a single dissimilation pattern appears to hold synchronically, but with alternations evident only from diachronic comparisons. Cuzco Quechua (ch. 5) is an example of such a case: there is an apparent dissimilation pattern that is synchronically active, and is substantiated on the basis of diachronic evidence. Diachronic evidence is admitted only when judged to be a reasonable approximation of an actual synchronic dissimilation system.

9.2.3.1.4. Interpretation of excluded cases

It's not clear how to interpret the kinds of dissimilation excluded here. For sporadic and gradient dissimilation effects, it would be possible to extend the SCTD to them by combining it with a theory of variation, e.g. using stochastic OT. However, empirical asymmetries between these cases and the types of dissimilation that do occur as active synchronic patterns suggest that this might not be the right approach. An alternative is that dissimilatory effects can arise in multiple ways: not just from correspondence-driven mappings in the grammar, but also from perceptual factors, or biases in diachronic change, or learnability issues, etc. Thus, dissimilatory patterns could emerge historically without ever being the result of an input-output mapping in a synchronic grammar – and thus would not be the fodder for a formal theory of dissimilation. It's also possible that some of these "fake" dissimilations might not be readily identifiable as such. For this reason, I have evaluated the attestedness of different types of dissimilation on a 4-point scale, with the expectation that there may be false positives of this sort. See the survey methodology summarized below for further details.

9.2.3.2. Methods for finding cases of dissimilation

The typological survey of dissimilation draws on previous cross-linguistic surveys of dissimilation (Suzuki 1998, Bye 2011), and augments these with additional cases of dissimilation. Additional cases not identified by Suzuki & Bye were found in various ways, including: review of works in other areas of phonology that relate to dissimilation; targeted searches of the literature (especially based on apparent gaps in the typology); and a search of grammars and other primary descriptive sources (especially based on geographical or genetic relatedness to other reported cases).[10]

The survey database is a listing of all plausible examples of active synchronic dissimilation patterns known to me. My intent was to compile a database as extensive as possible. This sample of cases is diverse: it includes languages from across numerous genetic families, and from all inhabited continents. It is not an evenly-balanced sample, though; dissimilation is reported more abundantly reported in some language families and areas, and less so in others.

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[10] Beyond the surveys by Suzuki & Bye, some key sources that report multiple cases of dissimilation are: Davy & Nurse (1982), McCarthy (1988), Yip (1988, 1989), Shaw (1991), Odden (1994), Walsh-Dickey (1997), Fukazawa (1999), MacEachern (1999), Fallon (2002), Nurse & Phillipson (2003), Lahrouchi (2005), Flynn (2006), and Zuraw & Lu (2009).

9.2.3.3. Survey size

The survey found 148 plausibly genuine cases of long-distance dissimilation, distributed among 133 languages and dialects.[11] This set of dissimilation patterns has been filtered based on plausibility that they represent actual synchronically-active dissimilation patterns. The full survey database (listed in the appendix) includes 250 cases in total, representing over 200 languages.

Some cases were excluded for being spurious; that is, the facts clearly show that the alternation doesn't occur, or that the pattern is clearly not dissimilation[12]. For instance, Modern Greek has repeatedly been reported as an example of rhotic dissimilation (Walsh-Dickey 1997, Suzuki 1998, Bye 2011). However, the alleged dissimilation is not involved in any synchronic alternations, and is clearly not a real gap in the language. Manolessou & Toufexis (2008:303) find that even as a diachronic change, it's evident in less than 0.2% of applicable words – the remaining 99.8% of words with two rhotics show no dissimilation. (See appendix for a listing of reported cases of dissimilation that are erroneous).

Other cases were judged as being plausibly harmony rather than dissimilation. As noted previously (cf. ch. 6), morpheme structure constraints and other static co-occurrence restrictions usually offer multiple possible interpretations - they could

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[11] The difference between these numbers reflects some languages exhibiting more than one pattern of dissimilation, such as two patterns involving different segments or features, or one dissimilation pattern that manifests in multiple distinct ways

[12] As Ohala (1981:188) points out, it is common for sound changes to be described as dissimilation even when they are not conditioned by the presence of another similar sound, and such cases should not be regarded in the same way.

involve harmony for one feature, or else dissimilation for another.[13] Since these cases are not clear evidence, they are discussed below only when related to otherwise-unattested kinds of harmony or dissimilation.

Some other reported cases of dissimilation were excluded for other reasons – the reports are not spurious, but the patterns aren't ones in the scope of this investigation. These include patterns of segment-adjacent dissimilation, and gradient similarity avoidance, as noted above. Other cases were excluded from the typology because they are not segmental alternations[14], or do not appear to be dissimilatory in nature.[15] See the appendix of the dissertation for a list of excluded cases.

9.2.3.4. Relation to previous cross-linguistic surveys of dissimilation

The present survey is substantially larger and more comprehensive than previous ones. For comparison, Suzuki's (1998) survey includes only 36 cases of consonant dissimilation, and Bye's (2011) includes only 55. Both of these surveys include some spurious cases, some patterns which are strictly segment-adjacent, and some which manifest only as statistical tendencies, and which do not give rise to alternations or (near)-absolute co-occurrence restrictions in any language known. Ergo, the number of genuine long-distance dissimilation cases in Suzuki's survey is actually closer to 19.

[13] The exception to this is when identical segment co-occurrence is prohibited - these can only be seen as dissimilatory.

[14] An example is Finnish, as reported by Bye (2011). The generalization is that regular consonant gradation effects are blocked by [h]; this is not clearly a segment-to-segment interaction, since gradation is a constellation of different alternations.

[15] An example is Bukawa (Ross 1993, 1995); obstruents in the last two syllables of a Bukawa word always disagree in voicing. This doesn't reflect a static dissimilation pattern in the grammar, it's just a relic of the historical changes that created the voicing distinction in Bukawa. The last two syllables in each word are an iamb, and diachronic changes made stops voiceless in stressed syllables, and voiceless in unstressed syllables.

The survey is also more comprehensive than previous ones. The previous surveys (Suzuki 1998, Bye 2011) examine only 4 factors: the segments (or classes of segments) that dissimilate, the feature that causes that dissimilation, the distance between the dissimilating segments[16], and whether the pattern is a static restriction or produces visible alternations. In my survey, I have considered the properties of dissimilation cases listed in the table in (12).

[16] Suzuki's survey also lists a property identified as the "domain of dissimilation"; however, this does not appear to be a meaningful characteristic. Suzuki lists the domain as "M" – presumably referring to the morpheme – for 35 of 36 cases of consonant dissimilation. In some of these cases (e.g. Arabic), the dissimilatory effect is observed only within single morphemes; in others (e.g. Zulu), the dissimilation is observed only across morpheme edges. As such, it is not clear to me what exactly the 'domain of dissimilation' factor is intended to represent.

(12) Specific factors examined in the survey

Property	*Remarks*
Dissimilating feature	The apparent feature(s) that characterize the interacting Cs; the feature that necessarily alternates, if alternations occur
Type of feature dissimilating	Features classified according to what practical distinctions they make, e.g. laryngeal features, liquid features, major place, secondary articulations, etc. (most useful when the featural characterization of a pattern is not obvious, given the available data)
Segments involved*	The exact set of segments that participate in the alternation (not available for all reported cases)
Plausibility	Whether the pattern is a plausible instance of real dissimilation in the grammar (represents things like plausibility that historical alternations reflect synchronic restrictions; assessed subjectively)
Activity	Whether the pattern produces visible alternations, and how productive they are. For cases without visible alternations, whether the restriction exerts blocking effects on other regular phonological patterns; whether static restrictions are absolute (or nearly so) vs. gradient; whether pattern is observed only from historical changes & reconstructions
Direction of dissimilation*	Left-to-right vs. right-to-left; also root-to-affix vs. affix-to-root (NB: typically not determinable for static restrictions)
Domain of dissimilation*	morphological and prosodic domains that contain both consonants; adjacency effects (segment, syllable, or morpheme levels), relation to domain edges (not
Blocking segments*	other segments associated with the failure of expected dissimilation, and their position relative to the dissimilating Cs (not applicable to all cases, not assessed for all cases)
Identicality effects	Whether dissimilation occurs for identical Cs only, for identical and similar Cs, or for only non-identical Cs; whether identicality effects follow from the nature of the alternation & the segments in the lg.
Harmony	Whether the language is also known to exhibit some form of consonant harmony in addition to dissimilation
Overkill*	Whether the dissimilation alternation involves additional changes beyond the shared feature(s) (cf. Struijke & de Lacy 2000)
Other noteworthy factors?*	Other observations beyond those above, including but not limited to: systematic exceptions, where dissimilation can or cannot be observed, how the available data relates to the featural characterization, quality of the evidence of alternations, basis for characterizing the pattern as dissimilatory, relatedness to other cases, etc.

(NB: * indicates that a factor was not assessed/assessable for all cases)

My survey results are presented in the appendix at the end of the dissertation, with a short description of each case. Given typographical limitations, not all of these factors are listed in this presentation of the data. The point is that I have drawn the generalizations presented in this chapter with these considerations in mind as potentially-relevant factors.

9.3. The attested typology of dissimilation

9.3.1. Features that dissimilate

It is not always clear whether a given type of dissimilation is attested or not. For this reason, the status of each type of dissimilation is classified according the scale in (13).

(13) Scale of attestation for dissimilation

a. "*Robustly*" attested: dissimilation of the feature occurs, with visible synchronic alternations, in a diverse group of languages, manifesting in diverse ways.

b. "*Moderately*" attested: dissimilation of the feature is clearly attested, but in a relatively small group of languages, and/or with little diversity in its manifestation.

c. "*Weakly*" attested: dissimilation of the feature occurs, but only in a few languages, with little variation across different cases, or with other significant confounds.

d. "*Questionably*" attested: dissimilation of the feature is not clearly attested in any language, and all potential cases are suspect.

e. "*Unattested*": dissimilation of the feature is not found in any language in the survey, and is judged to be clearly not attested.

The types of dissimilation noted as 'unattested' are ones that I have been unable to substantiate: I know of no languages where these types of dissimilation occur, and they are reported either spuriously, or not at all. The types of dissimilation listed as 'Robustly' or 'Moderately' attested are those which unambiguously exist. Kinds of dissimilation listed as 'Weakly' attested are judged to be genuinely attested, though extant cases are scarce. 'Questionably' attested kinds of dissimilation are of uncertain status: they are found only in a few marginal cases, and the available evidence is not sufficient to warrant treating them as attested.

The survey results are shown in the table in (14) below, broken down by features. Further discussion of the empirical basis for these results is presented in §9.7.

(14) Attested & unattested types of long-distance dissimilation:

	Feature	Dissimilation attested?
"Major Place" features	[Labial]	robustly
	[Coronal]	moderately
	[Dorsal]	weakly
	[Radical] (pharyngeal/glottal)	weakly
"Articulator-free" features	[±continuant]	+: questionable –: questionable
	[±sonorant]	+: unattested –: unattested
	[±nasal] (Prenasalization)	+: questionable –: unattested +/–: robustly
	Length	unattested
Laryngeal features	[±constricted glottis]	+: robustly –: unattested
	[±spread glottis]	+: robustly –: unattested
	[±voice]	+: moderately –: robustly
"Minor place" features and secondary articulations	Labialization	unattested
	Labio-velarity	unattested
	Uvularity	unattested
	Pharyngealization	unattested
	[±anterior] (in non-liquids)	unattested
	[±distributed] (in non-liquids)	unattested
	[±lateral] (in non-liquids)	+: unattested –: unattested
	[±strident] (≈ [±sibilant])	+: unattested –: unattested
Liquid features	[+rhotic] (≈ [–lateral])	robustly
	[+lateral] (≈ [–rhotic])	moderately
	[±liquid]	+: weakly –: unattested
	[±anterior] (in liquids) (≈ retroflexion of rhotics)	+: weakly –: weakly

The table in (15) below presents the same information, organized by robustness of dissimilation rather than by feature.

(15) Types of dissimilation, by robustness of attestation

	Feature	***Example Languages***
Robustly attested	[Labial]	Zulu, Imdlawn Berber, Acehnese
	NC clusters/Prenasalization	Gurindji, Timugon Murut, Kwanyama
	[+constricted glottis]	Quechua (e.g. Cuzco), Salish (e.g. Shuswap)
	[+spread glottis]	Meithei, Sanskrit, Zuberoan Basque
	[–voice]	Bantu (Dahl's law), Moro, Minor Mlabri
	[+rhotic]/[–lateral], in liquids	Georgian, Sundanese, Semelai
Moderately attested	[Coronal]	Colombian Spanish, Tahitian
	[+voice]	Western Bade, Japanese
	[+lateral]/[–rhotic], in liquids	Latin, Sabzevari Persian
Weakly attested	[Dorsal]	Judeo-Spanish, Ni'ihau Hawaiian?
	[Radical]	Tigre, Tigrinya, Seri?
	[+liquid]	Kɔnni, Yimas, Proto-Indo-European?
	[±anterior] (in liquids)	Yindjibarndi, Warlpiri?
Questionably attested	[+continuant]	Chaha?
	[–continuant]	Palauan?
	[+nasal]	Takelma, Xiamen Chinese?

Some types of dissimilation encountered in the survey are attested only between adjacent syllables and/or in CVC configurations. The table in (16) lists the types of dissimilation that are attested without this locality restriction. This is the attested sub-typology of *longer*-distance dissimilation discovered by the survey, after syllable-adjacent cases are excluded. Note that some types of dissimilation do occur over distances greater than one syllable, but are less well attested in this condition. These types of dissimilation are marked with asterisks (*).

(16) Dissimilation types attested over distances greater than CVC

	Feature	***Example Languages***
Robustly attested	[Labial]	Zulu, Imdlawn Berber, Acehnese
	NC clusters/Prenasalization	Gurindji, Bardi
	[+spread glottis]	Meithei, Zuberoan Basque
	[+rhotic]/[–lateral], in liquids	Georgian, Sundanese
Moderately attested	[+constricted glottis]*	Cuzco Quechua
	[+voice]*	Japanese
Weakly attested	[–voice]*	Kikuria (Dahl's law)?
	[+lateral]/[–rhotic], in liquids*	Latin?
Questionably attested	[+continuant]	Chaha?
	[–continuant]	Palauan?
	[+nasal]	Takelma?

(* indicates features with different degree of attestation from table above)

9.3.2. Base-level observations about the typology

9.3.2.1. Not all features can dissimilate

The attested typology of dissimilation has significant gaps. Dissimilation is robustly attested for only 5 of the 22 featural parameters listed in (14) above; it is clearly *unattested* for 8 of those 22 parameters. This is clear evidence that not all features can participate in dissimilation.

It is not terribly surprising to find that some features don't participate in dissimilation; this is a point of some importance, though. The typology of consonant harmony is also known to have gaps. Because there are gaps in both typologies, we can compare the accuracy of different predictions about the relationship between them.

If a theory predicts that some kind of harmony goes hand-in-hand with some kind of dissimilation, then it should connect gaps to gaps. That is, the fact that the typologies of dissimilation and harmony both have gaps is what allows us to test predictions about how the two phenomena are related. If all features participated in both, these predictions would not be testable.

9.3.2.2. Other asymmetries between features

The observed typology reveals striking asymmetries between related features. For instance, dissimilation of one Major Place feature, [Labial], is very robustly attested, while dissimilation of [Coronal] and [Dorsal] are far less widespread. Along similar lines, consider the laryngeal features. Dissimilation is attested for both values of [±voice]; it is also attested for [+constricted glottis] and [+spread glottis], but not for the opposite values [−sg] & [−cg]. Dissimilation is quite tenuously attested for [+nasal], and is clearly unattested for [−nasal], yet dissimilation of NC sequences is very robust.

The sorts of base-level disparities we see in the typology do not correlate with any systematic factor I know of. For instance, it is not the case that more marked segments dissimilate more usually, nor is it the case that less marked ones are more likely to dissimilate (see §9.6.2 for further discussion of markedness). Dissimilation is attested for some features classically thought of as privative, like [Liquid], but not for others, like [Sonorant]. The one fairly systematic generalization is that dissimilation of so-called 'secondary articulation' features seems to be highly limited. I found no cases of uvularity dissimilation, and no clear examples of dissimilation for any of the features usually used to distinguish among coronal obstruents, like anteriority, laterality, retroflexion, sibilance, etc. This is only a tendency, however: there are some dissimilation patterns that involve secondary pharyngealization, and dissimilation for laterality and retroflexion are undeniably attested in liquids. Overall, the features that participate in dissimilation do not seem to form any kind of natural grouping; features that *don't* participate in dissimilation don't seem like a natural class either.

9.4. Dissimilation isn't the mirror image of consonant harmony

9.4.1. Match or Mismatch?

The Mismatch property of the Surface Correspondence Theory of Dissimilation predicts that the typology of dissimilation should be systematically related to the typology of harmony, but not parallel to it. Parallelism between harmony & dissimilation is tacitly assumed or implied in much previous work (Kent 1936; Shaw 1991; Odden 1994; Walker 2000a, 2001; see also discussion in Rose 2011b). It is also a concrete – if not explicitly noted – prediction made by some previous theories that use the same mechanism to account for both phenomena (Mester 1986; Yip 1988, 1989; Alderete 1996, 1997; Nevins 2004; Mackenzie 2009; Gallagher 2010; Jurgec 2010, a.o.). This notion is the 'Match hypothesis', repeated in (17). Thus, assimilation for a given feature implies dissimilation for that feature, and vice versa.

(17) ***Match Hypothesis***: (repeated from (5) above)
Dissimilation is the mirror image of assimilation, so the typology of long-distance dissimilation should be the same as the typology of long-distance assimilation.

By contrast, the SCTD predicts that the typologies of assimilation & dissimilation are related, but in a consistently mismatched way. For example, consider the role that CORR constraints play in harmony and in dissimilation. In a dissimilation system, the relevant CORR constraint determines which feature dissimilates: consonants dissimilate so that they don't need to correspond. In harmony systems, on the other hand, CORR constraints do the job of determining which consonants are required to agree – *not* what feature they are required to agree for. The table in (18) lists some specific points where the mismatch prediction differs from the match hypothesis.

(18) Match hypothesis in contrast to predictions of the Mismatch property

if there is...	Match hypothesis predicts:	SCTD predicts:
Dissimilation *for* [αF]	Harmony *for* [αF]	Harmony *among* [αF] Cs
Harmony *among* [αF] Cs	Dissimilation *among* [αF] Cs	Dissimilation *for* [αF]
Harmony *bounded by* domain edges	Dissimilation *bounded by* domain edges	Dissimilation *across* domain edges
Harmony between *adjacent* syllables only	Dissimilation between *adjacent* syllables only	Dissimilation between *non-adjacent* syllables

So, the typological predictions of the SCTD are significantly different from previous theories that cultivate the idea that dissimilation and assimilation are mirror-image opposites. These predictions are testable because the typologies of dissimilation and consonant harmony both have gaps. If the Match Hypothesis is correct, then attested patterns of assimilation in harmony should match up with attested kinds of dissimilation; patterns attested in one phenomenon should not correspond to gaps in the typology of the other.

The following section (§9.4.2) takes up the predictions of the Match Hypothesis, and shows that the typology of dissimilation does not bear them out. Assessment of the Mismatch property's predictions is taken up in §9.5; as we will see, it fares much better than the match hypothesis.

9.4.2. Dissimilation and harmony do not have matching typologies

9.4.2.1. The features that dissimilate aren't the ones that harmonize

One finding of the survey is that the features that dissimilate are not the same as the features that harmonize. There are a number of features for which long-distance consonant agreement is clearly attested, but dissimilation is unattested, or very nearly so. Some examples are listed in the table in (19). Details of the relevant dissimilation cases are discussed in §9.7.

(19) Features for which agreement is attested, but dissimilation is not (or is suspect):

Feature/property	Harmony attested by: (ex)	Dissimilation attested?
Uvularity	[k]~[q] dorsal harmony in Misantla Totonac	Uvular ~ Velar dissimilation not attested
Anteriority	[s]~[ʃ] sibilant palatality harmony in Chumash, etc.	Alveolar ~ (Alveo)-Palatal dissimilation not attested
Retroflexion (in non-liquids)	[s]~[ʂ] sibilant retroflexion harmony (Kinyarwanda)	Alveolar ~ Retroflex dissimilation not attested in stops or fricatives
Distributedness	[t]~[t̪] harmony in Anywa, Mayak, Päri, etc.	Dental ~ Alveolar dissimilation not attested
Labio-velarization	P~Pʷ labial harmony in Ponapean	Labio-velarization dissimilation unattested
Pharyngealization	[s]~[sˤ] sibilant harmony in Tsilhqot'in (Chilcotin)	[C]~[Cˤ] dissimilation not attested synchronically
Nasality?	[l]~[n] nasal harmony in Kikongo, Lamba, Yaka, etc.	Nasal ~ Non-nasal dissim. questionably attested (only 2 marginal cases, Takelma and Southern Min)
Continuancy? (marginal)	[s]~[t] stricture harmony in Yabem	Stop ~ Fricative dissimilation weakly attested (only 2 marginal cases, Chaha and Muher)

There are also other features where the situation is reversed: they do participate in dissimilation, but don't show up as agreement features in harmony. Some examples of these are given in (20).

(20) Features for which dissimilation is attested, but agreement is not:

Feature/property	Dissimilation attested in:	Harmony attested?
[+liquid]	[r]~[t] Liquid dissimilation in Yabem, Kɔnni	Non-liquid ~ Liquid harmony questionably attested (only 2 marginal cases: Basaa, KiPare)
[Labial] [Coronal] [Dorsal] [Radical] (≈ Guttural)	[Lab]: (many) [Cor]: Tahitian, Colombian Span. [Dor]: Judeo-Spanish	Major Place harmony unattested?
NC clusters (including prenasalization)	NC~N dissimilation in Gurindji, Yindjibarndi, Lamba, (others) NC~C dissimilation in Gurindji, Bardi, Kwanyama, (others)	NC~N harmony questionable (MSCs in Ngbaka, Ganda Law/Meinhof's rule in Bantu) C ~ NC harmony questionable (MSCs in Ngbaka only)

The features noted above are not just cherry-picked examples; the disparity between harmonizing features and dissimilating features is also a by the numbers result. The table in (21) lists the types of consonant harmony Hansson (2001/2010) observes, sorted by the number of times each one occurs in his database (the 2010 version). The typical agreement features for each type of harmony are listed in the third column. Note that while gradient similarity avoidance has been excluded from the typology of dissimilation, Hansson's (2010) survey does include gradient agreement patterns. The database listing (Hansson 2010:381-390) explicitly identifies 5 cases as gradient, and 4 as sporadic historical changes. I have excluded these 9 cases from the table in (20) to avoid unfairly skewing the comparison.

(21) Types of consonant harmony, by degree of attestation (based on Hansson 2010)

Type of harmony	Number of cases	Usual Agreement feature(s)	Matching dissim. attested?
Sibilant harmony	60	Anteriority Distributedness	✗ ✗
Laryngeal harmony	25	Voicing Spread Glottis Constricted Glottis	✓ ✓ ✓
Nasal consonant harmony	26	Nasality	✗?
Coronal harmony (non-sibilants)	21	Anteriority Distributedness	✗ ✗
Liquid harmony	11	Laterality/Rhoticity	✓
Stricture harmony	7	Continuancy Liquidity?	✗? ✓
Dorsal harmony	5	Uvularity	✗
Secondary articulation	5	Labio-velarity Palatalization Pharyngealization	✗ ✗ ✗
Major place?	10?[17]	Place	✗?

Of 16 agreement features listed here, only 5 are attested types of dissimilation. Moreover, the few features that are attested for both agreement and dissimilation are all clustered together: it's only the laryngeal features and the features related to liquids that participate in both assimilation and dissimilation. It's also worth noting that the kinds of agreement found in sibilant harmony, by far the most robustly attested form of harmony, have no parallels in dissimilation whatsoever. Dissimilation of distributedness is completely unattested; dissimilation of anteriority is attested only weakly, and only in the form of dissimilation between different types of rhotics (see §9.7.5.3). While harmony patterns like /s...ʃ/ → [ʃ...ʃ] are extremely well-attested, the matching equivalent in dissimilation, i.e. /ʃ...ʃ/ → [s...ʃ], never occurs.

[17] NB: Hansson (2010) notes that all possible cases of major place harmony are questionable.

The observed mismatch between the harmonizing features and the ones that dissimilate is, obviously, not consistent with match hypothesis. It *is* consistent with the SCTD, which does not predict any intrinsic connection between the features that undergo assimilation and those that undergo dissimilation.

9.4.2.2. Structural factors do not match up in harmony & dissimilation

There is also several lines of structural evidence which show that the typologies of harmony and dissimilation are not mirror images. These include domain effects, locality effects, and the role that similarity plays in the outcome of each pattern.

Following the match hypothesis, domain-bounding effects in harmony should have matching domain-bounding effects in dissimilation. That is, if it's possible for the edge of a given domain to stop harmony from occurring, then we should also find languages where the same edges stop dissimilation from occurring. This is not a correct prediction. While there are some languages where dissimilation holds only within some domain, these are explained in the SCTD as being limited to the domain of scope of the relevant CORR constraint.

Crucial evidence that would refute the SCTD's treatment of domains is dissimilation that is bounded by a domain that *isn't* a possible domain of scope for CORR constraints. Consider the syllable, for example. Under the definition of CORR constraints proposed in chapter 2, the CORR constraints cannot have the syllable as their domain of scope (the closest approximation is the CVC domain). So, under the match hypothesis, if there is syllable-bounded harmony, then there should be cases of syllable-bounded dissimilation to match. Syllable-bounded consonant harmony is attested in Obolo (ch. 5). Syllable-bounded dissimilation, however, is questionable at best. I have found no examples of dissimilation that clearly hold only within a single syllable and never across syllable boundaries.[18]

What we find instead are patterns of cross-edge dissimilation. An example is Dahl's Law in Kinyarwanda (ch. 3): dissimilation happens only for consonants separated by the stem edge – not inside the stem, and not outside it either. There are no reported cases of harmony with this kind of cross-edge harmony, where agreement fails anytime consonants are on the same side of a domain boundary.[19] So, the big-picture observation is that domain edges can prevent harmony and can cause dissimilation – a clear mismatch between the two phenomena.

There is also evidence that locality conditions operate differently in dissimilation than in harmony. Harmony with a 1-syllable distance limit is a well-attested pattern (Hansson 2001/2010, Rose & Walker 2004). Under the match hypothesis, this predicts the same kind of 1-syllable distance limit could hold in dissimilation patterns in the same way. While this is attested (Kinyarwanda is an example; see ch. 3), we also find a different kind of pattern in Sundanese (ch. 4): dissimilation that happens *only* between non-adjacent syllables. There is no parallel in harmony, another clear mismatch.

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[18] One case of this sort is reported, dissimilatory glottal stop deletion in Seri (Marlett & Stemberger 1983; see also Yip 1988). The key generalization (as framed by Yip 1988) is that a glottal stop deletes after another glottal stop, but only if it is in the same syllable. The available data does not fully support this characterization, though. Marlett & Stemberger (1983:628) give the example /ʔa-a:ʔ-otš/ → [ʔa-a:-otš], *[ʔa-a:ʔ-otš] 'what was sucked'; here, the dissimilation occurs in a /ʔVʔV/ sequence, even though the glottal stops would surface as the onsets of two different syllables. Marlett (1990:526-527) also notes that the dissimilation fails to occur in some forms where the two glottal stops *are* in the same syllable: /ʔe-ʔ-panšX/ → [ʔeʔpánšX] 'run like me!'.

[19] There are languages where harmony applies in affixes, but not in roots; this is understood as root-specific faithfulness. The crucial evidence that a pattern is a cross-edge one is that pairs of consonants that are both *outside* the domain also behave like ones that are both inside it.

Finally, there are asymmetries between harmony & dissimilation in the way that features relate to each other. In harmony patterns, consonants that share one feature also agree for another. If we adopt the match hypothesis, the same should be true of dissimilation: dissimilation should be disagreement among similar consonants (cf. Roberts 2011, Rose 2011b). That is, the outcome of dissimilation should be consonants that crucially differ on one feature, but also *share* another feature.

While some cases of dissimilation do exhibit this pattern (e.g. Sundanese, where dissimilation changes one liquid to another), others do not. A clear example is labial dissimilation in Acehnese (Durie 1985; see §9.7.1.1.1 for discussion), where /p…m/ dissimilates to [s̪…m], *[t…m]. That is, in addition to shedding the shared feature [Labial], the /p/ also undergoes an incidental change from [–continuant] to [+continuant] – a sort of 'overkill'[20] beyond the minimum change needed to avoid a sequence of two labials. The result, in this case, is that labial dissimilation yields a pair of output consonants that have no features in common.

So, in harmony, interacting consonants consistently share some feature in both the input *and* output. The match hypothesis predicts that dissimilation should parallel this: the outcome of dissimilation should be disagreement between *similar* consonants. The facts tell us this is not how things work: languages like Acehnese show that the outcome of dissimilation can be two surface consonants that are not similar in any way whatsoever. This mismatch between harmony & dissimilation is consistent with the SCTD: the only firm prediction it makes about the output of dissimilation is that it must always be two consonants that do not correspond with each other.

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[20] This term adopted from Struijke & de Lacy (2000).

9.4.3. Section summary

The Match Hypothesis is a recurring theme in previous work on harmony and on dissimilation, both as an intuitive expectation and an explicit prediction. However, it is clearly wrong. The facts uncovered in the present survey tell us that the typology of long-distance consonant dissimilation is substantially different from that of consonant harmony: they involve different sets of features, and they have different structural properties. On a typological level, it is not the case that dissimilation is the mirror-image of assimilation.

9.5. Assessing the Mismatch property's predictions

9.5.1. Mismatch predictions & CORR constraints

Following from the general Mismatch Prediction, the surface correspondence theory of dissimilation predicts that the set of features that dissimilate should correlate with the features that define classes of agreeing consonants in harmony. If a CORR constraint for a given feature exists, then segments that share that feature may be required to correspond – setting the stage for them to agree (for some other feature) or to dissimilate. Consequently, if dissimilation for some feature is attested, we predict that harmony among those segments can also occur. For instance, since Labial dissimilation occurs, there must be a CORR·[Labial] constraint; if this CORR constraint is used in an Agreement By Correspondence system, the result will be harmony among labial consonants.

The table in (22) summarizes the kinds of harmonizing classes predicted, based on the typology of dissimilation.

(22) Types of harmony classes predicted ***to occur***, based on typology of dissimilation

	Dissimilating Feature	***Prediction for harmony***
Robustly attested	[Labial]	harmony among labials
	NC clusters/Prenasalization	harmony among NC sequences (?)
	[+constricted glottis]	harmony among ejectives or implosives
	[+spread glottis]	harmony among aspirates
	[–voice]	harmony among voiceless Cs
	[+rhotic]/[–lateral], in liquids	harmony among (different) rhotics
Moderately attested	[Coronal]	harmony among coronals
	[+voice]	harmony among voiced Cs
	[+lateral]/[–rhotic], in liquids	harmony among (different) laterals
Weakly attested	[Dorsal]	harmony among dorsals
	[Radical]	harmony among pharyngeals/gutturals
	[+liquid]	harmony among liquids
	[±anterior] (in liquids)	harmony among [+ant] or [–ant] liquids
Questionably attested	[+continuant]	harmony among continuants
	[–continuant]	harmony among non-continuants
	[+nasal]	harmony among just nasals

The Mismatch property holds for unattested types of harmony and dissimilation just as well as attested ones: the SCTD predicts that gaps in the typology of one should have corresponding gaps in the other. If there are *no* CORR constraints that target a particular feature, [F], then correspondence cannot be required based on that feature. This means that dissimilation for [F] should be impossible, and harmony among [F] consonants should also be impossible. That is, if a feature can't participate in dissimilation, then it also can't define a class of segments that harmonize (i.e. that participate together in agreement for some other feature).

(23) Types of harmony predicted to be ***unattested***, based on dissimilation typology:

Unattested *Dissim. type:*	***Prediction for harmony:***
Labialization	no harmony among just labialized Cs
Uvularity	no harmony among just uvulars
Pharyngealization	no harmony among just pharyngeals
Anteriority (in non-liquids)	no harmony among just [+ant] Cs or just [−ant] Cs
Distributedness	no harmony among just [+dist] Cs or just [−dist] Cs
Laterality (in non-liquids)	no harmony among just laterals
Sonority	no harmony among just sonorants/obstruents
Sibilance	no harmony among just sibilants

The accuracy of these predictions is examined below. §9.5.2 presents cases where attested patterns of harmony & dissimilation bear out the mismatch prediction. §9.5.3 considers features where the mismatch prediction is supported by unattested patterns – gaps the typology of dissimilation, which correspond to unattested kinds of harmony. §9.5.4 notes the features where the mismatch prediction seems to be the wrong result. Finally, §9.5.5 examines features where the mismatch prediction not clearly right or clearly wrong.

9.5.2. Support for the mismatch prediction in attested patterns

A number of the predictions for attested kinds of harmony laid out in (22) above are clearly good ones: the expected pair of effects in dissimilation & harmony are both attested. These good predictions are summarized in the table in (24).

(24) Attested dissimilation that predicts attested harmony

Attested dissimilation		
Feature	**Harmony predicted**	**Harmony pattern attested?**
[Labial]	harmony among labials	Yes: labio-velarity agreement in Ponapean, Mokilese, Ngbaka
[Coronal]	harmony among coronals	Yes: sibilant harmony, dental harmony, etc.
[Dorsal]	harmony among dorsals	Yes: Uvular harmony in Misantla Totonac, Tepehua, Malto
[+voice]	harmony among voiced Cs	Yes: implosive harmony in Ịjọ
[−voice]	harmony among voiceless Cs	Yes: laryngeal harmony in Chaha, Quechua?, Aymara?
[+liquid]	harmony among liquids	Yes: lateral harmony in Bukusu, Sundanese, Atsugewi
[+rhotic]/[−lateral] (in liquids only)	harmony among (different) rhotics	Yes: rhotic retroflexion harmony in Yuwaalaraay, Yuwaalayaay

Details of the relevant kinds of harmony are presented below. Note that none of the examples of harmony in the table above are gradient agreement cases, parallel to the exclusion of gradient similarity avoidance noted in §9.2 above).

9.5.2.1. Harmony among labials, among coronals, and among dorsals

In the SCTD, labial dissimilation is driven by CORR·[Labial] constraints, which require that if consonants are labial, they correspond. This correspondence among labials could also be the basis for agreement among correspondents, though. So, CORR·[Labial] constraints don't produce only labial dissimilation, they can also produce harmony systems where [Labial] consonants agree with each other on some other feature.

Agreement among labials is attested in Ponapean, analyzed in chapter 6. In Ponapean, there are two sets of labials, plain [p m] and velarized [p^w m^w], and roots exhibit static agreement for this distinction. That is, a root cannot two labials that disagree in velarization. The same pattern of labio-velarity agreement is also found in Mokilese, another Polynesian language closely related to Ponapean. Labio-velarity agreement among labials is also attested further afield: in Ngbaka, an Adawama-Ubangian language spoken in the Democratic Republic of Congo, roots may not contain both a plain labial and a labio-velar one (i.e. *P~K͡P, in either order). Nasal agreement among labials also seems to be attested in reconstructed Proto-Indo-European, which had no roots containing *m and an oral labial non-continuant (Cooper 2009:56).

Corr constraints referring to [Coronal], in the SCTD, predict both coronal dissimilation and harmony among coronals. Coronal dissimilation is attested in at least a handful of languages (see §9.7.1.2 for details). Harmony among coronals is also attested, and extremely robustly. Sibilant harmonies generally hold only between coronals. There are also a substantial number of languages with agreement among non-sibilant coronals. Relevant cases include dental agreement in Nilotic languages, and static retroflex agreement in a number of Australian and Austronesian languages; see Rose & Walker (2004), Hansson (2010, §2.4.1.2) for details of these cases.

CORR·[Dorsal] constraints lead to both dorsal dissimilation, and harmony among dorsals. Dorsal dissimilation is attested in a small number of cases; harmony among dorsals is also attested. Uvular harmony with visible alternations (e.g. /k…q/ → [q…q]) is attested in the Totonacan languages Misantla Totonac (MacKay 1999) and Tepehua (Watters 1988). In these cases, dorsal consonants agree for uvularity; Hansson (2010) identifies several other potential examples of static uvular agreement as well. There is also at least one language, Malto, where dorsals – including both velars and uvulars – agree for voicing (Rose & Walker 2004; Hansson 2010:76).

9.5.2.2. Harmony among [+voice] and [–voice] consonants

Dissimilation of voicing requires that there are CORR·[+voice] constraints; these also give rise to the possibility of harmony among only voiced consonants. This is attested in the form of implosive harmony in Kalaḅarị Ịjọ (Jenewari 1977:68). In Kalaḅarị, there is static agreement among voiced stops for implosion: a root may contain either the voiced implosives [ɓ ɗ] or the plain voiced stops [b d], but not one of each: *[ɓada], *[baɗa], etc. Similar implosive harmony is also reported in at least one other Ịjọ language, Ḅụmọ Ịzọn (Efere 2001; also discussed by Hansson 2001/2010, Mackenzie 2009, Gallagher 2010).

Voiceless dissimilation, such as the Dahl's Law pattern in Kinyarwanda (ch. 3) implies the existence of CORR constraints that target [–voice]; these predict that there can be harmony among voiceless consonants. While there are no reports of harmony patterns like this, a number of well-known laryngeal co-occurrence restrictions can be characterized as agreement limited to voiceless consonants. An example is Chaha: Rose & Walker (2004) report that there is glottalization agreement among stops in the root. However, Rose & King (2007) find that this agreement is only an exceptionless restriction among voiceless consonants. That is, if stops in the root disagree in voicing, then glottality disagreement is not common, but it is possible: sequences like [k'…d] are under-represented in roots, but not entirely unattested. By contrast, glottality disagreement between voiceless consonants is unattested: sequences like [k'…t] are not merely under-represented, they are non-existent. This facet of the Chaha pattern can be understood as agreement for [±constricted glottis] among [–voice] consonants, an example of the kind of agreement predicted by CORR·[−voice].[21] Other potential cases of agreement among [−voice] consonants are languages with agreement that cuts across ejectives and aspirates. A tentative example is Cuzco Quechua, which does not allow roots to contain both an ejective and an aspirate (as noted in chapter 5, but not analyzed). This can be interpreted as agreement among voiceless stops for [±sg] and/or [±cg]; a similar pattern is also found in Aymara, though there are exceptions that make it an imperfect example (see MacEachern 1999 for discussion).

9.5.2.3. Harmony among liquids, and among rhotics

9.5.2.3.1. Harmony among liquids

In the SCTD, CORR·[+liquid] constraints lead to dissimilation for liquidity (e.g. /l…r/ → [l…t]), and harmony among liquids. Liquid harmony is well known from previous work on consonant harmony. One example is Sundanese L-assimilation, analyzed in chapter 4, where liquids agree for laterality/rhoticity. Other languages with visible harmony among liquids include Atsugewi and Lubukusu and perhaps Wiyot; see Hansson (2010) for further details and references.

9.5.2.3.2. Harmony among rhotics

In the SCTD, rhotic dissimilation is driven by CORR·[Rhotic] constraints; the existence of CORR constraints that refer to rhoticity also predicts that harmony among rhotics is

[21] The Chaha generalizations are too complex for the present discussion to cover in full; see Rose & Walker (2004), Rose & King (2007) for details.

possible. The expectation is to find languages where rhotic consonants agree for some feature, such as retroflexion.

Harmony among rhotics is attested in two closely related Australian languages, Yuwaalaraay and Yuwaalayaay. In these languages, there are two different rhotic consonants: a retroflex approximant [ɻ], and an apico-alveolar trill [r], sometimes realized as a tap or flap (Williams 1980:16)[22]. These rhotics exhibit a static agreement pattern: if a word contains two rhotics, they are always two of the same rhotic. Put differently, a word may not contain the disagreeing rhotic sequences [r....ɻ] or [ɻ...r].

The evidence for rhotic agreement in Yuwaalaraay and Yuwaalayaay comes from a search of three dictionaries[23]. The examples in (25a) & (25b) show that each rhotic may co-occur with another of the same type. But, there is a near-absolute ban on words with one of each type of rhotic. The four words in (25c) are the only forms with [r....ɻ] or [ɻ...r]; all are of questionable status. Ash et al. (2003) note that two may not be certain because they are found in only one data source. Another is a probable compound. The last one is an English loanword, and is transcribed by Williams (1980) with final [d] rather than the [r] found in Ash et al's transcription.

[22] Williams notes that [ɻ] is relatively infrequent for historical reasons: it changes to [j] or Ø intervocalically (cf. Yuwaalaraay ~ Yuwaalayaay). See

[23] Williams's (1980) 1500-word lexicon of Yuwaalaraay, Ash et al.'s (2003) dictionary of Yuwaalaraay, Yuwaalayaay and Gamilaraay, and *Gayarragi, Winangali*, a 2600-entry dictionary of Gamilaraay and Yuwaalaraay (Giacon & Nathan 2009).

(25) Yuwaalaraay & Yuwaalayaay rhotic agreement (examples from Ash et al. 2003)

a. ✓[r...r]

burara	'bullrush'
d̪aragara	'platypus'
d̪arar	'rib'
galgari:r	'black-headed monitor'
garar	'type of tree frog'
garawir	'ringtail possum'
jara:d̪ar	'piece of bark'

b. ✓[ɻ...ɻ]

gaɻigaɻi	'afraid, frightened'
buribara	'pregnant'
galaɻi:nbaɻa:j	'Collarenbri' (placename; from galaɻi:n + baɻaaj)
n̪aɻibaɻa:j	'Narrabri' (placename)

c. *[r....ɻ], *[ɻ...r] (exhaustive list of all exceptions)[24]

barawaɻa:j	'sugar ant' (Yuwaalayaay only); only noted in one source
garaɻana	'bullroarer' (Yuwaalaraay only); only noted in one source[25]
muruɻwaliŋaj	'stale' (cf. *waliŋaj* 'lonely, sulky')
juɻabir ~ juɻabid	'rabbit' (from Eng. *rabbit*)

Note that each rhotic may co-occur with the non-rhotic liquid [l]; this shows that the ban on is not due to any more general requirement that liquids agree in retroflexion or for the trill/approximant distinction. The agreement pattern is limited to only the rhotic liquids.

9.5.3. Unattested patterns that support the mismatch prediction

The Mismatch property prediction also makes predictions about unattested patterns, as noted above (23). The reasoning is that if dissimilation for some feature *cannot* occur, then there must *not* be a CORR constraint that refers to that feature. This, in turn, means

[24] Williams (1980) gives one more word with disagreeing rhotics, [guɻajwa:r] 'type of willy wagtail'. This word is not found in Ash et al.; they list only [d̪irid̪iri] 'willy wagtail' instead. Giacon & Nathan (2009) do not list any additional examples that have both [r] & [ɻ].

[25] Ash et al. (2003:81) also note that the word garaɻana is "used in some [Yuwaalaraay], [Gamilaraay] areas". Gamilaraay doesn't exhibit the same rhotic agreement, so if this word is of Gamilaraay origin, it is a non-exception.

that correspondence cannot be required on the basis of that feature, and therefore correspondence requirements cannot hold over just that class of segments. So, the prediction is that if a feature doesn't participate in dissimilation, then there should be no languages where some kind of agreement applies only among consonants with that feature.

Paired gaps in the typologies of harmony and dissimilation also provide support for the mismatch prediction. For instance, long-distance dissimilation of secondary labialization is unattested; this suggests there is no constraint "CORR·[+labialized]", which in turn predicts that no language can have harmony among just labialized consonants. And, as predicted, this kind of harmony is unattested. The table in (26) illustrates some cases where clearly unattested kinds of dissimilation predict unattested kinds of consonant harmony.

(26) Mismatched gaps: unattested kinds of dissimilation predict unattested harmony

Unattested dissimilation	***Harmony predicted to be impossible***	***Harmony attested?***	***Mismatched?***
Labialization	no harmony among labialized Cs	unattested	✓
Labio-velarity	no harmony among labio-velar Cs only	unattested	✓
Uvularity	no harmony among different uvulars	unattested	✓
Pharyngealization	no harmony among just pharygealized Cs	unattested	✓
Laterality (in non-liquids)	no harmony among different lateral non-liquids	questionable (1 suspect case)	✓?
Nasality	no harmony among nasals	questionable (all cases suspect)	✓?

Agreement among labialized consonants, among labio-velars, among pharyngealized consonants, and among uvulars all seem to be unattested; they are absent from Hansson's (2001/2010) database, and I know of no reported cases of this sort. This supports the mismatch prediction, since long-distance dissimilation of these features is unattested.

9.5.4. Where the mismatch prediction seems wrong

Not all of the predictions that stem from the SCTD's Mismatch property are good; some are obviously not supported. The table in (27) identifies the clearest among these. Note that all of these are predictions based on gaps in the dissimilation typology, that incorrectly predict gaps in the typology of harmony. There are no cases where an attested pattern of dissimilation predicts a definitively unattested pattern of harmony.

(27) Key cases where the mismatch prediction seems wrong:

Dissimilation type	*Prediction for harmony*	*Harmony attested?*	*Mismatched?*
Sibilance dissimilation is unattested	no harmony among just sibilants (or non-sibilants)	Attested: Sibilant harmony is robustly attested	✗
Sonority dissimilation is unattested	no harmony among just sonorants or obstruents	Attested: Nasal harmony among nasals & liquids in Kikongo	✗
[–constricted glottis] dissimilation is unattested	no harmony among just non-glottalized Cs	Attested: voicing harmony among non-implosives in Ngizim	✗

I have little insight to offer about the predictions that are obviously wrong. The clearest of these concerns sibilants: sibilant harmony is extremely robustly attested, but the existence of sibilant dissimilation is very tenuous. It is possible that gaps like this one in the dissimilation typology are coincidental. While I have considered cases of dissimilation from a diverse sample of languages (both geographically and genetically), this is not necessarily representative of the full space of grammatical possibilities. For instance, it is conceivable that sibilant dissimilation was widespread in the Americas before the arrival of smallpox – or that it actually is robustly attested somewhere in Papua New Guinea. It's also conceivable that it is possible, but is rare due to non-phonological factors, such as biases in acquisition and/or processing. Or the gap could represent a failing on the part of the basic theory of features – perhaps the predictions made by CORR·(D)-[+sibilant] are wrong because [±sibilant] isn't a real feature. Explanation of this typological asymmetry is left for future work.

9.5.5. Points of unclarity for the mismatch predictions

In between the clearly good and clearly bad predictions of the theory are a plethora of less clear cases. The observed typology of dissimilation is, as noted above, unexpectedly spotty. Consequently, there are a number of cases where the theory makes a specific prediction, but it's not clear from the typology whether it's right or wrong. Some of these points of unclarity are noted in the table in (28), and discussed below.

(28) Points of unclarity for the mismatch predictions:

Dissimilation	*Prediction for harmony*	*Mismatch borne out?*
[+continuant] dissimilation is weakly attested	(no) harmony among just continuants?	Yes?: Dissimilation questionable, parallel harmony cases all ambiguous
[−continuant] dissimilation is weakly attested	(no) harmony among just non-continuants?	No?: Dissimilation questionable, parallel harmony cases all ambiguous
[+nasal] dissimilation weakly attested	(no) harmony among just nasals?	Yes?: Dissimilation nearly unattested, parallel harmony cases all marginal
dissimilation of NC sequences is robustly attested	harmony among NC sequences	No?: Harmony among NC sequences (excluding lone Ns & Cs), for some feature other than nasality, is unattested
[+cg] dissimilation is robustly attested	harmony among ejectives	Maybe: Dissimilation robust, but parallel harmony cases all ambiguous
[+sg] dissimilation is robustly attested	harmony among aspirates	Maybe: Dissimilation robust, but parallel harmony cases all ambiguous
Lateral dissimilation is moderately attested in liquids only	harmony among lateral liquids?	Maybe: Lateral dissimilation attested in liquids, but not for other consonants; harmony among laterals questionable
Anteriority dissimilation is attested only in liquids	harmony among anterior liquids?	Maybe: Anteriority dissimilation attested only for rhotics; harmony among [+ant] or [−ant] Cs never limited to liquids
Distributedness dissimilation is unattested	no harmony among distributed consonants	Maybe: harmony among [−dist] Cs is weakly attested, but harmony among [+dist] Cs is unattested
Labial dissimilation is robustly attested	harmony among labials	Agreement among labials is attested, but not robustly (no cases with visible alternations)
Coronal dissimilation only moderately attested	Harmony among coronals	Harmony among coronals is very robustly attested (sibilant harmony, dental harmony)
Dorsal dissimilation only weakly attested	Harmony among dorsals	Harmony among dorsals (i.e. uvular harmony) is clearly attested
Radical dissimilation is weakly attested	Harmony among gutturals	Harmony among gutturals (e.g. for pharyngeality, voicing, etc.) is unattested

9.5.5.1. Dissimilation for [±continuant]?

Continuancy dissimilation is weakly attested: there few potential examples, and none are especially clear (see §9.7.2.1 for discussion and details of each). If these cases are regarded as legitimate dissimilation patterns, the Corr constraints responsible for them would be CORR·[+continuant] or CORR·[–continuant]. The former can also lead to harmony among just continuants; the latter to harmony among only non-continuants.

There are numerous documented cases of consonant harmony which holds only among continuants; however, in many of these cases it isn't clear that [+continuant] is the crucial feature. As an example, consider sibilant harmony, such as the kind found in Kinyarwanda (ch. 3). In Kinyarwanda, sibilant retroflexion agreement holds only between the sibilant fricatives {s z ʂ̺ ʐ̺}, and does not affect stops or affricates. On the one hand, the harmonizing consonants all share the feature [+continuant], so this is technically an instance of harmony among continuants. But on the other hand, continuancy isn't the only feature they share: {s z ʂ̺ ʐ̺} are also all characterized as [+sibilant], and [Coronal], and [–sonorant], etc. So, the CORR constraint(s) responsible for correspondence among the sibilants could refer to these other features, and not refer to [+continuant]. A similar situation arises in Yucatec Mayan. The pertinent generalization is that if a root contains two of the strident stops & fricatives {s ʃ ts tʃ}, they must be identical – i.e. they must agree for anteriority, and the fricative/affricate distinction. This pattern has been characterized in previous work agreement among the [+continuant] consonants (Straight 1976, Yip 1989, McCarthy 1989, Lombardi 1990); however, we could just as easily interpret it as agreement among stridents or sibilants instead. So, while harmony among continuants is attested, further work must be done to determine whether these cases really feature CORR·[+continuant] as the operative constraint.

Harmony among only *non*-continuants does seem to be clearly attested. For instance, in Päri (Andersen 1988, Rose & Walker 2004, Hansson 2001/2010), dental/alveolar harmony applies to coronal stops and nasals, but does not affect continuant coronals. That is, the agreement holds only among the [–continuant] consonants. Another example is Chaha, where laryngeal agreement holds between stops, but demonstrably doesn't extend to fricatives (Rose & Walker 2004:497). Hansson (2001/2010) also identifies a number of other languages where coronal harmony holds among only stops; or among stops and nasals; or among stops, nasals, and laterals – all classes characterizable as [–continuant]. These cases include dental/alveolar agreement patterns in various Nilotic languages (Adhola, Alur, Anywa, Dholuo, Mayak, Shilluk), as well as retroflex agreement in some Australian languages (Gaagudju, Gooniyandi, Mayali, Murrinh-patha) and Malto, a Dravidian language. There are also numerous cases where laryngeal agreement hold among stops, but not continuant obstruents, including Gojri, Hausa, Ngbaka and Yabem among others. Finally, nasal harmony in some Bantu languages appears to be constrained based on continuancy. A well-known example is Kikongo, where nasal agreement holds between /l/s and nasals within the stem (Ao 1991, Rose & Walker 2004; see also ch. 2 for examples and brief discussion). While /l/ and nasals both share the feature [+sonorant], other sonorants like the glides [w j] are not reported to participate in the nasal harmony pattern. Thus, it seems that Kikongo has nasal harmony only among non-continuant sonorants – further evidence that CORR constraints can refer to [–continuant].[26]

[26] The same observation holds for some of the other Bantu languages that Rose & Walker (2004) and Hansson (2001/2010) identify as cases of nasal consonant harmony, including: Ila (Smith 1907, Doke 1928), Yaka (Walker 2000b), Ndonga (Fivaz & Shikomba 1986), Lamba (Doke 1927, 1938).

Finally, another relevant case worth noting is Kalasha, an Indo-Aryan language reported to have retroflex agreement only between coronal obstruents with the same continuancy (Arsenault & Kochetov 2011). In Kalasha, static retroflexion agreement is evident between fricatives (*s~ʂ), between affricates (*ts~ʈʂ), and between stops (*t~ʈ). However, Arsenault & Kochetov find that coronal obstruents are allowed to disagree in retroflexion if they differ in continuancy: retroflex stops can occur with non-retroflex fricatives, etc. As noted briefly in chapter 6, this pattern can be interpreted as correspondence being required among coronals, but limited such that correspondence is only allowed between coronals that agree in continuancy – this would be an effect of CC·IDENT-[continuant]. However, an alternative interpretation is possible as well: it could be that correspondence is only required between [+continuant] coronals, and the [–continuant] coronals. If analyzed in this way, Kalasha would be evidence for CORR·[+continuant] and CORR·[–continuant].

9.5.5.2. Harmony among nasals and among NC clusters?

True dissimilation of nasality (e.g. /n…n/ → [l…n]) is questionably attested; there are a small number of reported cases, and all of them are questionable examples (see §9.7.2.3 for discussion). If nasal dissimilation is regarded as unattested, this suggests that there is no CORR constraint that refers to nasality – i.e. that CORR·[+nasal] is not one of the CORR constraints that actually exist. The non-existence of CORR·[+nasal] predicts that consonant harmony cannot hold exclusively among nasals. And, true to that expectation, neither Hansson (2001/2010) nor Rose & Walker (2004) find any languages where agreement for some feature holds just between nasals.

The only kind of long-distance nasality dissimilation that clearly *is* attested is dissimilation in NC sequences, e.g. /NC…NC/ → [NC…C], *[NC…NC] (see §9.7.2.3 for discussion of cases). These patterns are problematic to characterize: in many cases, the dissimilating NC sequences are definitively clusters, not prenasalized consonants. As such, these cases cannot uniformly be analyzed as dissimilation of prenasalization; some of them are clearly cluster-to-cluster interactions. The CORR constraints as formulated in chapter 2 cannot be formulated to refer to clusters directly. As such, there is no way to define a CORR constraint that penalizes non-correspondence for only those nasals which happen to be followed by a non-nasal consonant.[27]

9.5.5.3. Harmony among [+cg] and [+sg] consonants

Dissimilation of [+constricted glottis], of the sort encountered in Cuzco Quechua in chapter 5, is driven by CORR·[+cg]; CORR constraints that target [+cg] also predict that agreement for some feature can hold among just constricted glottis consonants. The ejective identity effects in Chol analyzed in chapter 6 can be understood as this sort of agreement. In the Chol case, ejectives in the same root must agree in place, anteriority,

[27] Note that the logic of the mismatch prediction still holds, even in this case. If there *were* a CORR constraint that required correspondence only between consonants in NC clusters, the SCTD would predict both dissimilation of NC clusters *and* harmony among such clusters. It's not clear what such harmony would look like, so it's not clear if it's attested. Harmony between NC clusters would be most apparent if the agreement were for voicing, i.e. /nt…mb/ → [nd…mb]. Agreement between NC clusters would be *least* apparent if it was agreement for nasality; the result would be patterns that look very much like dissimilation: /NC…NC/ → [NC…CC] (where the second cluster agrees with the [−nasal] value of the C in the first), or /NC…NC/ → [NN…NC] (where the first C agrees with the [+nasal] of the nasal portions of the clusters). The latter is strikingly similar to certain occurrences of Meinhof's rule, also known as the 'Ganda Law'; see §9.7.2.3.4.2).

and continuancy. There are no alternations, so the data does not determine whether this agreement is enforced by assimilation or by dissimilation. The analysis in chapter 6 explores the dissimilatory interpretation of the pattern; however, if Chol's ejective agreement is interpreted as assimilation, it's an example of the type of harmony predicted by CORR·[+cg]. Laryngeal co-occurrence restrictions in a number of other languages can also be characterized as agreement among [+constricted glottis] consonants. One particularly clear example is Hausa (MacEachern 1999), where glottalic stops – whether they are ejectives or implosives – must agree in all features. Hansson (2001/2010) also notes Aymara and various Mayan languages (including Chol) as potential examples of agreement among ejectives.

Dissimilation of [+spread glottis] is robustly attested; this too was encountered in Cuzco Quechua (some other cases are noted in §9.7.3.2 below). In the SCTD, this type of dissimilation is driven by CORR constraints that target [+spread glottis], constraints which also predict the possibility of agreement among only [+sg] consonants. Two potential examples of this kind of harmony are Gojri and Peruvian Aymara (MacEachern 1999, Hansson 2001/2010). In both of these languages, ejectives in the same root must agree in all features – an identity effect parallel to the pattern in Chol noted previously.

9.5.5.4. Lateral dissimilation and harmony among laterals

Lateral dissimilation, in the SCTD, is driven by CORR·[+lateral] constraints; these can also give rise to harmony among laterals. So, because there are languages with lateral dissimilation, such as Latin (see ch. 8), we expect that there could be languages where laterals agree on some feature.

It's not clear whether the predicted sort of harmony among laterals is attested or not. A potential example is Jibbāli (discussed in §9.7.4.4.1), which appears to require that lateral fricatives agree in voicing, though the data is somewhat tenuous. Furthermore, all known cases of lateral dissimilation involve lateral *liquids* (e.g. /l...l/ → [l...r]); lateral dissimilation among non-liquids is clearly unattested. This can be interpreted as evidence that there is CORR·[+lateral, +liquid], but no general CORR·[+lateral] constraints. The Jibbāli pattern would be agreement only among non-liquid laterals, so it isn't necessarily an example of the pattern predicted.[28]

It's also not clear whether the unattestedness of agreement among laterals is a real strike against the mismatch prediction. What the SCTD predicts is that if there is CORR·[+lateral], then there *can* be systems where laterals agree for some feature. This possibility does not entail that such patterns should be observable: it's not necessarily the case that all grammatical possibilities occur in the extant languages of the world, let alone the languages known in the phonology literature. Since it's relatively uncommon for languages to distinguish multiple different laterals, we expect harmony

[28] The only other *possible* example of agreement among laterals that I know of is Chimwiini. Chimwiini has two lateral liquids; the difference between them has been characterized either as a tap vs. full approximant (Kisseberth & Abasheikh 1975, Hansson 2001/2010), or as a dental/alveolar contrast (Kisseberth & Abasheikh 2004). Certain suffixes exhibit alternations between these two laterals, depending in part on stem-final liquids. While some kind of interaction between non-adjacent liquid and/or lateral consonants is clearly involved in the Chimwiini pattern, this case defies straightforward characterization as assimilation or dissimilation, and may well involve both. The reader is referred to Kisseberth & Abasheikh (2004:xvi) and Hansson (2010:101-103) for details.

among different laterals to be more uncommon still. It may be unattested simply because it's unlikely to arise, rather than being grammatically impossible.

9.5.5.5. Anteriority and liquids vs. non-liquids

Anteriority dissimilation is questionably attested. The only potential cases are rhotic type dissimilation in two Australian languages, Yindjibarndi & Warlpiri (see §9.7.5.3 for details). In both cases, the dissimilation is between two different kinds of rhotics – one an alveolar tap or trill, the other a retroflex approximant. These are questionable as examples of anteriority dissimilation because the alveolar vs. retroflex contrast is confounded with the distinction between taps/trills and approximants.

If there were CORR constraints that target [+anterior] or [–anterior], the predicted mismatch would be harmony among [+anterior] or [–anterior] consonants, respectively. This is also questionably attested. Yip (1989:365) characterizes dental agreement in Luo as [±distributed] agreement among [+anterior] coronals; similar dental agreement in other Nilotic languages can be treated in the same way. However, this characterization is somewhat suspect, as Hansson (2010:61) points out: it rests on the assumption that [s] is [–anterior] in Luo, even though primary-source descriptions clearly describe it as being alveolar, just like [+anterior] [t] and [d] (Tucker 1994:30, e.g.). The pattern in Luo is more accurately characterized as being agreement among the [–continuant] coronals, rather than the [+anterior] ones, and the same is true of the related patterns in related languages.

A lone, similarly questionable, example of harmony among [–anterior] consonants is found in Kipare, a Bantu language from Tanzania (Odden 1994:315; see also discussion in Rose & Walker 2004, Hansson 2001/2010). The pertinent generalization is that in two suffixes, /j/ optionally becomes [ɟ] after {ʃ ɟ ɲ}, e.g. /ni-maɲ-ije/ → [ni-maɲ-iɟe] 'I have known'. Two things make this case unclear as an example of agreement among [–anterior] consonants, though. First, the agreement is purely optional, never mandatory. Second, the same /j/ also assimilates to match the clearly [+anterior] consonants {r l}: /ni-zor-ije/ → [ni-zor-ire] 'I bought' (Odden 1994:316). So, the Kipare pattern is not clearly consonant harmony on the same order as established cases, and it is clearly not an interaction between just [–anterior] consonants. For these reasons, it is suspect as a case of agreement among [–anterior] consonants.

If we leave aside the cases of rhotic type dissimilation, the generalization is that anteriority dissimilation is unattested. And, if we leave aside suspect cases like the Luo and Kipare ones noted above, harmony among [–anterior] consonants is also unattested. While this result is not strong and unambiguous support for the mismatch prediction, it is nonetheless consistent with it.

9.5.5.6. Dissimilation and harmony based on [±distributed]

Dissimilation for [+distributed] is unattested; this suggests there are no CORR·[+distributed] constraints, which means correspondence cannot be required specifically among [+distributed] consonants, i.e. dental and palatal coronals. Harmony among just dentals and/or palatals is questionably attested. Neither Hansson (2001/2010) nor Rose & Walker (2004) find any cases of harmony like this. McCarthy (1988:104) mentions one example, Ngiyambaa (Donaldson 1980), but this pattern appears to be conditioned by vowels, and not a genuine case of consonant-to-consonant agreement. So, for the [+distributed] value, the mismatch prediction seems to be correct.

Dissimilation of [–distributed] is unattested; this means there must be no CORR·[–distributed] feature, which implies that there cannot be harmony among just the [–distributed] consonants, i.e. apical coronals. Harmony among apicals appears to be attested in a number of northern Australian languages, but these cases are somewhat marginal as there are no alternations. The generalization, found in languages like Gaagudju and Gooniyandi (MacGregor 1990, Hamilton 1993, Gafos 1999, Hansson 2001/2010) is that alveolar and retroflex apicals do not contrast in root-initial position; apicals in this position are either alveolar by default (Gaagudju), or vary freely between alveolar and retroflex. The harmony is observed when a root contains two or more apicals: a root-initial apical deviates from the normal realization to match a non-initial one.

9.5.5.7. Place asymmetries

A final area where the accuracy of the mismatch prediction is unclear concerns the different major place features, [Labial], [Coronal], and [Dorsal]. Labial dissimilation is robustly attested; this leads us to predict harmony among labials. While this is attested (see §9.5.2.1 above), it is relatively uncommon, all extant cases involve agreement for labio-velarity, and none exhibit visible assimilatory alternations. This lack of diversity is unexpected from the view of the SCTD. There is no intrinsic formal relationship between the CORR constraint & CC·IDENT constraint in a harmony system, so there is no reason labials should agree for velarization rather than, say, nasality, or voicing. [29]

Coronals and dorsals present a similar puzzle: dissimilation for these features is much less robustly attested than harmony. Harmony among coronals is extremely well attested, and exhibits many different types of agreement. Harmony among dorsals is less robustly attested, but there are still multiple different kinds of agreement (e.g. uvular harmony in Misantla Totonac, laryngeal agreement in Malto), and more examples than for harmony among labials. The theory makes no predictions about relative frequency of occurrence, so this is not evidence against it. Still, it is somewhat surprising that [Labial] dissimilates so robustly, yet participates so little in harmony, and that the other place features show the same kind of disparity.

Finally, it's worth noting that while Radical (≈ guttural) dissimilation is attested, albeit weakly, I know of no reported cases of harmony among gutturals. It's difficult to say if this is a meaningful result or an accidental gap in the data. If pharyngeal dissimilation is taken to be genuine, the mismatching kind of harmony predicted would be agreement among pharyngeals, for some other feature. Since pharyngeals typically offer a very narrow range of possible featural contrasts, this harmony would most likely be voicing agreement, i.e. /ħ...ʕ/ → [ʕ...ʕ]. The likelihood of discovering languages with this kind of pattern seems low, given that pharyngeal consonants are

[29] Predicting no inherent connection between the features that define harmonizing classes and the features that agreement is required on is not a new development of the SCTD; this also falls out previous work on Agreement By Correspondence (Walker 2000a, 2000b, 2001; Rose & Walker 2004; Hansson 2001/2010). It also appears to be an empirically outcome. For instance, sibilants can assimilate for coronal-specific features like [±anterior] and [±distributed], but also for other features like pharyngealization, in Tsilhqot'in (=Cholcotin), and for voicing, in Berber.

rare, and the vast majority of laryngeal harmony patterns are clearly static agreement with no alternations. So, while the theory makes a specific prediction here, it is not clearly testable in any very convincing way.

9.5.6. Mismatch predictions & CC·Limiter constraints

9.5.6.1. Structural factors support the mismatch prediction

Chapter 2 posits 5 structural limiter constraints: three CC·EDGE constraints, as well as CC·SROLE, and CC·SYLLADJ (following Rose & Walker 2004, as noted previously). For all of these constraints, the predicted mismatch between harmony & dissimilation is borne out. This is summarized in the table in (29).

(29) Mismatch predictions for structural CC·Limiters

Constraint	Effect in harmony	Prediction for dissim.	Attested in:
CC·EDGE-(Stem)	Stem-bounded harmony (Ex: Kinyarwanda sibilant harmony)	Dissimilation that happens only across the stem edge	Kinyarwanda (ch. 3) (Dahl's Law)
CC·EDGE-(Root)	Root-bounded harmony (Ex: Chaha laryngeal harmony)	Dissimilation that happens only across the root edge	Zulu (ch. 7), Georgian, Latin? (ch. 8)
CC·EDGE-(σ)	Syllable-bounded harmony (Ex: Obolo nasal harmony)	Dissimilation that happens only across a syllable edge	Cuzco Quechua (ch. 5)
CC·SYLLADJ	Harmony with a one-syllable distance limit (Ex: Ndonga nasal harmony)	Dissimilation between non-adjacent syllables (but not for adjacent syllables)	Sundanese (ch. 4)
CC·SROLE	Harmony between Cs with matching syllable roles (Ex: Kikongo nasal harmony)	Dissimilation for Cs with mismatching syllable roles (but not those with matching syllable roles)	Sundanese (ch. 4)

Edge-bounded harmony and cross-edge dissimilation are both attested, for each of the three CC·EDGE constraints posited in this dissertation. The same is true for CC·SROLE & CC·SYLLADJ, as shown by the analysis of Sundanese in chapter 4. Since all of these cases of dissimilation were discussed in detail in previous chapters, this chapter will not attend to structural factors in detail.[30]

The Mismatch property's predictions for CC·Limiter constraints are also supported by paired gaps in the typologies of harmony and dissimilation. For example, the CC·EDGE constraints defined in chapter 2 can target the root, the stem, or the syllable; there is no CC·EDGE-(Foot). The evidence for this is that there are no known cases where dissimilation happens crucially across the edge of a foot. In harmony, CC·EDGE-(Foot) would predict foot-bounded harmony, which is also unattested.[31] There are also no cases of foot-bounded dissimilation, which supports the non-existence of CORR constraints with the foot as their domain of scope.

9.5.6.2. CC·IDENT & featural agreement in dissimilation

The Mismatch property of the SCTD, as it relates to CC·IDENT constraints, predicts that if there is agreement for some feature in consonant harmony, then there can also be dissimilation which depends on *disagreement* for that feature. In other words, CC·IDENT

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[30] Each of these example cases of harmony were noted in ch. 2 as well. See Rose & Walker (2004) for more detailed discussion of Ndonga, Kikongo, and Chaha; see also ch. 3 for Kinyarwanda, and ch. 5 for Obolo.

[31] Hansson (2001/2010) notes one case, Yabem, where stops in the same foot agree in voicing. This is not a true example of foot-bounded harmony, though: it's a case of tone spreading, and the voicing agreement follows from tone of each syllable (Hansson 2004; see also Ross 1993, 1995).

constraints predict 'anti-parasitic' dissimilation, in the sense of Kimper (2011:170). This is because CC·IDENT-[F] constraints penalize correspondence between segments that have disagreeing values on some feature [±F]. This penalized correspondence can be improved upon by assimilation to achieve agreement, or by dissimilation to achieve non-correspondence.

Chapter 6 examined the types of dissimilation systems predicted by CC·IDENT constraints: they resemble the "Complete Identity Effects" of MacEachern (1999). While such patterns do unquestionably exist, they seem to rarely (if ever) exhibit the visible alternations needed to distinguish dissimilation from harmony. So, I am not able to determine whether this prediction is a sound one. The predicted type of pattern does exist, but the known cases are not conclusively dissimilation.

9.5.7. Summary: mismatch predictions is more right than wrong

We have seen in this section that the Mismatch property of the SCTD leads to a complex array of predictions. Some of them are clearly correct. A few are clearly incorrect. Many are difficult to categorize one way or the other, based on the data known so far – these are areas where future research is warranted. Overall, though, the mismatch prediction seems to be correct more often than incorrect. It also clearly fits with the observed typology far better than the obvious alternative, the match hypothesis (considered in §9.4 above).

9.6. Comparison to other theories of dissimilation

9.6.1. The Generalized OCP

The fact that not all features dissimilate is not obviously explainable by previous OCP-based theories of dissimilation. One of the more explicitly defined OCP-based theories of dissimilation is Suzuki's (1998) Generalized OCP ("GOCP"). The theory specifies a general template for defining OCP constraints (30), each of which penalizes the co-occurrence of two instances of a specified grammatical or phonological category.

(30) Generalized OCP (Suzuki 1998:27)
"*X...X"
- i) 'X' $\in$ {PCat, GCat}
  (any phonological or grammatical category)
- ii) '...' is intervening material
  (picked from the proximity hierarchy values {Ø > C_0 > μ > μμ > σσ > ... > ∞})

In defining the OCP as a fully generalized template, the GOCP theory predicts that anything can dissimilate. Suzuki argues that this is a positive characteristic of the theory because it allows an OCP analysis of non-featural things (e.g. repetition of the same affix, cf. Yip 1988).

The prediction that anything can dissimilate is clearly not consistent with the attested typology. Not all features actually do participate in dissimilation, and the GOCP theory has nothing to say about this issue. By contrast, in the Surface Correspondence Theory of Dissimilation, gaps in the typology of dissimilation are interpreted as the result of gaps in the set of CORR constraints. They are predicted to line up with gaps in the typology of consonant harmony, because the CORR constraints affect both phenomena in tandem. So, while neither theory offers an immediate explanation for why particular features don't participate in dissimilation, the SCTD makes a testable prediction where the GOCP does not.

9.6.2. OCP as self-conjoined markedness

Some previous approaches to dissimilation derive OCP constraints by local self-conjunction of markedness constraints (Alderete 1996, 1997; Itô & Mester 1996, 1998); these theories predict a strong connection between dissimilation and formal markedness. The idea is that local conjunction (Smolensky 1993, 1995) of a general markedness constraint with the form *[αF] with itself produces a $*[\alpha F]^2_{Dom}$: a constraint that assigns violations only when there are two instances of [αF] in the same domain of locality. Dissimilation arises when faithfulness constraints are ranked between these two markedness constraints: $*[\alpha F]^2_{Dom}$ » IDENT-[αF] » *[αF]. This ranking allows one [αF] segment to surface faithfully, but prohibits the co-occurrence of two [αF] segments in some given domain.

Defining OCP constraints as self-conjoined markedness leads to a number of specific predictions about dissimilation, identified in previous work that follows this approach.

(31) Predictions of dissimilation as self-conjoined markedness

a. *Dissimilation in a large domain implies the same dissimilation in a smaller domain*
Locally conjoined constraints have a fixed ranking in terms of their locality domains: constraints with a smaller domain dominate those with a larger one – i.e. $*[\alpha F]^2_{Stem}$ » $*[\alpha F]^2_{Word}$ » $*[\alpha F]^2_{Phrase}$ (Itô & Mester 1996, 1998). Therefore, if $*[\alpha F]^2_{Word}$ » IDENT-[αF], then $*[\alpha F]^2_{Stem}$ » IDENT-[αF]; dissimilation in the word entails dissimilation in the stem.

b. *Dissimilation of less-marked feature implies dissimilation of more-marked ones*
Local conjunction preserves the structure of fixed rankings: if *[Labial] » *[Coronal], then $*[\text{Labial}]^2$ » $*[\text{Coronal}]^2$. Therefore, if a language has Coronal dissimilation, it must also have Labial dissimilation (Alderete 1996, 1997). The same holds for any features where one value is more marked than another; *[+voice] » *[–voice] entails $*[\text{+voice}]^2$ » $*[\text{–voice}]^2$, etc.[32]

c. *Dissimilation entails markedness: only marked features can dissimilate*
The existence of a dissimilation constraint $*[\alpha F]^2_{Dom}$ entails the existence of a general markedness constraint *[αF] (Alderete 1996, 1997). If a feature participates in dissimilation, there is a constraint that penalizes it generally.

Each of these predictions appears to be incorrect.

Dissimilation over greater distance does not imply dissimilation over shorter distance: (31a) is not a good prediction. This is particularly clear in Sundanese, as seen in chapter 4: two /r/s do not dissimilate in adjacent syllables, but do when they are closer together or farther apart. A comparable situation is found in Zulu, seen in chapter 7: labial dissimilation occurs within the stem domain, but two labials still can co-occur in the same root. These and other cross-edge dissimilation patterns (including Kinyarwanda in ch. 3) are clear evidence that distance and domain size do not form an implicational scale.

[32] The OCP as Local Conjunction theory also predicts that absolute bans entail dissimilation. Locally conjoined constraints universally dominate both of their conjuncts (Smolensky 1993, 1995). So, if *[αF] » IDENT-[αF], then $*[\alpha F]^2$ » IDENT-[αF], because $*[\alpha F]^2$ » *[αF]. This is not necessarily a testable prediction.

Dissimilation of less-marked features does not imply dissimilation of more-marked ones: the prediction in (31b) is not supported. The specific prediction identified by Alderete (1996, 1997) is that if a language has dissimilation of [Coronal], it has parallel dissimilation of [Labial] and [Dorsal] as well. We can see this in the few languages with coronal dissimilation effects, including Colombian Spanish, colloquial Tahitian, Ni'ihau Hawaiian, Takelma, and Akan (see §9.7.1.2 for details of these cases). None of these languages have labial dissimilation; only one, Ni'ihau Hawaiian, also has a potential case of dorsal dissimilation, though the evidence is tenuous (see §9.7.1.3.2). Other features show the same pattern. If we infer a markedness scale *[+voice] » *[–voice], on par with relative markedness among places of articulation, the prediction is that voiceless dissimilation implies voicing dissimilation. This is plainly not the case; Kinyarwanda (ch. 3) is an example of a language with dissimilation of [–voice] and no dissimilation of [+voice].

The prediction in (31b) also has a corollary for segmental blocking: dissimilation of a less-marked segment cannot yield a pair of more-marked segments. For example, given the fixed ranking $*[+\text{voice}]^2_{\text{Dom}}$ » $*[-\text{voice}]^2_{\text{Dom}}$, it follows that dissimilation driven by $*[-\text{voice}]^2$ cannot produce an optimal form that violates $*[+\text{voice}]^2_{\text{Dom}}$: therefore, voiceless dissimilation can never produce a sequence of two voiced segments. This predicts that voiceless dissimilation will always be blocked anytime there is a voiced consonant in the same domain. The same prediction holds for other features: a language with coronal dissimilation can dissimilate /t…t/→[t…k], but this dissimilation cannot happen if there is another [k] in the same local domain. The prediction is that segmental blocking effects in dissimilation are unavoidable for any feature where one value is more marked than the other. This is clearly not the case; as chapter 8 noted, segmental blocking effects in dissimilation are actually quite rare, and the segments that behave as blockers do not necessarily share any features with the normal output of dissimilation.

There is also good evidence that dissimilation of a feature does not entail a markedness constraint against that feature, contrary to the prediction in (31c). The most obvious consequence of a general markedness constraint *[αF] is that there can be languages that lack [αF] segments – languages where *[αF] is undominated. Using this as a rule of thumb for estimating the set of *[αF] constraints, there does not seem to be an implicational relationship between dissimilation and markedness. For example, voiceless dissimilation is robustly attested; I know of no languages that lack voiceless consonants, and no compelling evidence for *[–voice], markedness against just voiceless consonants. By the same token, many features that clearly are marked clearly do not participate in dissimilation. For instance, the abundance of languages without uvulars supports positing a constraint *[+uvular], which could be self-conjoined to produce a uvular OCP constraint $*[+\text{uvular}]^2_{\text{Dom}}$. But, uvular dissimilation is clearly unattested. Similar observations hold for other obvious candidates for markedness constraints: in obstruents, laterality and retroflexion are clearly marked, but this is not an attested type of dissimilation.

It is also worth noting that there is also not any clear connection between markedness of features and robustness of dissimilation. For example, [+voice] is canonically regarded as more marked than [–voice], yet voiceless dissimilation is attested far more robustly than voicing dissimilation. Similarly, [Labial] and [Dorsal] are considered more marked than [Coronal]; labial dissimilation is much more robustly attested than coronal dissimilation, but dorsal dissimilation is less robust.[33] What we see in the typology is that labial dissimilates more robustly than other places of articulation – *not* that more marked places dissimilate more robustly than less-marked ones.

If anything, the generalization is that featural markedness correlates with consonant harmony, and not with dissimilation. This can be seen in the table in (21) above, which identifies discrepancies between the features that participate in harmony as agreement features, and those that participate in dissimilation. For most of the features that harmonize and do not dissimilate, one value is clearly more marked than the other.[34]

9.6.2. Dissimilating features don't all have temporally-extended cues

Ohala (1981) proposes that dissimilation results from perceptual hypercorrection on the part of the listener. The idea is that a sequence of two sounds which share some acoustic characteristic gets perceived as the result of unintended co-articulation. The listener infers that the property shared by the two sounds has spread from one to the other; the listener 'undoes' this co-articulation, and assumes that the shared property is not shared underlyingly. The result is that a pair of sounds with some similar

[33] If we treat [Glottal] as a fourth place, a parallel observation can be made: [Glottal] would be less marked than [Dorsal], but neither is obviously a more robustly attested type of dissimilation.

[34] Based on my review of the consonant harmony cases identified by Hansson (2001/2010), this seems to be a robust correlation. Where the relative markedness of alternating consonants is clear, harmony propagates the more marked value of a feature. Thus, all examples of dorsal harmony change less-marked velars to more-marked uvulars. Similarly, all examples of voicing harmony change voiceless Cs to voiced, and all examples of laryngeal harmony involve agreement to [+cg] or [+sg] (rather than to [–cg]/[–sg]). Nearly all examples of nasal harmony change non-nasals to nasal; the only exceptions are Tiene, where alternations go in both directions, and Sawai, where the assimilation appears to be limited to only four examples (see Hansson 2010:92, Whistler 1992 for details).

characteristic gets re-analyzed as one sound that has that characteristic, and another that does not; the similar property is attributed to one sound, not both.

The perceptual hypercorrection theory makes concrete predictions about the typology of long-distance consonant dissimilation. If dissimilation arises from perceptual re-analysis of similarity as the result of co-articulation, then the features that participate in long-distance dissimilation should be the ones associated with long-distance co-articulation. So, the features that dissimilate are predicted to be the ones that spread their perceptual cues to other segments; features that don't do this are predicted not to dissimilate. The resulting prediction is the typology in (32).

(32) Predictions of dissimilation as perceptual hypercorrection (Ohala 1981:193)[35]

Prediction	***Feature***	***Dissimilation attested in survey?***
Likely to dissimilate	Labialization	✗
	Palatalization	✗
	Retroflexion	? (✓ for liquids / ✗ for other Cs)
	Velarization†	✗ (✓? diachronically)
	Uvularization	✗
	Pharyngealization	✗? (✓ diachronically)
	Place of articulation	✓? (individual places only)
	Aspiration	✓
	Glottalization	✓
	Nasalization†	✗? (✓ diachronically)
	Laterality†	✓
	Rhoticity†	✓
Not likely to dissimilate	Fricative	✗? (✓ diachronically)
	Affricate	✗? (✓ diachronically)
	Stop	✗?
	Voicing	✓ (✓ for voiced / ✓ for voiceless)
	Labio-velarization†	✗?

[35] A significant amount of research has been done since 1981. The features marked with '†' are not identified by Ohala (1981) as likely to dissimilate, but have been classified as such in later work that reviews the predictions of Ohala's model (Bye 2011:13; Alderete & Frisch 2007:385).

While Ohala definitely does *not* propose the perceptual hypercorrection model as a theory of synchronic phonology, it does make concrete predictions about which features can dissimilate and which cannot. As an exercise in curiosity, we might ask how those predictions compare to the attested typology. The column on the right in the table above notes which types of assimilation are attested, and which are not. The predictions are clearly not borne out in synchronic dissimilation patterns: of 12 predicted types of dissimilation, only 5 are clearly attested, and 5 more are clearly unattested. The situation is somewhat different if we include cases of diachronic dissimilation (as noted above); however, there are still unexplained gaps, and some unexpected kinds of dissimilation are attested. These disparities in no way disprove the listener hypercorrection theory: Ohala (1981:195) very astutely notes the possibility that this model may not be sufficient on its own, and that some cases of dissimilation might require other explanations. The survey findings seem to bear this out: the predictions of the perceptual hypercorrection model don't match the observed typology of long-distance dissimilation.

9.7. Details of the typology of features that dissimilate

This section presents the empirical support for the typology summarized in §9.3.3 above. The features are organized into groups in the same way as in the table in (14) above.

9.7.1. *Major Place features*

9.7.1.1. Labial

This section covers dissimilation where primarily labial consonants dissimilate to non-labial ones; dissimilation of [Labial] as a secondary feature (e.g. dissimilation of labialization) is discussed in §9.7.4.1.

Labial dissimilation is very robustly attested. Languages with overt dissimilation of [Labial] include: Akkadian (Suzuki 1998, Hume 1992); various southern Bantu languages (Doke 1954) such as Ndebele (Sibanda 2004), SiSwati (Chen & Malambe 1998), and Xhosa (Anderson 1992, Vondrasek 2001), and Zulu (cf. chapter 7)[36]; various Berber languages, including Ayt Ndhir Tamazight (Penchoen 1972), Imdlawn Tashlhiyt (Elmedlaoui 1985, 1995a, 1995b; Lahrouchi 2005), and Tamashek Tuareg (Heath 2005); and dozens of Austronesian languages (Zuraw & Lu 2009). (Additional marginal cases of labial dissimilation are reported for Kabyle Berber (Lahrouchi 2005), Kukú (Cohen 2000), Puthi (Donnelly 2007), and Southern Min (Xiamen) Chinese (Lien 1998), though these cases have no consistent synchronic alternations.)

The outcome of labial dissimilation may be the most similar coronal alternative (e.g. [m]~[n] in Akkadian), but this is not the only possibility: in Tahitian, dissimilation produces a glottal ([f]~[h]); in Zulu the result is an (alveo)-palatal (i.e. [p’]~[tʃʼ], and in Acehnese it is a sibilant ([p]~[s̪]).

[36] Many other southern Bantu languages also have cognates of the same labial palatalization phenomenon analyzed in Zulu, but without the long-distance character.

Two examples of labial dissimilation patterns in unrelated languages are noted below as examples. Details of other cases can be found in the appendix of the dissertation.

9.7.1.1.1. Acehnese

Acehnese (Durie 1985) exhibits labial dissimilation, with visible alternations in affixes. Acehnese has a causative prefix /pɯ-/; this morpheme clearly has an underlying labial /p/ (33a,b), but it surfaces with [s̺] instead when the root has an initial labial consonant (33c-d).

(33) Acehnese labial dissimilation in causative prefix /pɯ-/ (Durie 1985:33)

a. [pɯ-nan] 'to name'
b. [pɯ-saka] 'to sugar'

c. [s̺ɯ-mũʔɛ̃n] 'to amuse, entertain'
d. [s̺ɯ-baro] 'to renew'

Dissimilation of labials to [s̺] can also be seen with the intransitive verbalizing affix /ɯm-/. In bisyllabic roots, as long as the initial consonant is not a sonorant or [b], this morpheme appears as [=ɯm=], and is infixed after the root-initial consonant (34a,b)[37]. When this infix follows a root-initial /p/, the /p/ dissimilates to [s̺], as shown in (34c,d) (examples from Durie 1985:33-35).

(34) Acehnese: labial dissimilation with intransitive verbalizer infix /ɯm-/

a. [c=ɯm=atɔʔ] 'to hoe, intr.'
b. [t=ɯm=ulak] 'to push, intr.'

c. [s̺=ɯm=ɯprɛh] 'to wait, intr.' (</p-ɯm-ɯprɛh/)
d. [s̺=ɯm=ãɟoh] 'to eat, intr.' (</p-ɯm-aɟoh/)

[37] When the root is trisyllabic and/or starts with a sonorant or [b], the intransitive verbalizer /ɯm-/ appears as a prefix [mɯ-], as in [mɯ-nari] 'to dance'.

Durie notes two particular limitations on this labial~[s̥] alternation: first, it happens only in verbs, never in nominal stems. Second, it is apparently restricted to trisyllabic stems: attaching the /pɯ-/ prefix to monosyllabic roots does not produce the dissimilation. These limitations are illustrated by the examples in (35a) & (35b), respectively, where dissimilation does not occur (cf. (34) above).

(35) Acehnese: limits on labial dissimilation (Durie 1985:33)

a.	/pɯ-batɛᵊ/	→ [pɯ-batɛᵊ]	‘to stone’	(< /batɛᵊ/ ‘stone (n.)’; no dissim.)
b.	/pɯ-blɔᵊ/	→ [pɯ-blɔᵊ]	‘to sell'	(cf. *[s̥ɯ-blɔᵊ]; no dissimilation)

Durie (1985:33) also reports that labials are realized as [s̥] when an /n/ or /l/ intervenes between them. This situation arises consistently due to a nominalizing affix /ɯn-/, which (like other VC prefixes in Acehnese) is infixed after root-initial consonants. Some examples are given in (36):

(36) Acehnese: labial dissimilation with nominalizer affix /ɯn-/ (Durie 1985:33)

a.	[s̥=ɯn=ɯ̃pɔh]	‘beating’	(</p-ɯn-ɯpɔh/; /p...p/→ [s̥...p])
b.	[s̥=ɯn=ɯ̃blɔᵊ]	‘thing bought’	(</b-ɯn-ɯblɔᵊ/; /b...b/→ [s̥...m])
c.	[s̥=ɯn=ɯ̃mɛ̃]	‘thing brought’	(</m-ɯn-ɯmɛ̃/; /m...m/→ [s̥...m])

Durie (1985:34) also points out that the same thing is observed as a historical change, even with no infixation, as illustrated by the examples in (37).

(37) Acehnese: historical dissimilation – Bv{l,n}vB → Sv{l,n}vB (Durie 1985:34)

a.	sɯlumpɯk	‘protecting flap on banana flower’	(other dialects: *pɯlumpɯk*)
b.	sɯlimɛŋ	‘fruit (type)’	(cf. Malay *blimbing*)

Acehnese labial dissimilation has many intriguing nuances that I will not attempt to analyze in full here, but it illustrates clearly that dissimilation of [Labial] can involve incidental changes to other features as “overkill”. In cases like (36c), where /m...m/ maps to [s̥...m], dissimilation involves changing not only [Labial], but also

[±continuant], [±nasal], [±sonorant] (and, depending on representational assumptions, possibly also [±voice], [±strident], and [±anterior]). Nonetheless, it is clear that only [Labial] (and perhaps [–continuant]) are crucially involved in triggering the pattern, since these are the only shared features in forms like (34c), where the interaction is between [m] & [p].

9.7.1.1.2. Southern Bantu Labial Palatalization

Labial dissimilation is found in Zulu (see ch. 7), where it manifests as palatalization of labials before the labial glide [w]. Many related Southern Bantu languages also have cognates of this pattern (Doke 1954; see also Louw 1975, Stahlke 1976, Herbert 1977, 1990, among others). Other languages where the labial palatalization is a long-distance effect include Ndebele (Sibanda 2004), SiSwati (Chen & Malambe 1998), and Xhosa (Vondrasek 2001).

9.7.1.2. Coronal

Dissimilation of [Coronal] is moderately attested. This type of dissimilation manifests with observable alternations in Colombian Spanish (de Ramirez 1996), Ni'ihau Hawaiian (Blust 2004), Tahitian (Blust 2004), and Takelma (Goodman 1992). Akan (McCarthy & Prince 1995/1999) also exhibits [Coronal] dissimilation in the form of blocking effects. All of these cases are discussed below in further detail. (Segment-adjacent dissimilation of [Coronal] has also been reported in Dakota (Shaw 1980, 1985; Fukazawa 1999), and Obispeño Chumash (Klar 1977), though both of these are marginal cases.)

9.7.1.2.1. Akan

In Akan, [Coronal] dissimilation is observed as a blocking effect (McCarthy & Prince 1995/1999). The generalization (Schachter & Fromkin 1968:89, Welmers 1946:11-12) is that Akan typically palatalizes velars before front vowels, but, this expected palatalization fails when the following syllable contains either of the coronal obstruents /t/ or /s/. Consequently, the generalization is that a sequence of two [Coronal] obstruents in adjacent syllables is avoided - a pattern that is clearly dissimilatory in character.

9.7.1.2.2. Colombian Spanish

Dissimilation of Coronal is attested in Colombian Spanish (de Ramirez 1996, Jose Camacho p.c.)[38], in the form of alternations between the diminutive suffixes *-ito/a* & -*ico/a*. The normal form of the diminutive suffix is *-ita* or *-ito* (the final thematic vowel depends on the gender of the root); this is illustrated by forms like those in (38), and is typical of many other Spanish dialects (de Ramirez 1996:27).

(38) Colombian Spanish: diminutive suffix -ito~-ita

a.	barco	'ship'	barqu-ito	'ship-dim.'
b.	casa	'house'	cas-ita	'house-dim.'
c.	lado	'side'	lad-ito	'side-dim.'
d.	locha	'laziness'	loch-ita	'laziness-dim.'
e.	carro	'car'	carr-ito	'car-dim'
f.	cabeza	'head'	cabec-ita	'head-dim.'
g.	mano	'hand'	man-ito	'hand-dim.'

Where Colombian Spanish exhibits the Coronal dissimilation is in diminutives of roots with /t/ in the final syllable. Instead of forming diminutives with the usual -ita/-ito

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[38] I thank Akin Akinlabi for bringing this case to my attention, by pointing out an example from Costa Rican Spanish in a phonology exercise in an introductory linguistics textbook (O'Grady et al. 2004).

suffix, these roots appear with [k] instead of [t], as -ico/-ica. This is shown in (39) (data from de Ramirez 1996:27, and Jose Camacho, p.c.).

(39) Colombian Spanish: t~k dissimilation /…t-ito/→[…t-iko]

a.	gato	'cat'	gat-ico [gat-iko]	'cat-dim.'
b.	cara	'letter'	cart-ica	'letter-dim.'
c.	galleta	'cookie'	gallet-ica	'cookie-dim.'
d.	foto	'photo'	fot-ico	'photo-dim.'
e.	pato	'duck'	pat-ico	'duck-dim.'
f.	moto	'motorcycle'	mot-ico	'motorcycle-dim.'
g.	Alberto	(proper name)	Albert-ico	'Albert-dim.'
h.	mamerto	'communist'	mamert-ico	'communist-dim.'

In Colombian Spanish, the distribution of -ico/-ica is clearly dissimilatory in nature: the generalization is that all (and only) forms with [t] in the final syllable form diminutives with [k] (orthographic <c>). It is, in short, an observable synchronic alternation; de Ramirez (p. 27) notes this explicitly: "en algunos territorios, el alomorfo *-ic-* (Cuba, Colombia, Centroamérica) que, por disimilación, puede ser alomorfo de *-it-* en palabras cuya última sílaba comienza por *t*."[39]

Since the dissimilatory alternation changes only the feature [Coronal], this [t]~[k] alternation must be understood as dissimilation of [Coronal]. This is deserving of mention because forms like *lado~ladito* and *casa~casita* show that not all [Coronal] consonants trigger the alternation. The relevant correspondence requirement holds only among voiceless coronal stops (i.e. the set of feature specifications [COR, -son, -

[39] 'in some territories, the allomorph /-ik-/ (Cuba, Colombia, Central America), which, by dissimilation, may be an allomorph of /-it-/ in words whose last syllable starts with /t/'. Note that there is also considerable cross-dialectal variation in the occurrence of -ico/-ica diminutives. For instance, in Costa Rican Spanish, the -ico/-ica diminutive suffix seems to be the general one, regardless of the consonants of the root (Resnick 1981:151). Moreover, -ico diminutives are also found, albeit marginally, in at least some varieties of peninsular Spanish, in forms like *cafecico*, 'coffee-dim.' (thanks to Teresa Torres-Bustamante, p.c. for pointing this form out to me).

cont, -voi]). By hypothesis, this entails that correspondence based on the feature [Coronal] is possible, and may result in dissimilation.

9.7.1.2.3. Ni'ihau Hawaiian

In Ni'ihau Hawaiian (Blust 2004:368), [Coronal] dissimilation manifests as a static restriction, which is observable through its effects on diachronic change. Blust reports that Proto-Polynesian *t is retained as /t/ in Ni'ihau Hawaiian (unlike Standard Hawaiian), except in /t...t/ sequences. This is illustrated by comparisons like those below, where Standard Hawaiian /k...k/ sequences (the outcome of a regular *t > k sound change) correspond to /k...t/ in the Ni'ihau variety.

(40) Diachronic *t > k Coronal dissimilation in Ni'ihau Hawaiian (Blust 2004:368)

	Pre-Hawaiian	Std. Hawaiian	Ni'ihau Hawaiian	Gloss
a.	*te tahi	kekahi	ketahi	'one'
b.	*tatou	kakou	katou	'1.pl incl'
c.	*matahiti	makahiki	makahiti	'year'

This dissimilatory pattern is somewhat confounded with a pattern of dorsal dissimilation (see §9.7.1.3 for details). Since Hawaiian has undergone a historical change *t > k, the correspondence between Ni'ihau [t] and Standard [k] could also be interpreted as a multi-stage historical shift, *tVt > kVk, followed by dissimilation of kVk to kVt. If this is the case, then Ni'ihau constitutes an example of dorsal dissimilation rather than coronal dissimilation. However, if this historical pathway is not the actual story, then Ni'ihau would seem to attest both types of dissimilation.

9.7.1.2.4. Tahitian

Standard Tahitian (Blust 2004:371) exhibits [Coronal] dissimilation in rapid speech: /tVt/ sequences are produced with two [t]s in slow and/or careful speech, but as [kVt] in rapid speech. Productive alternations occur with the article /te/, but also occur morpheme-internally.

(41) Tahitian: t~k dissimilation in rapid speech (Blust 2004:371)

	Careful speech	Rapid speech	Gloss
a.	te taane	kə taane	'man, male'
b.	te taʔata	kə taʔata	'person, human being'
c.	te peretiteni	tə perekiteni	'president'

Forms like (c), [tə perekiteni] (*tə peretiteni), show that the dissimilation is limited to either adjacent syllables or CVC configurations. The word /peretiteni/ contains two /t/s, in the sequence /tit/; in rapid speech, the first of these dissimilates to [k], but no dissimilation occurs in the preceding article [tə], which is not syllable-adjacent to the remaining [t] in the root. Along the same lines, Blust (2004:371) reports that the article /te/ invariably surfaces with [t] before other roots with no initial /t/, such as /te mata/ 'eye'.

9.7.1.2.5. Takelma

In Takelma (Goodman 1992, Sapir 1912) [Coronal] dissimilation is observed through alternations of [l n] with [m] in certain suffixes. Nouns in Takelma occur with a 'noun characteristic' suffix before pronominal suffixes, and in locatives. The noun characteristic suffix is typically of the shape [-Vn], as illustrated in (42).

(42) Takelma noun characteristic suffix is /-Vn/ (Goodman 1992:46-47)

a.	/pep + Vn/	→ [pepen]	'rushes'
b.	/xt + Vn/	→ [xtan]	'eel'
c.	/tak + Vn/	→ [takan]	'turtle'

However, when the root contains one of the coronal sonorants [n l], then adding the noun characteristic suffix /-Vn/ with another coronal, /n/, leads to dissimilation. One of the coronal sonorants dissimilates to [m], as seen in the examples below. When the root contains /l/, the dissimilation happens in the suffix, turning it into [-Vm] as in (43); when the root contains /n/, the same /n/ → [m] dissimilation occurs in the suffix (44) (though in this situation the root /n/ also appears as [l], the result of a nasal dissimilation pattern discussed in §9.7.2.3 below).

(43) Takelma [Coronal] dissimilation: /l...-Vn/ → [l...-Vm] (Goodman 1992:47-48)

a.	/hel + Vn/	→ [helam]	'board'	(*[hela**n**])
b.	/hapil + Vn/	→ [hapilim]	'empty'	
c.	/kul + Vn/	→ [kulum]	'oak'	
d.	/lap^{h} + Vn/	→ [lap^{h}am]	'frog'	
e.	/lox + Vn/	→ [loxom]	'manzanita'	
f.	/tolk^{h} + Vn/	→ [tolk^{h}am]	'anus'	

(44) Takelma [Coronal] dissimilation: /n...-Vn/ → [l...-Vm] (Goodman 1992:48)

a.	/xan + Vn/	→ [xalam]	'urine'	(*[xanan], *[xalan])
b.	/k^{w}an + Vn/	→ [k^{w}alam]	'road'	

Sapir (1912:21) also observes at least one form where reduplication of /n/ leads to an [l...m] sequence (like that in (45) above), though dissimilation in this morphological context appears to be sporadic (and perhaps rare).

(45) Takelma [Coronal] dissimilation in reduplication (Sapir 1912)

a.	/xan-/	→ [xan-]	'urine'	
b.	/xanaxan-/	→ [xalaxam-]	'urinate'	(*[xanaxan-], *[xalaxan-])

9.7.1.2.6. [Coronal] dissimilation recap

Dissimilation of [Coronal] is only considered moderately attested for several reasons: there are few confirmed cases, most of them involve the exact same pattern, and the clarity of the data is limited.

The five cases discussed above are the only examples I have found of long-distance coronal dissimilation. This is a marked contrast to Labial dissimilation (§9.4.1.1), which is attested by dozens of languages. Moreover, the coronal dissimilation patterns found in Tahitian, Ni'ihau Hawaiian, and Colombian Spanish are ostensibly the exact same thing: *[tVt] is avoided, in favor of [kVk]. In these 3 cases, the interacting segments are strictly [t] & [k], and they only interact when they are in adjacent syllable onsets. Additionally, in each of these cases, the dissimilation is not robustly observed. Colombian Spanish exhibits dissimilation only in diminutive suffixes, and Tahitian exhibits it only in colloquial fast speech. Along the same lines, the Ni'ihau Hawaiian case is supported principally on diachronic evidence, and is not provably productive synchronically (either in the present day, or in the past).

In Akan, the dissimilation manifests only as blocking; there are no alternations to be found. And, the effect occurs only between voiceless obstruents (not strictly [t]s, also [s] & [tç]), the same narrow class of segments that exhibit the dissimilation in the 3 cases previously noted.

Takelma's pattern of [Coronal] dissimilation is not principally a t~k alternation. But, it is only observed in one morpheme, and is by no means a clear and simple case of dissimilation, since it is confounded with nasal dissimilation, and can involve alternations of both segments (which is unusual crosslinguistically).

9.7.1.3. Dorsal

Dissimilation of [Dorsal] is weakly attested. The only clear example of [Dorsal] dissimilation is Judeo-Spanish (Bradley & Smith 2011). Other possible cases also include

Ni'ihau Hawaiian (Blust 2004), Korean (Kim 1995, 2003), and Mayali (Evans 1995), though these are marginal examples for reasons discussed below.

9.7.1.3.1. Judeo-Spanish

Judeo-Spanish, exhibits consistent [Dorsal] dissimilation in the form of alternations in the diminutive suffix -iko/a, which has a dissimilated allomorph -ito/a (Bradley & Smith 2011). The essential generalization is that the /k/ of the diminutive suffix dissimilates to [t] when it follows another dorsal consonant in the preceding syllable.

The basic form of the diminutive suffix is either [-iko] or [-ika], with a velar stop. (The final thematic vowel depends on the gender of the root; root-final vowels are deleted, except for stressed /a/ & /o/). This is shown by examples like those in (46) (data from Bradley & Smith 2011:2).

(46) Judeo-Spanish: diminutive suffix -iko/-ika

a.	palo	'stick'	pal-i**k**o	'stick-dim.'
b.	kolcha	'blanket'	kolch-ika	'blanket-dim.'
c.	guluba	'pigeon'	gulub-ika	'pigeon-dim.'
d.	hamor	'donkey'	hamor-iko	'donkey-dim.'
e.	prezente	'gift'	prezent-iko	'gift-dim.'
f.	pará	'money'	para-iko	'money-dim.'

The diminutive suffix appears as -ito/-ita, however, when the root ends in any of the dorsal consonants /k/ /g/ /x/ (orthographically <h>) or /w/, as shown by the examples in (47) (Bradley & Smith 2011:3).

(47) Judeo-Spanish: /-iko/ → [-ito] after dorsals

a.	sako	'sack'	sak-ito	'sack-dim.'
b.	minag	'custom'	minag-ito	'custom-dim.'
c.	malah [malax]	'angel'	mala[x]-ito	'angel-dim.'
d.	lingwa	'tongue'	lingw-ita	'tongue-dim.'

The appearance of the [t] allomorph of the suffix only after velar consonants is interpreted as dissimilation of [Dorsal].

The t~k dissimilation in Judeo-Spanish is subject to a syllable-adjacency condition (or is possibly limited to the stricter CVC configuration). This locality condition can be seen in roots with an underlying final stressed /a/ or /o/ - the only root-final vowels retained in diminutive formation. When the root-final vowel is retained before the /-iko/ suffix, the two dorsal consonants are separated by two vowels; they are therefore in non-adjacent syllables. In this situation, no dissimilation is observed, as shown by the example in (48).

(48) shaká > shaka-ika [ʃa.ka.i.ka] 'joke-(dim.)'

The same CVC/syllable-adjacency limit can also be observed in the behaviour of a third allomorph of the diminutive suffix, -eziko/-ezika. This longer form of the suffix occurs with monosyllabic roots, and disyllabic roots ending in unstressed -e , as shown in (49) below (Bradley & Smith 2011:3). Monosyllabic roots containing dorsal consonants show no dissimilation for this reason.

(49) Judeo-Spanish: k~t dissimilation only in CVC domain

a. fil > fil-eziko [fi.le.zi.ko] 'elephant-(dim.)'
b. kal > kal-eziko [ka.le.zi.ko] 'synagogue-(dim.)'
*kal-ezito (no dissim.)

This longer allomorph has no dissimilated counterpart (e.g. -ezito), because the dissimilation only occurs when dorsals are syllable-adjacent, and the long form of the suffix never produces that condition. (By the same token, dissimilation is not observed when the root contains a non-final dorsal consonant, as illustrated by forms like *kolch-ika* in (46b) above).

9.7.1.3.2. Ni'ihau Hawaiian?

Blust (2004:369) reports that the pattern kVk is "impermissible" in the Ni'ihau variety of Hawaiian. This restriction is evident from the treatment of loanwords like 'cook', borrowed as [kuke] in Standard Hawaiian, but as [kute] in Ni'ihau. This example is the only datum available to me, however. The pattern is also confounded with a diachronic *t>k change that is reportedly dissimilatory in nature (discussed in §9.4.1.2.3 above), which makes it unclear if the dissimilatory effect in this language is for [Coronal], or [Dorsal], or both. As such, I regard Ni'ihau Hawaiian as a marginal case of [Dorsal] dissimilation.

9.7.1.3.3. Mayali?

Another marginal case of [Dorsal] dissimilation is found in Mayali (Evans 1995:758). In iterative reduplications of monosyllabic roots, Mayali uses a reduplicative template of the shape CVNV-. The N in this template alternates between [n] and [ŋ], depending on the place of the C: it is [n] following labial or velar consonants (the 'peripheral' consonants), and [ŋ] following coronals. Evans (1995:728) views this as dissimilation for "peripherality" - the inserted nasal is /ŋ/ underlyingly, and dissimilates to [n] after consonants that share its "[+peripheral]" characteristic. However, this case could also be analyzed as the reverse, dissimilation of [Coronal]: the inserted nasal would be /n/ underlyingly, and dissimilate to [ŋ] only following another [Coronal] segment. Either way, since the dissimilation effect happens only in a restricted subset of reduplicated forms, it is a marginal case of dissimilation.

9.7.1.4. Radical (Guttural)

The feature [Radical] is taken here to represent the primary place of articulation of all post-uvular consonants (pharyngeals, laryngeals, epiglottals); dissimilation of pharyngealization is considered with other secondary articulations (in §9.7.4). The feature [Radical] is very often confounded with interactions of laryngeal features, as [h] & [ʔ], the two most common [Radical] consonants can often be characterized solely in terms of [±spread glottis] and [±constricted glottis], without reference to their place of articulation. In other words, a descriptively simple pattern of glottal stop dissimilation like /ʔ...ʔ/ → [Ø...ʔ] could plausibly be interpreted as either dissimilation of [Radical], or dissimilation of [+cg]. What distinguishes [Radical] place dissimilation from laryngeal-feature dissimilation is crucially the involvement of non-glottal consonants (e.g. pharyngeals). If glottals and pharyngeals interact in a dissimilatory way, to the exclusion of non-[Radical] consonants (perhaps including those that are [+cg] or [+sg]), then the pattern can only be characterized as a type of Place dissimilation.

Dissimilation of [Radical] is very weakly attested. This kind of dissimilation is found in Tigre & Tigrinya (Rose 2000a), where the dissimilatory patterns hold over the class of glottal and pharyngeal segments together. One other case, glottal stop dissimilation in Seri (Marlett & Stemberger 1983; see also Yip 1988), can also be interpreted as radical dissimilation, but is a marginal case (at best).

9.7.1.4.1. Tigre & Tigrinya

Rose (2000a) observes dissimilation among “gutturals”, the class of glottal and pharyngeal consonants, in Tigre & Tigrinya, two North Ethiopian Semitic languages. Both languages have four “guttural” consonants: the glottals [h ʔ], and the pharyngeals [ħ ʕ]. The relevant generalization in both languages is that two guttural consonants may not occur in a CVC configuration - a pattern of trans-vocalic (and therefore long-distance) dissimilation the property of "Gutturality", i.e. of [Radical] place.[40]

In Tigre, avoidance of guttural co-occurrence leads to morphologically-based alternations: affixes with gutturals are blocked or modified when affixation would yield a CVC sequence with two [Radical] consonants. This is illustrated below by patterns of pluralization (Rose 2000a, Raz 1983). Tigre 'broken plurals' often have a prefix [ʔa-] (50); however, this prefix never appears before roots with initial gutturals (51) – these roots systematically follow other pluralization paradigms instead.

(50) Tigre: /ʔa-/ prefix in broken plurals (Rose 2000a:89)

	Singular	Plural	
a.	kəbɨd	ʔa-kbud	'belly'
b.	mɨtɨd	ʔa-mtud	'stake'
c.	wərɨk'	ʔa-wərrɨk'	'silver'
d.	bɨħar	ʔa-bħur	'sea'
e.	dɨhəb	ʔa-dhub	'gold'

(51) Tigre: /ʔa-/ plural prefix blocked before gutturals (Rose 2000a:90)

	Singular	Plural		
a.	ʔɨkɨl	ʔakal	'corn, crop'	(*ʔaʔkul; GVG sequence avoided)
b.	ħabil	ħabɨllɨt	'rope'	(*ʔaħbul)
c.	ħɨwar	ħawrət	'foal'	(*ʔaħwur)
d.	ħarɨb	ħarɨb	'water-skin'	(*ʔaħrub, *ʔaħarrɨb)
e.	ħakɨl	ħakɨllɨt	'hoe'	(*ʔaħakul, *ʔaħakkɨl)

Similar alternations occur with the 1st-person singular nonperfective subject marker /ʔɨ-/ (Rose 2000a:89, Raz 1983), and the causative prefix /ʔa-/. This is illustrated below, with the causative prefix: this affix normally surfaces as [ʔa-] (52a,b),

[40] Both Tigre & Tigrinya also ban sequences of two segment-adjacent gutturals, including geminates. The present theory could be extended to analyze this by adding CORR constraints for the segment-adjacent domain, i.e. by positing Corr-CC-[Radical] alongside CORR-CVC·[Radical]. I do not pursue this here, though.

but as [ʔat-] (with an inserted [t]) before roots with an initial guttural consonant (52c,d).[41]

(52) Tigre: /ʔa-/ causative prefix appears as [ʔat-] before gutturals (Rose 2000a:90)

a.	k'ətla	ʔa-k'təla	'kill'/'cause to kill'	
b.	səbra	ʔa-sbəra	'break'/'cause to break'	
c.	ʕak'ba	ʔat-ʕak'əba	'guard'/'cause to guard'	(*ʔa-ʕak'əba)
d.	ħadga	ʔat-ħadəga	'leave'/'make leave'	(*ʔa-ħadəga)

The restriction on two gutturals in a CVC sequence also holds over the lexicon of Tigre: Rose (2000) notes that there are no verbs with forms like CVʔVħ, CVhVʕ, etc. Two gutturals may co-occur in a word only of they are not in a CVC sequence. Thus, Tigre words with two gutturals always have another consonant intervening between them, as illustrated in (53).

(53) Tigre: gutturals may co-occur, when not in a CVC configuration: (Rose 2000a:93)

a.	ʕarʕa	'cause someone to pasture cattle
b.	ʔarʔa	'shove'
c.	ħasʕa	'lack butter/milk in food; be dry due to lack of oil'
d.	ħanʔa	'twist ankle, leg'
e.	hadʔa	'calm down'

Note that forms like these have two gutturals in adjacent syllables. In Tigre & Tigrinya, as Rose (2000a) points out, it is crucially the CVC configuration in which the long-distance dissimilatory pattern holds; it cannot be reduced to syllable-adjacency, or syllable role.

In Tigrinya, the restriction against CVC sequences with two gutturals is enforced only in the domain of the root (Rose 2000a:92).[42] Thus, the Tigrinya lexicon

[41] In some cases, the causative prefix before a guttural consonant is realized as vowel lengthening, rather than the alternative form [ʔat-] (Rose 2000a:90), e.g.: [ħarsa] 'plough', [ħa:rəsa] 'cultivate'. It is not clear what governs this choice. But, crucially, in both cases a sequence of two gutturals in a CVC configuration is avoided.

exhibits the same gaps as in Tigre: there are no forms with the shape CVGVG (or GVGVC, etc.), whether the two gutturals are the same or different. However, affixation in Tigrinya does produce sequences of gutturals; the causative prefix /ʔa-/ is (unlike in Tigre) permitted to appear before guttural-initial roots, as in (54).

(54) Tigrinya: /ʔa-/ causative prefix yields sequences of gutturals: (Rose 2000a:93)

a.	ʕayyənə	ʔa-ʕayyənə	'spoil'/'cause to spoil'
b.	ʔasərə	ʔa-ʔ^{a}sərə	'arrest'/'cause to arrest'
c.	ʕaddəgə	ʔa-ʕaddəgə	'buy'/'cause to buy'

In both Tigre & Tigrinya, the dissimilatory pattern holds among glottal and pharyngeal consonants - the entire class of post-uvular consonants in these languages. This interaction can be interpreted as dissimilation for [Radical], a Major Place of Articulation on par with [Labial], [Coronal], and [Dorsal].

9.7.1.4.2. Glottal stop dissimilation as guttural dissimilation?

A small number of other languages also exhibit dissimilation of glottal consonants, in a way that is not subsumed by a more general laryngeal feature dissimilation pattern. Seri (Yip 1988, Marlett & Stemberger 1983) exhibits a pattern of non-adjacent glottal stop dissimilation that does not follow from any larger generalization about the distribution of [±cg] in non-glottal consonants. This could be interpreted as dissimilation of [Radical], or as dissimilation of [+cg]. A similarly ambiguous pattern (a [ʔ]~[w] alternation triggered by [ʔ]) is found in allomorph selection in Caddo (Paster

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[42] Draft note: this may be a problem for analysis. CORR-CVC·[Radical] demands correspondence between gutturals in CVC sequences, irrespective of morpheme boundaries; CORR-Root·[Radical] exempts gutturals in different morphemes from corresponding, but is not limited to CVC sequences.

2006:42), though in this case the dissimilation may be limited to strictly adjacent segments.

9.7.2. "Articulator-free" Manner features

9.7.2.1. Continuancy

Continuancy dissimilation is very weakly attested, and its status is unclear. The survey found only one potential case of long-distance, synchronic, [+continuant] dissimilation, and it has significant confounds. There are two potential cases of dissimilation for [–continuant], but both of these are exceedingly marginal as well. These three cases are discussed in more detail below.

9.7.2.1.1. Chaha: dissimilation for [+continuant]?

Long-distance dissimilation of [+continuant] is reported in Chaha (Kenstowicz & Banksira 1999), but there are significant confounds that render this case marginal as an example.

The claimed [+continuant] dissimilation in Chaha is observed in the distribution of [x] and [k]. Chaha has nearly complementary distribution between [x] and [k] (Kenstowicz & Banksira 1999, Banksira 2000): [k] occurs in roots only when followed by any of the underlying continuant consonants /f s z x ʕ/, while [x] occurs everywhere *except* in that circumstance.[43] This generalization is illustrated by comparing examples like (55) with those in (56).

[43] These are in "nearly complementary" distribution because [k] can also arise from devoicing of /g/, part of a general pattern of geminate devoicing (see Banksira 2000 for details).

(55) Chaha: [x] occurs in roots with no following continuants (Kenstowicz & Banksira 1999:574-575)

a.	y-a-xətɨr	‘precede (jussive 3.sg.m)’	/xytr/
b.	yə-xdɨr	‘thatch (jussive 3.sg.m)’	/xdr/
c.	yə-xrəm	‘spend year (jussive 3.sg.m)’	/xrm/
d.	yə-frəx	‘tolerate (jussive 3.sg.m)’	/frx/
e.	sənəx	‘be weakened (perfect)’	/srx/
f.	mesəx	‘chew (perfect)’	/mysx/

(56) Chaha: [k] occurs in roots only when there is a following continuant (Kenstowicz & Banksira 1999:575)

a.	yə-kfɨr	‘separate (jussive 3.sg.m)’	/xfr/
b.	yə-kəʃ	‘crush (jussive 3.sg.m)’	/xsy/
c.	yə-kəsɨs	‘accuse (jussive 3.sg.m)’	/xs/
d.	yə-ktɨf	‘hash (jussive 3.sg.m)’	/xtf/
e.	yə-kad	‘deny (jussive 3.sg.m)’	/xʕd/

Kenstowicz & Banksira suggest that this pattern reflects /x/ undergoing dissimilation for [+continuant]. Thus, /x/ surfaces faithfully, as a [+continuant] fricative [x] in the forms in (55), but changes to the [–continuant] stop [k] when any of the [+continuant] radicals /f s z x ʕ/ follow it (56). Examples like (56d) [yə-ktɨf] show that the dissimilatory pattern is long-distance: the initial /x/ in this form surfaces as [k] even though [t] & [ɨ] intervene between it and the triggering continuant [f].

There are some caveats about Chaha as an example, however: the generalization does not hold on the surface in all cases. Note that /ʕ/ represents a historical guttural (i.e. pharyngeal) fricative; it is phonetically realized as a vowel [a] or [ə], not as an actual obstruent. Also, the voiced bilabial [β] does not participate in this dissimilatory pattern; /x/ surfaces as [x] (not [k]) before [β], provided there are no other continuants present. Kenstowicz & Banksira (1999:574) suggest this is because /β/ is underlyingly an approximant rather than a fricative. These opaque cases are illustrated in (57).

(57) Chaha [x]~[k] dissimilation is opaquely triggered

a.	yə-tka	'replace'	/txʕ/	(/ʕ/ → [a] triggers dissim.)
b.	yə-mka	'trouble'	/mxʕ/	
c.	yə-ŋxəβ	'find'	/rxβ/	([β] does not trigger dissim.)
d.	yə-xβɨβ	'encircle'	/xβ/	

Thus, [x] may occur on the surface before segments that are [+continuant], and [k] can occur in the absence of any following [+continuant] consonant on the surface.

Regular affixation does not yield any synchronic alternations that show the [x]~[k] dissimilation; [x]~[k] alternations do occur in reduplication, but are opaque in these cases. When reduplication produces a /x…x/ sequence, it surfaces as either [k…k] or as [x…x], never as [k…x], the expected result of the dissimilation pattern seen above.

(58) Chaha: reduplication of /x/ surfaces as [k…k]: (Kenstowicz & Banksira (1999:578)

a.	kət-kɨt	'crush'	/xt/+RED
b.	kə-kɨm	'trim'	/xm/+RED
c.	kə-kɨr	'hold in armpit'	/xyr/+RED
d.	sɨkɨk	'drive a peg'	/sx/+RED
e.	tə-mərkək	'kneel down'	/mrx/+RED
f.	bʷəkək	'talk a lot'	/βwx/+RED

Kenstowicz & Banksira (1999) interpret this as back-copying: the sequence of /x…x/ is subject to dissimilation as normal, but with the "triggering" /x/ also modified to achieve base-reduplicant identity. The result is an output form where dissimilation is evident, but there are no [+continuant] consonants.

Chaha also has a pattern of frequentative reduplication which copies the middle radical of a tri-consonantal root; in roots with [x], this produces systematic exceptions to the [+continuant] dissimilation identified above. This is shown by data like that in (59). The abstract roots /sxr/ 'get drunk', /mxr/ 'advise' and /rxβ/ 'find' surface with

[x] by default, as in the imperative & imperfect forms in (59a,c,e). However, applying the frequentative /123/→[1223] reduplication pattern yields a peculiar asymmetry: the reduplicated stems have [k...k] in their imperfect forms, but [x...x] in imperatives (59b,d,f).

(59) Chaha medial frequentative reduplication: dissimilation fails? (Kenstowicz & Banksira 1999:581)

	Imperative	Imperfect		
a.	sɨxər	yɨ-sxər	'get drunk'	/sxr/
b.	tə-sxaxər	yɨ-t-sɨkakər	'act naughtily'	/sxxr/
c.	mɨxɨr	yɨ-məxɨr	'advise'	/mxr/
d.	tə-mxaxər	yɨ-tɨ-mkakər	'advise each other'	/mxxr/
e.	nɨxəβ	yɨ-rəxɨβ	'find'	/rxβ/
f.	tə-rxəxəβ	yɨ-tɨ-rkəkəβ	'show up'	/rxxβ/

Chaha perfect forms exhibit another sort of exceptionality, where /x/ seems to dissimilate in the absence of another [+continuant] consonant. The template for forming perfect verbs involves fortition of medial consonants, a phenomenon that Banksira (2000) analyzes as opaque gemination. In this fortition process, underlying voiced obstruents surface as voiceless, /r/ surfaces as [n], and fricative /β/ surfaces as a stop [b] or [p]. Some examples of this fortition are given in (60), along with Banksira's posited underlyingly geminated forms.[44]

(60) Chaha perfective fortition (Banksira 2000:160-161)

	Jussive	Perfect		
a.	yə-βdər	bətər	< /βəddər/	'be first'
b.	yə-βɨrs	bənəs	< /βərrəs/	'demolish a dam'
c.	yɨ-dəβs	dəbəs	< /dəββəs/	'enlarge'

[44] Some of the alternations seen in medial fortition with perfect forms also happen word-initially; e.g. (60a) has the perfect form [bətər], not *[βətər].

In the perfect forms with medial fortition, we find the dissimilatory /x/→[k] mapping, again in the absence of any [+continuant] consonant (even an opaque [k]) which could trigger dissimilation. This is illustrated in (61).

(61) Chaha perfective "gemination" seems like spurious /x/→[k] dissimilation (Banksira 2000:160, Kenstowicz & Banksira 1999:581)

	Imperfect	Perfect		
a.	yɨ-məxɨr	məkər	'advise'	/mxr/
b.	yɨ-rəxɨβ	nəkəβ	'find'	/rxβ/
c.	yə-βxər	bəkər	'lack, miss'	/βxr/

Chaha's [+continuant] dissimilation is further marred by a number of exceptions to the basic generalization. As Banksira (2000:94) dutifully observes, there are two roots that yield a small number of minimal pairs where [k] & [x] contrast; these are given in (62). There are some other forms where [x] appears despite the presence of a following fricative or /ʕ/, or where [k] appears in roots with no fricatives (63).

(62) Chaha exceptional minimal pairs showing [x]~[k] contrast: (Banksira 2000:94)

a.	xəna	'has put/prohibited'
	a-xəna	'has shouted'
	a-ŋ-xəna	'has not put/prohibited'
b.	kəna	'has ascended'
	a-kəna	'has ascended sth.'
	a-ŋ-kəna	'has not ascended'

(63) Chaha: other exceptions to the [x]~[k] dissimilation pattern: (Banksira 2000:98-109)

a.	xəda	'has betrayed'	(root /xdʕ/)
b.	yə-t-raxəs	'let him bite repeatedly/quarrel!'	
c.	xar	'know (perf.)'	(root /xʕr/)
d.	yə-kβər	'let him be respectable!'	
e.	yə-kmɨr	'let him pile sth. up!'	
f.	y-əkɨm	'let him give medical care!'	
g.	yə-βarɨk	'bless, sanctify'	(root /βrk/; < Amharic)

Some verbs also fail to show the [x]~[k] alternation in reduplication (compare to (59) above):

(64) Chaha: exceptional [x]...[+cont] sequences in reduplications: (Banksira 2000:110)

a.	sɨxəsəx	'has ground sth. slightly'	(*sɨkəsəx, *sɨkəsək; no dissimilation)
b.	məxmɨx	'mash'	
c.	xʷərxʷɨr	'penetrate!'	

Chaha is considered a marginal case of dissimilation. What is happening in the [x]~[k] alternation is not completely clear, but interpreting the pattern as dissimilation for [+continuant] requires significant departure from the observable facts. We must assume that [k] is always underlyingly /x/ rather than /k/, even in morphemes where it invariably appears as [k] (such as /xfr/ 'separate', where /x/ is *always* required to dissimilate). Accordingly, we need to assume a complete absence of underlying /k/; a peculiar gap, given that Chaha has both voiced [g] (from /g/) and ejective [k'] (from /k'/), as well as voiceless stops at other places of articulation ([p t c]). Moreover, the dissimilation needs to occur primarily at the underlying level; it is not predictable from the segments in the surface from. That is, we need to allow substantial flexibility for what counts as a [+continuant] consonant: such that the continuant consonant [β] never triggers dissimilation, while /ʕ/ does, even when it surfaces as [a] or [ə] instead of an actual consonant.

9.7.2.1.2. Muher: dissimilation for [+continuant]?

The Chaha [x]~[k] pattern has a cognate in another Gurage language, Muher (Rose 2000b). This can also be interpreted as a case of dissimilation, but is far more marginal than the Chaha case. The basic pattern in Muher is that /k/ tends to spirantize to [x], particularly in post-vocalic positions. The dissimilatory generalization is the failure of this spirantization: it tends not to happen before another fricative (Rose 2000b:111), a restriction comparable to the avoidance of [x]…[+continuant] sequences in Chaha. What makes the Muher case dubious as an example of real, synchronic, [+continuant] dissimilation is that there is considerable variability in the generalizations: Rose (2000b:115) explicitly notes that they are not productive, and are only general tendencies. Because the /k/→[x] spirantization is not a productive alternation, its tendency to fail before fricatives is not clear evidence for a productive restriction against the co-occurrence of multiple continuants. So, while the Muher case could be interpreted along the same lines Kenstowicz & Banksira (1999) propose for Chaha, this leaves a substantial portion of the data unexplained.

9.7.2.1.3. Palauan: dissimilation for [–continuant]?

Palauan (Zuraw & Lu 2009) is the best potential case of [–continuant] dissimilation found in the survey, though here again the situation is quite murky and the key data is thin. The relevant generalization (Zuraw & Lu 2009, Łubowicz 2010) is that an infix /-m-/ surfaces as [-w-][45] when there is another non-continuant labial {m b} later in the stem. This affix alternates between a prefix, and an infix positioned after a root-initial consonant, and is a reflex of the same Proto-Austronesian *um affix that demonstrates the same behavior in other related languages (e.g. Tagalog).

The Palauan pattern is illustrated in (65) (examples from Zuraw & Lu 2009:206). The form in (65a) shows a root with no labial consonants; here, the /-m-/ affix surfaces faithfully as [-m-], and is infixed following the root-initial consonant. The forms in

[45] Zuraw & Lu and Łubowicz cite the same sources, but have different transcriptions: where Zuraw & Lu have [w], Łubowicz has [u] or [o]. If this segment is a vowel rather than a consonant, this pattern is outside the scope of the Surface Correspondence theory.

(65b,c) show that an [m] or [b] in the next syllable causes the affix to surface as [-w-]; the examples in (65d,e) show the same pattern for more distant root labials. Finally, the examples in (65f,g) show that a [w] in the root does not induce the same alternation. Zuraw & Lu (2009:207) note that the dissimilation is exceptionless when the stem labial is the next consonant, but is not absolute for stem-final labials (cf. 65e).[46]

(65) Palauan: /-m-/ infix appears as [-w-] before [m b]

a.	ŋ-m-as	'subtract'	(infix [-m-])
b.	ð-w-obəʔ	'chop down'	(infix dissimilates to [-w-]; *ð-m-obəʔ)
c.	k-w-ɛməð	'sew up'	
d.	ð-w-aləm	'plant'	(infix dissimilates; *ð-m-aləm)
e.	s-w-ɛsəb ~ s-m-ɛsəb	'burn'	
f.	l-m-uwt	'return'	(no dissimilation before [w]; *l-w-uwt)
g.	k-m-iwt	'clean up'	

The basis for interpreting this as dissimilation is that the alternation changes a non-continuant, /m/, into a continuant, [w], only before another labial non-continuant (b-e), but *not* before a labial non-continuant (f). The forms in (f) & (g) are crucial to this interpretation: these two examples (the only ones that Zuraw & Lu give with [w]) are all that shows that the alternation is induced just by the non-continuant labials, rather than by labials in general. (Note that on this interpretation, the change in nasality from /m/ to [w] is an incidental shift rather than dissimilation – an overkill effect).

The Palauan case is a marginal one, for several reasons. First, the one morpheme that shows the dissimilation shows it only under a very strict set of

[46] There are also exceptions for vowel-initial roots. In this situation, the /-m-/ infix surfaces as a prefix, and there appears to be no long-distance dissimilation: /m+asəm/ → [im-asəm], *iw-asəm 'try out' (Zuraw & Lu 2009:206).

circumstances. As noted above, the /-m-/ affix is an infix only with consonant-initial roots; with vowel-initial roots, it appears instead as a prefix. The dissimilation pattern only applies to the infixed instances of this morpheme (Łubowicz 2010); in contexts where the affix /-m-/ surfaces as a prefix, there is no dissimilation (66). Second, the same affix surfaces as a vowel [o] when next to a segmentally adjacent [b], whether before or after (67). Here, there is an alternation reminiscent of the one in (65) above, but with the important difference that the output form distinctly has a vowel, and not a continuant consonant. Łubowicz reports that this /m/→[o] alternation happens with stem-initial labials; however, Zuraw & Lu (2009:205) report a different generalization – that the stem-initial labial either deletes or fuses with the affix /m/ (68). Finally, there is no dissimilation root-internally (69).

(66) Palauan: no dissimilation for prefixed /m-/ (Łubowicz 2010:264)

a.	mə-dub	‘get poisoned’
b.	mə-kimd	‘been cut (of hair)’
c.	mə-sesəb	‘been burnt’
d.	mə-ʔarəm	‘been tasted’

(67) Palauan: /m/ surfaces as [o] next to a segment-adjacent [b]

a.	o-burək	‘be swollen’	(/m/→[o] instead of infixing; *b-m-urək)
b.	t-o-bəkij	‘patched (3.sg.)’	(cf. tabək ‘patch’)

(68) Palauan: /m/ before some stem-initial /b/ leads to fusion/deletion?

a. /m/ + /basəʔ/ → [m-asəʔ] ‘name’ (/m-b/→[m]; *mə-asəʔ, *o-basəʔ)

(69) Palauan: no dissimilation root-internally (Łubowicz 2010:265)

a.	maməd	‘bedding given to visitors’
b.	bab	‘area or space above’
c.	mətab	‘dead fish in trap’

So, to recap: the dissimilation in Palauan occurs only for a subset of instances of one morpheme, and it's a subset that does not appear to be predictable from the distribution of other labial consonants. This morpheme also exhibits an array of different alternations, and little data is available for many of the crucial contexts (Zuraw & Lu 2009 have no examples of /m/ affixed to roots with initial /m/, for instance). Apart from this one morpheme, the language offers no basis to posit dissimilation of continuancy or among labials. The situation is complex and clearly deserving of further study, and possibly involves some dissimilatory component; but, it's by no means clear evidence of dissimilation for [–continuant].

9.7.2.1.4. Acehnese: dissimilation for [–continuant]?

Acehnese (Durie 1985) is the only other language I know of that could be argued to have long-distance [–continuant] dissimilation, though it is at best a very marginal example. The relevant generalization is that root-initial /t/ variably surfaces as a laminal sibilant [s̻] when followed by the sequence /ɯ{r l n}/, as illustrated in (70). This alternation occurs optionally in /t/-initial roots when combined with the infix /ɯn-/ (70a-c), and is also evident as a historical change, illustrated in (70d-e) by the comparison between Malay words with [t] and their Acehnese cognates with [s̻].

(70) Acehnese: /t/-frication (Durie 1985:34)

a.	/t-ɯn-ɯboʔ/	→ [s̻ɯnɯ̃boʔ]	'pepper clearing'
b.	/t-ɯn-ɯtroh/	→ [s̻ɯnɯ̃troh]	'something arrived'
c.	/t-ɯn-ɯmpoʔ/	→ [s̻ɯlɯ̃mpoʔ]	'stack of rice sheaves'[47]
d.	Malay [terasi]	~ Aceh. [s̻ɯras̻i]	'prawn paste'
e.	Malay [tenaman]	~ Aceh. [s̻ɯnaman]	'garden'

[47] See (§9. on nasal dissim.) for discussion of the Acehnese [l]~[n] alternation seen in this example.

The alternation between [t] and [s̥] clearly involves a change from [–continuant] to [+continuant]. If the segments [r l n] are all regarded as being [–continuant] as well, then this could be construed as a type of dissimilation. And, since the interacting segments are always separated by the vowel [ɯ], it would be an instance of long-distance dissimilation.[48]

There are some problems, however, with viewing Acehnese /t/-frication as dissimilation of [–continuant]. First, it is not clear that Acehnese /r/, a trill, should be regarded as [–continuant] rather than [+continuant] (Hall 2007). Second, other consonants that clearly *are* [–continuant] from an articulatory standpoint do *not* trigger this alternation, nor do they undergo it. Acehnese also has a verbal prefix /tɯ-/, which can create sequences of two syllable-adjacent [–continuant] segments. But, the alleged [t]~[s̥] dissimilation does not occur in these situations, as shown in (71) (examples from Durie 1985:73-75).

(71) Acehnese: /t/-frication does not reflect general [–continuant] dissimilation

a.	[tɯ-dɤŋ]	'stopping'	(*[s̥ɯ-dɤŋ])
b.	[tɯ-koh]	'harvested'	(*[s̥ɯ-koh])
c.	[hãn-tɯ-languᵊ]	'cannot be swum'	(*[hãn-s̥ɯ-languᵊ])

Given the extremely restricted context of application of /t/-frication, its clear non-productivity, and Durie's own observations that the pattern is highly variable and not systematic, I do not regard this case an attestation of [–continuant] dissimilation.

[48] Durie (1985:34) also gives the example [t=ɯn=ũtɤt] as evidence that frication of initial /t/ is blocked when another [t] is the onset of the final syllable of the stem. This observation is intriguing, but tangential.

9.7.2.1.5. Continuancy dissimilation summary

I tentatively consider long-distance continuancy dissimilation to be unattested. The only potential examples of dissimilation for [+continuant] are Chaha & Muher, and both are tenuous. The same goes for long-distance [–continuant] dissimilation: only Palauan and Acehnese are potential examples, and again both are tenuous. There are a few other languages where continuancy dissimilation is evident as a historical change, but with no manifestation in synchronic phonology; these include Iban & Ngaju Dayak (Blust 1996, Ohala 1981). There are other cases where [–continuant] dissimilation is reported in clusters but not between non-adjacent segments. There are also cases where dissimilation for some other feature results in a change from [–continuant] to [+continuant] as "overkill"; this is common for Dahl's Law [–voice] dissimilation in languages that have [ɣ] but lack [g], such as Gikuyu (Davy & Nurse 1982). But, there appear to be no languages that have bona fide patterns long-distance dissimilation for [–continuant] or [+continuant].

9.7.2.2. Sonority dissimilation

Long-distance dissimilation of [±sonorant] is unattested. What would such a pattern look like? It could possibly resemble either fortition or lenition, depending on which value of [±sonorant] dissimilates. Dissimilation for [+sonorant] could produce alternations like /l…n/ → [d…n], which might be taken as a type of fortition rather than dissimilation. Similarly, dissimilation for [–sonorant] could yield alternations like /t…d/ → [t…ɾ], a sort of flapping pattern with a dissimilatory distribution. While both of these seem impressionistically like plausible types of alternations, it is exceedingly difficult to prove that they are truly dissimilation for [±sonorant] and not any other features, and that they cannot be analyzed alternatively as some general strengthening or weakening phenomenon. Crucially, this would require interaction between different classes of sonorants.

The point is that dissimilation of [±sonorant] may be an accidental gap of sorts. It may exist, but present in ways that are never characterized as dissimilation, and therefore be under-reported. Along similar lines, since a large and precise array of data is needed in order to prove that an alternation is crucially [±sonorant] dissimilation, this may present a learnability problem. It is possible that this type of dissimilation is unattested because it is statistically unlikely to arise from a historical perspective.

9.7.2.3. Nasality dissimilation

The status of nasal dissimilation is not very clear. There several languages which exhibit dissimilation patterns involving nasality, but the majority of these cases crucially hold only for NC sequences (interpretable as either prenasalized consonants, or nasal+C clusters). Patterns interpretable as dissimilation of just [+nasal] or [–nasal] are far fewer in number, and all cases are marginal. So, dissimilation of NC sequences is robustly attested, but true dissimilation of nasality appears to be unattested (or at most very weakly attested). The table in (72) summarizes the types of nasality dissimilation patterns found in the survey, and each one is discussed below.

(72) Summary of attested dissimilation related to nasality:[49]

Language	***Relevant Pattern***	***Complication***
Takelma	/N...N/ → L...N *or* → N...L	confounded with Coronal dissimilation
Xiamen Chinese (Southern Min)	*NVN (*ṼN)	confounded w/ vowel nasality; alternations in both directions
Korean	avoidance of [ŋ...ŋ] in partial reduplication	generalization not robustly supported
Australian NC dissimilation	NC...NC → NC...C (E.g. Gurindji)	NC~NC (cluster) dissimilation
Meinhof's Rule (Ganda Law)	NC...N(C) → N(N)...N(C) (E.g. Luganda)	NC~NC (cluster?) dissimilation
Static NC dissimilation	*NC...NC (E.g. Timugon Murut)	NC~NC (prenasal?) dissimilation

A hypothetical example of "pure" nasal dissimilation is a pattern like that in (73): a morpheme that clearly contains an unambiguously [+nasal] consonant (i.e. a nasal, like {m n ŋ}) in alternating productively with an otherwise-similar though clearly [–nasal] consonant like [ɾ l d] only when another nasal is present.

(73) A hypothetical illustration of "pure" nasal dissimilation:

a.	tik	tik-na	(suffix /-na/, faithful after roots with no nasals)
b.	mik	mik-ɾa	(*mik-na; /n/ becomes non-nasal [ɾ] after a nasal)
c.	ŋap	ŋap-ɾa	(*ŋap-na; /n/→[ɾ] dissimilation after all nasals)
d.	ha	ha-na	(*ha-ɾa; no dissimilation after non-nasals)

Of the languages that exhibit dissimilatory patterns involving nasality, Takelma comes closest to this type of behavior: the segments that "trigger" the alternation are clearly [+nasal], and the alternation involves mapping one underlying [+nasal] consonant to a [–nasal] surface form. None of the other potential cases of nasal

[49] Previous surveys of dissimilation (Suzuki 1998, Bye 2011) also note Chukchi as an example of nasal dissimilation, citing Odden (1987). I do not include the Chukchi case here because it is a strictly segment-adjacent pattern: the relevant generalization is that /ŋ/ becomes [ɣ] in a coda when the following segment is a following nasal. The Chukchi case is also marginal as an example of dissimilation, since the reported dissimilation is confounded with other patterns: segment-adjacent nasal assimilation, and neutralization to [ɣ] in codas.

dissimilation have this characteristic: they are evident as static restrictions and do not present real synchronic alternations, or they are alternations which apply crucially to clusters containing both a [+nasal] consonant *and* a [–nasal] one.

9.7.2.3.1. Takelma: nasal dissimilation?

Takelma (Goodman 1992, Sapir 1912) exhibits nasal dissimilation, in the form of visible alternations between nasals and [l] in 'noun characteristic' suffixes (cf. §9.7.1.2.5 above). As noted above, nouns in Takelma occur with a 'noun characteristic' suffix before pronominal suffixes, and in locatives. The noun characteristic suffix is underlyingly of the form /-Vn/, with a coronal nasal [n].

(74) Takelma noun characteristic suffix is /-Vn/ (Goodman 1992:46-47)

a.	/pep + Vn/	[pepen]	'rushes'
b.	/xt + Vn/	[xtan]	'eel'
c.	/tak + Vn/	[takan]	'turtle'

Nasal dissimilation occurs in Takelma when the /-Vn/ noun characteristic suffix is added to roots containing the nasals [m n]. If the root contains [m], the /-Vn/ suffix surfaces with [l] instead of [n] (75). When the root contains [n], the resulting /n…n/ sequence surfaces as [l…m], with the nasal dissimilation affecting the root nasal instead of the suffix (76).

(75) Takelma nasal dissimilation: /-Vn/ surfaces as [-Vl] after [m]: (Goodman 1992:48)

a.	/ʃim+ Vn/	[ʃimil]	'dew'
b.	/tʃam + Vn/	[tʃamal]	'mouse'
c.	/meh + Vn/	[mehel]	'basket for cooking'

(76) Takelma nasal dissimilation: /…n…-Vn/ surfaces as […l…-Vm]: (Goodman 1992:48)

a.	/kʷan + Vn/	[kʷalam]	'road'
b.	/xan + Vn/	[xalam]	'urine'

In both of these situations, a sequence of two nasals is changed to one nasal and [l]. But, unusually, the direction of the dissimilation (rightward vs. leftward) depends on the input, and on whether coronal dissimilation occurs. Nasal dissimilation happens from right to left *only* in forms like (76), where coronal dissimilation *also* happens to the same consonants, but from left to right. So, Takelma's two dissimilation patterns are entangled in a way that renders this a somewhat marginal example of long-distance dissimilation for [+nasal].

9.7.2.3.2. Korean partial reduplication?

A very limited form of nasal dissimilation is also reported in Korean ideophones (Kim 1995:407, 2003). Kim's claim is that in partial reduplication systematically fails to copy /ŋ/ from the base, though other sonorants and other velar consonants may be copied. This is illustrated in (77): the forms in (a-b) suggest that the RED template is typically CVC, but the forms in (c-e), where the second C would be [ŋ], have a CV reduplicant instead.

(77) Korean partial reduplication: dissimilatory non-copying of /ŋ/ (Kim 2003)

	Base	Red. Form		
a.	kolu	kol-kolu	'evenly'	(CVC reduplicant)
b.	t'ekul	t'ek-t'ekul	'rolling'	
c.	tuŋsil	tu-tuŋsil	'floating gently'	(CV reduplicant; *tuŋ-tuŋsil)
d.	p^haŋ	p^ha-p^haŋ	'exploding'	(*p^haŋ-p^haŋ)
e.	p'aŋ	pa-paŋ	'banging (of a gun)'	(*p'aŋ-paŋ)

Kim (1995, 2003) proposes a rule of nasal dissimilation (ŋCVŋ{C,#} → ØCVŋ{C,#}) to explain this asymmetry; if this analysis is correct, this could be another case of dissimilation for [Nasal].

There are several caveats about the Korean case, however, which must be emphasized. First, this sort of partial reduplication is limited to ideophones, not in the core lexicon of Korean (Seunghun Lee, p.c.). Second, as Kim (2003:8) notes, this pattern "is not regular in Korean phonology", and is by no means productive. Third, there is a substantial range of variation in these reduplicated ideophones: not all of them manifest the same type of reduplication. For example, compare (77) to [culuk] → [cululuk] 'dribbling', where the reduplicant is infixed, and is CV in shape even though there are no velar nasals that fail to copy. As such, Korean is a very marginal example of nasal dissimilation at best.

9.7.2.3.3. Xiamen Chinese

Dissimilatory restrictions against nasals are found in Xiamen Chinese, as well as some other Southern Min varieties (Lien 1998). The generalization in this case is that a syllable with a nasal onset cannot contain any other nasals. Thus, nasal codas are permitted only in syllables that do not have nasal onsets: an apparent pattern of [+nasal] dissimilation. This *NVN ban manifests primarily as a static restriction, but there are also diachronic examples de-nasalization that are consistent with it, e.g. Middle Chinese [nen] > Xiamen [lẽŋ^5] (not > [nẽŋ]) 'milk' (Norman 1988:241). Additionally, Lien (1998:4) observes that the *NVN restriction is evident in L2 mispronunciations: Xiamen speakers have been documented interchanging nasals and non-nasals when speaking Japanese and Mandarin. Some examples of this accidental L2 nasality reversal are given in (78).

(78) Xiamen: *NVN evident from de-nasalization in L2 Japanese? (Lien 1998:4-5)

	Correct Japanese form	Mispronunciation	
a.	mannaka	bannaka	'center'
b.	mendori	bendori	'hen'
c.	nandaka	dandaka	'what'
d.	sakunen	sakuren	'last year'
e.	kunin	kurin	'nine persons'
f.	minarenai	midadenai	'unfamiliar'
g.	dame	name	'bad'
h.	danshi	nanshi	'man'
i.	bin	min	'vase'
j.	hanete	harete	'hop'
k.	ichiba	ichima	'market'

Forms like (a-f) can be interpreted as the result of a *NVN restriction in Xiamen, which is transferred into L2 speech. However, examples like (g-k) call these mispronunciations into question as genuine evidence of dissimilation. In cases like (g) [dame] ~ [name], the mispronunciation creates an NVN sequence, instead of avoiding one. Furthermore, examples like (j) & (k) show reversal of nasality in words with no other nasals. So, these mispronunciations run in all directions; they are not evidence of a truly dissimilatory pattern.

The Xiamen case is only marginal as an example of dissimilation, due to involvement of vowel nasalization. Lien (1998:2) notes that syllables with nasal onsets always have nasal nuclei: if the onset is [m n ŋ], then the nucleus is either a nasalized vowel, or a syllabic nasal. Along related lines, Norman (1988:235) characterizes the historical change in words like *nen > lẽŋ as de-nasalization before oral vowels. This could still be viewed as dissimilation, but it is crucially a segment-adjacent interaction. As such, there is no long-distance consonant-to-consonant interaction going on in the Xiamen pattern.

9.7.2.3.4. Dissimilation of NC sequences

In the remainder of the cases of nasal dissimilation, the segments involved are crucially NC sequences, not simple [+nasal] consonants: the alternations and/or restrictions observed in these languages cannot be characterized solely in terms of the [±nasal] value of an individual segment.

9.7.2.3.4.1. NC cluster dissimilation in Australian languages

A number of Australian languages are reported to have patterns of NC cluster dissimilation; as an example, let us consider Gurindji (McConvell 1988), one of the more well-studied cases. Gurindji exhibits semi-productive NC ~ C alternations in suffixes, depending on the distribution of nasals in the root. The pattern is illustrated in (79): the suffix /-mpal/ 'across' surfaces as [-mpal] after roots with no nasals or NC sequences (79a), but appears instead as [-pal] after roots with an NC sequence (79b).[50]

(79) Gurindji: NC dissimilation (McConvell 1988:138)

a.	kayirra-mpal	'across the north'	(suffix /-mpal/ 'across')
b.	kanyju-pal	'across below'	(dissimilation: /NC...-mpal/ → [NC...-pal])

In Gurindji, however, this alternation cannot plausibly be characterized as [+nasal] dissimilation, nor even as dissimilation of prenasality. This is because the alternation is an interaction between clusters, not individual segments. It is only N+C *sequences* that produce the alternation; ordinary nasals do not, as illustrated in (80a), where the locative suffix /-mpa/ surfaces faithfully even though the root contains the [+nasal] consonant [n]. Additionally, N+C clusters which are *not* homorganic, do trigger

[50] The Gurindji case is simplified somewhat here for illustrative purposes; in some cases, /NC...NC/ dissimilates to [NC...N] or [NC...CC]; see McConvell (1988) and the appendix of ch. 8 for further discussion.

the alternation. This is illustrated in (80b): neither [k] nor [n] triggers dissimilation, but the cluster [n.k] does.

(80) Gurindji: NC dissimilation is a property of N+C clusters

a.	kani-mpa	downstream-LOC	*kani-pa; no dissimilation after [n] or [k]
b.	kanka-pa	upstream-LOC	*kanka-pa; dissimilation after [n.k]

Dissimilation of nasal-stop clusters also occurs in other Australian languages, including Bardi (Bowern 2004), Gooniyandi (Suzuki 1998, Evans 1995, McGregor 1990), Nhanda (Blevins 2001), and Yindjibarndi (Suzuki 1998, Wordick 1982). (See appendix for a fuller list).

9.7.2.3.4.2. Meinhof's Law: NC dissimilation in Bantu languages?

A related phenomenon, the 'Ganda Law' or 'Meinhof's Law' is also found in many Eastern Bantu languages, including Lamba (Piggott 1994, Doke 1938), Luganda (Nurse & Phillipson 2003, Meinhof 1962), Lumasaaba (Piggott 1994), Kikuyu (Piggott 1994, Armstrong 1967), Kinyarwanda (Kimenyi 1979), Kwanyama (Hyman 2003), UMBunundu (Kula 2006), and Yao (Nurse & Phillipson 2003) (See appendix for full list). The common characteristic of all of these cases is the avoidance of NCVNC sequences, but the details vary from one language to another. In the canonical example, Luganda, /NC...N(C)/ → [NN...N(C)]: root-initial consonants become nasals when preceded by a nasal, and followed by another nasal in the next syllable (Hyman 2003). In other languages, the root-initial consonant deletes instead, and in Kwanyama it is the second NC sequence that is adjusted instead of the first one. There is also cross-linguistic variation in what "triggers" the process. For instance, in Luganda, the later triggering element can be a single nasal rather than an NC sequence; in Yao only NC sequences cause the alternation, and in Kikuyu it is only NC sequences with a voiced consonant. This cross-linguistic variation is illustrated in (81) (Piggott 1994:131, Hyman 2003:51-56; see also the appendix of this dissertation for a fuller list of cases and sources).

(81) Meinhof's Law (Ganda Law): sample of cross-linguistic variation

a.	Ganda:	NC...N	→ NN...N	/n-limi/	→ [nnimi] 'tongues'
b.	Lamba:	NC...NC	→ N...NC	/i-n-βaŋgo/	→ [imaŋgo] 'bonds'
c.	Lumasaaba:	NC...N	→ N...N	/i-n-lima/	→ [inima] 'I dig'
d.	Yao:	NC...NC	→ N...NC	/ku-n-dííŋga/	→ [kuu-nííŋga] 'to try me'
e.	Kwanyama:	NC...NC	→ NC...C	/N-gandu/	→ [oŋ-gadu] 'crocodile'

Not all instances of Meinhof's Law are necessarily genuine dissimilation. In Luganda, for example, the change is /NC...N/ → [NN...N]: this can be readily explained as nasal assimilation rather than dissimilation of prenasality (a point made by Herbert 1977b, 1986). Additionally, in some languages, the pattern is observed only as a diachronic change, and does not necessarily reflect any actual synchronic mapping.

9.7.2.3.4.3. Other cases of NC dissimilation

Dissimilation of NC sequences is also found in a number of other languages, including Timugon Murut (Prentice 1971, Blust 2012), Muna (Coetzee & Pater 2006, Zuraw & Lu 2009), Ngadju Dayak and Mori Bawah (Blust 2012). Old Japanese (Kawahara 2008, Unger 1975, Vance 2005) also had NC dissimilation effects, in the form of static co-occurrence restrictions and blocking of alternations.[51]

[51] Modern Japanese voiced stops developed historically from prenasalized stops in Old Japanese (which some dialects retain as such), which were subject to the same dissimilatory generalizations (i.e. Lyman's Law).

9.7.2.3.5. [–nasal] dissimilation?

Dissimilation of [–nasal] is unattested: in my survey, I was not able to find any languages that show dissimilation of this sort. This kind of dissimilation, if it exists, could manifest in familiar-looking ways. For instance, if this dissimilation occurs only among sonorants, it would presumably result in alternations like /r…r/→[r…n]. While Ainu has this type of [r]~[n] dissimilation in consonant clusters (Suzuki 1998, Shibatani 1990), long-distance dissimilation patterns of this type appears to be unattested.

9.7.2.3.6. Nasality dissimilation summary

In sum: it is not clear whether true dissimilation for [±nasal] is phonologically possible. While dissimilatory patterns involving phonetically nasal (and/or nasalized) consonants are attested, there are no clear examples of long-distance, synchronic, consonant-to-consonant, dissimilation of [+nasal]. The best examples of dissimilatory interactions between just nasals are either confounded with other patterns (Takelma), or are not really long-distance consonant interactions (Xiamen Chinese), or are empirically suspect (Korean). While there are abundant examples of languages that avoid the co-occurrence of N+C clusters, not all of these are clearly dissimilatory: many cases of Meinhof's Rule (the Ganda Law) are just as readily explained as nasal assimilation (Herbert 1977b, 1986), and some cases of NC dissimilation in Australian can also be alternately explained as spreading of [–nasal] (cf. Odden 1994:303). Furthermore, they crucially apply only to clusters that contain both a nasal and oral component – they are not clearly segmental interactions, nor dissimilation for any one feature.

9.7.2.4. Length

Previous surveys of dissimilation (Suzuki 1998, Bye 2011) report that length dissimilation is attested; the finding of this survey is that length dissimilation is not supported as a genuine type of long-distance consonant dissimilation.

The languages reported to have length dissimilation are: Dinka, Gidabal, Oromo, Slovak, Latin, Finnish, and Japanese. The first four of these involve only vowel length alternations, and do not affect consonants. Of the remaining three reported cases (Latin, Finnish, and Japanese), none are clearly patterns based on consonant length. The pattern in Latin is degemination before a heavy syllable (the so-called 'Lex Mamilla' alternation): geminates shorten before any syllable with a long vowel, not just before another geminate (Itô & Mester 1996). The alleged dissimilation pattern in Finnish is the failure of "consonant gradation" before heavy syllables, a pattern that likewise is neither dissimilatory nor strictly a consonant length alternation (Bye 2011:f.n.1). The alleged dissimilation pattern in Japanese is a static prohibition against multiple geminates in the same word; however, the only evidence for this restriction is the generalization that gemination in English loanwords does not produce two geminates in the same morpheme (Itô & Mester 1996, Tsuchida 1997:151). I know of one other recently reported case of geminate dissimilation, Talaud (Blust 2012). Here, again, the pattern really isn't about length: the generalization (Blust 2012:364) is that diachronic gemination of word-final consonants fails after any CC sequence - including not just geminates, but also NC clusters.

If we eliminate the dubious cases of length dissimilation, and the cases that apply only to vowels, there are no examples left. As such, I consider length dissimilation to be unattested (contra Suzuki 1998, Bye 2011).

9.7.3. Laryngeal features

This section considers dissimilation for the laryngeal features - [±voice], [±spread glottis], and [±constricted glottis]. All three can participate in dissimilation, but there is a peculiar asymmetry between [±voice] and the two glottal constriction features. Dissimilation is attested for both values of [±voice] (viz. [+voice] *and* [–voice]); on the other hand, only the "positive" specifications [+sg] and [+cg] exhibit dissimilation.

9.7.3.1. Voicing

9.7.3.1.1. [+voice] dissimilation

Dissimilation for [+voice] is moderately attested. There are not many languages that exhibit this type of dissimilation, but it does occur with overt alternations in Western Bade (Schuh 1977, 2002), and also manifests as very robust blocking effects and co-occurrence restrictions in Japanese (Itô & Mester 1986, 1996; Alderete 1996, Kawahara et al. 2006).[52]

9.7.3.1.1.1. Western Bade

Dissimilation of [+voice] is found in Western Bade (Schuh 1997, 2002). The core generalization observed by Schuh (2002:4) is that "a voiced obstruent becomes

[52] Voicing dissimilation is also reported in Gothic (a pattern known as 'Thurneysen's Law'; Chomsky & Halle 1968, Walker 2000a; see also Thurneysen 1897), though Flickinger (1981) argues that this case is spurious and not actually supported by the Gothic data available.

voiceless if the next syllable begins in a voiced obstruent." In most varieties of Western Bade, this dissimilation is apparent only as a static restriction: relatively few words in the lexicon contain sequences of two [+voice] obstruents, and those that do are largely loanwords, ideophones, or full-root reduplicants (Schuh 2002:4-5). Alternations can be seen in CV-reduplicants, though (82): roots with an initial [+voice] obstruent have CV-reduplicated forms with a sequence of [−voice]...[+voice], instead of two [+voice] obstruents. The same sort of alternations can also be observed comparatively (e.g. Western Bade [kádùwáːn] ~ Hausa [gàdáː] 'duiker' (Schuh 2002:5)).

(82) Western Bade: [+voice] dissimilation in CV reduplicants (Schuh 2002:5,9)

a.	fàːvərú	'go out repeatedly'	(< vərú 'go out'; *[vàːvərú])
b.	tə́də̀mə́n	'blood'	(cf. Bole dòm; *[də́də̀mə́n])
c.	pàbdú	'ask repeatedly'	(< ə̀bdú; *[pàbdú])

In addition, some varieties of Western Bade have productive [+voice] dissimilation in prefixes (Schuh (2002:6) terms these varieties 'Far Western Bade'). Some examples are given in (83) below: prefixes that contain voiced obstruents in other dialects of Western Bade exhibit, in 'Far' Western Bade, systematic alternations between [+voice] and [−voice] obstruents.

(83) 'Far Western' Bade: Synchronic [+voice] dissimilation in prefixes (Schuh 2002:7)

a.	ká-zə̀nàɛá	'whithered'	(cf. [gà-hə́ɗà] 'dried', with /ga-/→[ga-])
b.	kə́-vərú	'you went out'	(cf. [gə̀-kərū] 'you stole', with /gə-/→[gə-])
c.	tə́-bàkà	'burned'	(cf. [də̀-səɛà] 'washed', with /də-/ as [də-]
d.	tâ-bdə́ʧi	'that he ask'	(cf. [dà-kərə́ʧì] 'that he steal', with [da-])

9.7.3.1.1.2. Japanese

Dissimilation for [+voice] is also attested in Japanese, in the form of a static morpheme structure constraint, and blocking of regular alternations. The static dissimilatory restriction is observed in the native 'Yamato' vocabulary of Japanese: roots in this stratum of the lexicon never contain two voiced obstruents (Itô & Mester 1986:67; see also Kawahara et al. 2006, among many others).

There is also evidence that the co-occurrence restriction against multiple [+voice] obstruents is an active part of the synchronic phonology of Japanese: it blocks regular voicing alternations, an interaction known as 'Lyman's Law' (Itô & Mester 1986, 1996, 1998; Vance 1987, 2005; see also Alderete 1997, among others). The generalizations are the following: in compounds, the initial consonant of the second root must be voiced, resulting in a constellation of alternations known as 'Rendaku' or 'sequential voicing' (84).[53] However, when the second morpheme in the compound already contains another [+voice] obstruent, the Rendaku voicing alternation fails to occur (85).

(84) Japanese: Rendaku voicing in compounds (Itô & Mester 1986:52)

a.	iro	+	kami	→	irogami	(*irokami)
	'color'		'paper'		'colored paper'	
b.	e	+	tako	→	edako	(*etako)
	'picture'		'kite'		'picture kite'	
c.	yo	+	sakura	→	yozakura	(*yosakura)
	'night'		'cherry'		'blossoms at night'	
d.	hana	+	ʧi	→	hanaʤi	(*hanaʧi)
	'nose'		'blood'		'nosebleed'	

[53] The Rendaku pattern also involves alternations between /h/ (including allophones [h f ç]) and [b], e.g. [ike] 'arrange' + [hana] 'flower' → [ike**b**ana] 'ikebana (art of flower arrangement)' (Itô & Mester 1986:53). This quirk in the pattern is because modern /h/ descends from earlier *p.
Additionally, Vance (1987:114) notes that some speakers use [ŋ] instead of [g] intervocalically; for these speakers, sequential voicing of /k/ produces [ŋ] rather than [g], e.g. [jama] 'mountain' + [kawa] 'river' → [jamaŋawa]. Vance suggests this is related to the fact that modern Japanese voiced stops derive historically from prenasalized stops (i.e. [g] originates from earlier *ŋg).
For simplicity, I will abstract away from these two irregularities in the Rendaku pattern, and will take [+voice] to be the only relevant feature involved.

(85) Japanese: Rendaku voicing blocked when it would yield two [+voice] obstruents

a.	kami	+	kaze	→	kamikaze	'divine wind'	(*kamigaze)
b.	mono	+	ʃizuka	→	monoʃizuka	'tranquil'	(*monod͡ʒizuka)
c.	siro	+	tabe	→	sirotabi	'white tabi'	(*sirodabi)

Thus, Rendaku voicing systematically fails to produce roots with multiple voiced obstruents. This shows that the restriction on the Yamato vocabulary is not a historical accident; it the prohibition against voiced obstruent co-occurrence is actively enforced on the surface, even though it does not cause alternations on its own. See also Kawahara (2012) for additional experimental evidence that Lyman's Law reflects an active phonological restriction.

9.7.3.1.2. [–voice] dissimilation

Dissimilation of [–voice] is robustly attested. Overt voiceless dissimilation is found in many Eastern Bantu languages (Dahl's Law), including: Kikuria, Ekegusii, Embu and Meru (Davy & Nurse 1982); Kikuyu (Davy & Nurse 1982, Armstrong 1967); Tharaka, Mwimbi, and possibly Nyamwezi & Luyia (Bennett 1967); Kinyarwanda (Kimenyi 1978, 1979); and Kirundi (Hyman 2003:56, Meussen 1959). These languages all exhibit dissimilatory voicing of stops (most commonly /k/) before voiceless obstruents, though with some cross-linguistic variation. This phenomenon is not unique to Bantu languages, however: overt [–voice] dissimilation also occurs in Moro (Rose 2011b), a Kordofanian language, and Minor Mlabri (Rischel 1995:90), an Austro-Asiatic language. (Other possible examples of voiceless may also be found Bukawa (Ross 1993) and Bakairi

(Bye 2011; de Souza 1991; Wetzels & Mascaró 2001), though these would be extremely marginal cases.)[54]

9.7.3.2. Spread Glottis

9.7.3.2.1. [+spread glottis]

Dissimilation of [+spread glottis] is robustly attested. Languages with this type of dissimilation include: Ekoti (also known as Makhuwa/Makua) (Kisseberth 2003; Schadeberg 1999, 2000), Meithei (Chelliah 1997), Ofo (MacEachern 1999, De Reuse 1981), Cuzco Quechua (MacEachern 1999, Rowe 1950, Parker & Weber 1996; see ch. 5), Sanskrit (Anderson 1970), and perhaps also Adiyaman Kurmanji, a Kurdish Indo-Iranian language spoken in Eastern Turkey (Ümit Atlamaz, p.c.).[55] Additionally, static morpheme structure constraints that prohibit the co-occurrence of two [+sg] consonants are found in Peruvian Aymara, Zuberoan Basque, Gojri & Harauti (MacEachern 1999), though in these cases there are no observable alternations.

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[54] The pattern in Bukawa is that stops in adjacent syllables always disagree for voicing; thus, sequences like [papa] are impossible. Ross (1993) explains this as the result of a diachronic voicing pattern based on foot structure: obstruents are voiceless in the head of a foot, and voiced in the non-head of a foot. If this is correct, then the non-co-occurrence of [–voice] obstruents in Bukawa could be seen as an accidental gap.
In Bakairi, the generalization (Wetzels & Mascaró 2001:235) is that a word can contain no more than one word-internal voiceless obstruent. Thus, Bakairi has words like [igeke] 'singing', but no words of the form *[ikeke]. What makes this a marginal case is that word-initial obstruents are always voiceless, and have no bearing on the occurrence of voiceless obstruents elsewhere in the word. Thus, Bakairi does have numerous words like [sekadai] 'asked', with two [–voice] obstruents, which are apparent counter-examples.

[55] The generalization in Adiyaman Kurmanji is that breathiness/aspiration is lost in emphatic partial reduplication. For example: [z^ha] > [zəpɪ-z^ha], *z^həpɪ-z^ha 'dry'/'very dry'; and [m^hor] > [mos-m^hor], *m^hos-m^hor 'purple'/'very purple'. This pattern of partial reduplication involves the insertion of an extra consonant [p] or [s] in these examples, and appears to be borrowed from Turkish; see §9.7.4.5.1.2.

9.7.2.3.1.1. A note about 'Vaux's Law' & [+spread glottis] in fricatives

Vaux (1998a) argues that voiceless fricatives should be regarded as having a default or underlying [+spread glottis] specification, even in the absence of any contrastive function of [±sg] as a feature. If we accept this proposal, it allows a number of additional patterns of long-distance consonant interaction to be understood in terms of dissimilation.

In Makhuwa (Schadeberg 1999, 2000; Kisseberth 2003), there is a static, dissimilatory, co-occurrence restriction against aspirated stops: only one aspirate is allowed in a root. Schadeberg (2000:15) observes that in some verbs, addition of the causative suffix [-is-]~[-ih-] can result in deaspiration in the root, as shown below (86).

(86) Ekoti: de-aspiration before causative /-is-/ (Schadeberg 2000:15)

a.	osut^{h}uwa	'to be startled'	
b.	osutisa	'to startle'	(cf. *osut^{h}isa; deaspiration before /s/)
c.	okatipuk^{h}a	'to be angry'	
d.	okatipuk$^{(h)}$isa	'to make angry'	(optional deaspiration)

A similar pattern is found in Huave (Kim 2008:81-85), a language isolate spoken in Mexico (Oaxaca). Huave deletes /h/ following other /h/s, an apparent pattern of [+spread glottis] dissimilation. As Kim notes, the sibilant fricatives [s ʃ] also trigger this [h]-deletion, perfectly consistent with Vaux's claim that they are [+sg].

Both of these cases can be understood if sibilant fricatives are [+sg], and they can then be assimilated to other cases of regular [+sg] dissimilation like those discussed above.

9.7.3.2.2. [–spread glottis]

Dissimilation of [–spread glottis] is unattested. This type of dissimilation is easy to conceive of: imagine a language in which stops are usually unaspirated, but become aspirated when another stop follows. There are numerous languages where stops are aspirated only in certain contexts, but I do not know of any languages where aspiration is distributed in this dissimilatory way.[56]

9.7.3.3. Constricted Glottis

9.7.3.3.1. [+constricted glottis]

Dissimilation for [+constricted glottis] is robustly attested. Languages with this type of dissimilation include: Cuzco Quechua (Parker & Weber 1996); various Salish languages including Columbian (Fallon 2002:213), Okanagan (Thompson & Thompson 1985), Shuswap (Thompson & Thompson 1985, MacEachern 1999, Fallon 2002), and Tillamook (Fallon 2002:214). Marginal cases of [+cg] dissimilation with visible alternations are also found in Seri (Yip 1988, Marlett & Stemberger 1983), where the dissimilation applies to glottal stops only (not any other [+cg] consonants), and in partial reduplications in both Kalispel Salish (Fallon 2002:211)[57] and Korean ideophones (Kim 2003, Kim 1995:407). Static restrictions against co-occurrence of [+cg] consonants are also found in Bolivian

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[56] A related pattern is reported for Tangkhul Naga (Shosted 2007, Bhat 1969): word-initial stops are aspirated only when the onset of the next syllable is a sonorant. Shosted (2007) characterizes this as a perceptual OCP effect. This case does not pass the test for dissimilation, though: the interaction is between sonorants and stops, two classes of segments that have no shared features. Underlying aspirated and unaspirated stops behave in exactly the same way - [±spread glottis] has nothing to do with "triggering" this pattern, and it therefore cannot be dissimilation for [–sg].

[57] Kalispel Salish exhibits de-glottalization of ejectives in reduplication, a pattern found in the other Salish languages noted above. I treat this as a marginal case because there are no examples where a vowel intervenes between the two dissimilating ejectives (though dissimilation does occur across other intervening non-ejective consonants). See Fallon (2002:211-212) for discussion and examples.

Aymara (MacEachern 1999), Old Georgian (MacEachern 1999), Hausa (MacEachern 1999, Newman 2000); various Mayan languages, including Chol (Gallagher & Coon 2009), Tzeltal (Suzuki 1999, Kaufman 1971), Tzutujil (MacEachern 1999, Dayley 1985), and Yucatec (Yip 1989, MacEachern 1999); and Bolivian Quechua (Gallagher 2010, 2011).

9.7.3.3.2. [–constricted glottis]

Dissimilation for [–constricted glottis] is unattested. What this might look like is conditional glottalization of obstruents, e.g. stops are ejective only when the following syllable also contains a stop. Positional glottalization of obstruents is attested[58], but I have found no languages where this happens only to avoid the co-occurrence of two non-glottalized consonants.

The absence of dissimilation for [–cg] is significant because there are consonant harmony patterns where agreement holds over only non-glottalized obstruents. An example is Ngizim (Hansson 2001/2010; Schuh 1978, 1997): Ngizim has voicing agreement among stops and fricatives in the root (as evidenced by diachronic changes). But, implosives do not participate in this agreement: [ɗ] is a voiced consonant, but it neither agrees with voiceless obstruents, nor does it cause voiceless obstruents to assimilate to match its [+voice] value.

Interpreting the Ngizim pattern as agreement by correspondence among all and only the [–constricted glottis] consonants, we might posit a CORR constraint CORR·[–son, –cg] - a constraint that demands correspondence among all and only the non-glottalized obstruents. The existence of this constraint, given the Mismatch property

[58] For example, in some varieties of American English, including the author's, phrase-final voiceless stops may be realized as ejectives.

of the SCTD, would predict that dissimilation for [−cg]. But, such dissimilation doesn't appear to be attested.

9.7.4. Secondary Place features

9.7.4.1. Secondary Labialization

By labialization, I mean a secondary labial gesture that is distinct from the main place of articulation - e.g. the difference between [k] and [k^w]. I will represent this property using an ad hoc feature [±labialized].

Long-distance dissimilation of labialization is considered unattested. This type of dissimilation is reported in Imdlawn Tashlhiyt Berber (Elmedlaoui 1995a, 1995b, Selkirk 1993), but this case is a marginal one (see discussion below). This is the only case I know of where labialization dissimilation is reported to be long-distance; other cases of labialization dissimilation (e.g. Moroccan Arabic, Elmedlaoui 1995a, 1995b) are strictly segment-adjacent patterns.

9.7.4.1.1. Imdlawn Tashlhiyt Berber

Elmedlaoui (1995a, 1995b) reports dissimilation of secondary labialization on velars, distinct from another pattern of dissimilation for [Labial] as a major place feature. The relevant generalization is that a labialized consonant cannot appear before other labialized consonants, or the vocalic elements [w] & [u]. This is illustrated below (examples from Elmedlaoui 1995a:57): aorist forms involve a final [-u] (87), and this round vowel causes loss of labialization on a previous consonant (88).

(87) Imdlawn Tashlhiyt Berber: Aorist formation with [-u]

	Perfective	Aorist	
a.	bna	bnu	'bâtir'
b.	ʒla	ʒlu	'égarer'
c.	rka	rku	'ê. sale'

(88) Imdlawn Tashlhiyt Berber: de-labialization before Aorist [-u]

	Perfective	Aorist	
a.	gʷna	gnu (*gʷnu)	'coudre'
b.	kʷna	knu	'se courber'
c.	ʁʷla	ʁlu	'ê. cher'
d.	χʷla	χlu	'démolir'

Similar alternations are found in singular-plural pairs of nouns, as illustrated below (Elmedlaoui 1995a:56). Some nouns show regular ablaut of their final vowel, with [u] in the singular form and [a] in plurals (89a,b). A subset of these nouns show a corresponding alternation in labialization: a dorsal consonant is labialized in the plural form (where the final vowel is [a]), but not in the singular form (with final vowel [u]), as in (89c-f). This is taken to be dissimilation: these consonants are labialized underlyingly, but this labialization fails to appear when the labialized element [u] follows. This is a long-distance pattern: as (89c-f) show, the "triggering" [u] and the consonant exhibiting the [K]~[Kʷ] alternation can be separated by other segments, even other labial consonants. The forms in (89g,h) show that this is crucially a dissimilatory phenomenon: nouns that have no [u] in their singular forms may have labialized consonants, and do not show the labialization alternation.

(89) Imdlawn Tashlhiyt Berber: [Cʷ]~[C] dissimilation before [u] (Elmedlaoui 1995a:56)

	Singular	Plural		
a.	a-srdun	i-srdan	‘mulet’	(Sg. [u] ~ Pl. [a])
b.	a-zgzu	i-zgza	‘verdure’	
c.	a-mrgul	i-mrgʷal	‘récipient aved couvercle pour pâte’	
d.	a-gdur	i-gʷdar	‘gargoulette’	
e.	a-ʁnbub	i-ʁʷnbab	‘visage (au péjoratif)’	
f.	a-qmmu	i-qʷmma	‘museau’	
g.	a-χʷrˀbiʃˀ	i-χʷrˀbaʃˀ	‘mosquée modeste du douar’	
h.	a-skʷfl	i-skʷfal	‘gradin’	

Note that in these examples, the interaction is between a consonant and a vowel, and crucially *not* between two consonants. The de-labialization of the dorsals in (88) and (89) is “triggered” by a surface vowel [u], not by another labialized consonant. Labial consonants do not cause loss of labialization, as in (89e) [i-ʁʷnbab].

Cross-dialectal comparisons provide evidence for de-labialization in Imdlawn, induced by another labialized consonant, though the pattern is not completely parallel. Elmedlaoui (1995a:121) provides the comparisons in (90), between the Imdlawn Tashlhiyt dialect, and the Tashlhiyt dialects of Indawzal & Zagmuzn; sequences of two labialized consonants in Indawzal/Zagmuzn correspond to single instances of labialization in Imdlawn, suggesting dissimilation.

(90) Imdlawn Berber: Comparative evidence for labialization dissimilation[59]

	Imdlawn	Indawzal/Zagmuzn	
a.	agʷmar	agʷmʷar	'cheval'
b.	lkʷmmijt	lkʷmmʷijt	'poignard chevaleresque'
c.	aqʷmlil	aqʷmʷlil	'gifle'
d.	akʷfaf	akʷfʷafʷ	'toît'
e.	χʷbi	χʷbʷi	'lacérer à coup de griffe'

There are some notable asymmetries, however, between this pattern of apparent dissimilation and the synchronic pattern considered above. First, the direction of dissimilation is reversed: the comparative evidence points to de-labialization *after* another labialized segment, not before (cf. (88-89) above). Second, this pattern of dissimilation is only observed between one [Dorsal] consonant and one [Labial] one - a peculiar gap, given that the synchronic labialization dissimilation seems to hold only for [Dorsal] consonants. Finally, in the comparative case, the presumed dissimilation is always segment-adjacent: neither vowels nor other non-labialized consonants intervene. This apparent historical dissimilation is apparently not a long-distance pattern.

Labialization dissimilation as a long-distance, synchronic, consonant-to-consonant interaction is not observed in Imdlawn Tashlhiyt, and fails to occur in morphological configurations that would give rise to it. The language has two verbal agreement suffixes with relevant consonants: 2nd-person masculine plural object suffix /-kʷn/ (with a labialized velar), and the 2nd-person plural dative suffix /-awn/ (with [w]). Neither of these suffixes causes de-labialization in the root:

[59] In these forms, Elmedlaoui (1995a) transcribes the dorsal consonants with labio-velarization, and the labials with velarization (as [mˠ] rather than [mʷ]). However, he notes (p. 113) that this velarization is an articulatory configuration comparable to the labio-velarized [kʷ]. I have changed the velarization diacritics to [Cʷ] for consistency.

(91) Imdlawn Tashlhiyt: C^w dissimilation is not productive (Elmedlaoui 1995a:59)

a.	i-g^{w}mr-k^{w}n	i-g^{w}mr-awn	'pratiquer la chasse'
b.	i-ʁ^{w}i-k^{w}n	i-ʁ^{w}j-awn	'tenir, attraper, arrêter'
c.	j-ag^{w}i-k^{w}n	j-ag^{w}j-awn	'refuser'

In these examples, affixation yields input sequences of /C^w...C^w/ or /C^w...w/. These sequences should dissimilate to [C...C^w] & [C...w] respectively, but this is not what happens - the sequence is simply tolerated instead.

Imdlawn Tashlhiyt Berber is considered a marginal case of dissimilation due to the complications discussed here. When the alternation is long-distance, it is only observed between a consonant and a vowel, never between two consonants. A related consonant-to-consonant can be inferred from diachronic evidence, but here the pattern is not a long-distance one. This complementary distribution is suspicious, and undermines the validity of Imdlawn Tashlhiyt as a case of genuine dissimilation for the property of (secondary) labialization.

9.7.4.2. Labio-velarity dissimilation

By 'Labio-velarity', I mean a second velar articulation on a consonant that is primarily labial – i.e. the distinction between [p] and [k͡p]. This property is typically viewed as a second [Place] feature, forming a complex segment (Sagey 1986, Clements & Hume 1995, Hall 2007, e.g.).

Dissimilation of labio-velarity is unattested. I know of no languages with dissimilatory patterns that crucially pick out labio-velar consonants, to the exclusion of [Labial] segments more generally. For instance, I have found no languages where labio-velars may co-occur with labials, but not with other labio-velars.

This property is notable because it participates in consonant harmony patterns. In Ngbaka (Thomas 1963, Sagey 1986), for instance, labials & labio-velars may not co-occur in roots, a pattern interpretable as agreement among [Labial] consonants for labio-velarity. Ponapean is another possible case (Hansson 2001/2010, Mester 1986, Rehg & Sohl 1981), along with Mokilese, which is reported to share the same generalizations (Mester 1986, McCarthy 1989).

What is not reported, however, is harmony specifically *among* labio-velars (for some other feature, e.g. voicing). This is the sort of harmony that would be predicted if there are Corr constraints which refer to the property of labio-velarity. This is consistent with the non-existence of this type of dissimilation.

9.7.4.3. Uvularity dissimilation

Dissimilation for uvularity – i.e. for the uvular vs. velar distinction among dorsals – is unattested. This type of dissimilation would appear as alternations like /q...q/ → [q...k], where a sequence of two uvular consonants surfaces as one uvular and one velar. In my survey, I have found no languages with dissimilatory patterns of this type, even as marginal examples or with only local, segment-adjacent dissimilation.

9.7.4.4. Laterality dissimilation in non-liquids

Lateral dissimilation is well attested among liquid consonants, but not among non-liquids. While lateral fricatives and affricates are not rare crosslinguistically, I found no cases where they show dissimilatory alternations for [+lateral] (e.g. /ɮ...tɬ/ → [ɮ...tʃ]). Only one language, Jibbāli, is reported to have dissimilatory restrictions on lateral obstruents (Walsh-Dickey 1997:57), has static restrictions involving both the lateral sonorant [l] and lateral obstruents.

9.7.4.4.1. Jibbāli

Jibbāli (Johnstone is a Modern South Arabian Semitic language, and has three lateral consonants: two fricatives [ɬ ɮ] and a sonorant [l].[60] The dissimilation generalization reported by Walsh-Dickey (1997:57) is that while different laterals freely co-occur, a root may not contain two identical laterals.

The generalization reported for Jibbāli is spurious, however. A search through Johnstone's (1981) dictionary turns up numerous roots containing two identical lateral consonants. While some of these roots can be seen as reduplicated forms (e.g. fully reduplicated roots like /ɬlɬl/ 'move slowly', as well as possible final reduplications like /fɬɬ/ 'squirting everywhere'), others plainly are not reduplicated. These include forms with two laterals that are non-adjacent radicals (92), and quadrilateral roots with two identical final radicals (93). Tri-consonantal roots with two identical final laterals could be interpreted as copying of an underlyingly bi-consonantal root to fill out the basic 3-consonant template, (e.g. following McCarthy 1979); however, this does not hold for roots that already have 3 consonants like those in (93). As such, I see no reason to think that the two identical final laterals in (93) should be regarded as copies of the same consonant - the template conditions are already satisfied without copying.

[60] In at least some Jibbāli dialects, the voiced lateral fricative [ɮ] is in complementary distribution with [l], appearing only next to high vowels (Al Aghbari 2011; see also Johnstone 1975, 1980).

(92) Jibbāli: non-reduplicated roots with two identical laterals (Johnstone 1981)
  a. lhlʕ ‘carefully’
  b. sˤlwl ‘ravine’

(93) Jibbāli: 4-Consonant roots with identical final laterals: (Johnstone 1981)[61]
  a. dħll
  b. dk’ll
  c. gmll
  d. hbll
  e. ħɮˤll
  f. sˤwll
  g. zħll

Thus, the generalization that Jibbāli prohibits all co-occurrences of identical laterals does not actually hold. Jibbāli is therefore not an actual case of [+lateral] dissimilation.

What the Jibbāli data possibly might be evidence for is voicing agreement among the lateral fricatives, though this rests on a particular interpretation of the data. My search of Johnstone (1981) turned up no roots containing both of the lateral fricatives. Both of the lateral fricatives may co-occur with the lateral sonorant [l], but not with each other – there are no roots like [ɬmɮ] or [ɮɬɬ], etc. This is illustrated by the examples in (94)[62].

(94) Jibbāli: co-occurrence of non-identical laterals

a.	✓ɬ ~ l	ɬll, ɬltˤ, ɬml, ɬwl, ɬxl, ɬlɬl
b.	✓ɮ ~ l	ħɮˤll, ɮl, ɮfl, ɮbl, ɮlʔ, ɮwl
c.	*ɬ ~ ɮ	(unattested; *ɮmɬ, *ɬɮɮ, *hɮɬɬ, etc.)

The gap in the lexicon in (94c) is not consistent with the reported dissimilation pattern. There are two possible explanations for it. The more interesting possibility is

[61] Johnstone (1981) does not give glosses for roots themselves, only forms derived from them. As such, no glosses are given here.

[62] Incidentally, Johnstone’s lexicon contains no examples of the opposite order from (94a,b): there are no roots that have /l/ as the first consonant, and also contain a following /ɬ/ or /ɮ/. I do not know if this is a meaningful generalization or simply an accidental gap in the data available.

that this gap represents a real prohibition against voiced and voiceless lateral obstruents in the same root. This would be a case of agreement among laterals: the observation is that a root may not contain lateral fricatives that disagree in voicing. The alternative is that the gap in (94c) may be accidental – a coincidence likely due to the low frequency of homorganic consonant co-occurrence throughout the Semitic languages (Greenberg 1950) (and perhaps amplified by the relatively low frequency of lateral fricatives in general).

9.7.4.4.2. Recap: Why [±lateral] dissimilation is "unattested"

As shown above, the lateral dissimilation reported in Jibbāli is not an accurate characterization of the pattern. This case is spurious, not even marginal.

I found only one other possible candidate for [±lateral] dissimilation in obstruents, Shangzhai Horpa (Sun 2007), but it is strictly segment-adjacent dissimilation, and thus outside the scope of the survey. The pattern is that /s/ alternates with the lateral fricative [ɬ] in clusters with another sibilant. This could be interpreted as local dissimilation of [–lateral], but it is a marginal case. First, the pattern is not robust: only one morpheme exhibits this alternation. Second, [±lateral] is not necessarily the crucial difference between [s] & [ɬ].

9.7.4.5. Coronal minor place features

This section considers dissimilation of the "minor place" features and manner features associated with [Coronal] non-liquids (liquids are discussed in §9.7.5). These features consist of [±anterior], which distinguishes dentals and alveolars from palatals and retroflexes; [±distributed] which separates palatals and dentals from alveolars and palatals from retroflexes; and [±sibilant] ([±strident]), which distinguishes the sibilant stops and affricates {s z ʂ ʐ ʃ ʒ t͡s d͡z t͡ʂ d͡ʐ t͡ʃ d͡ʒ} from other coronal obstruents.

Long-distance dissimilation is not attested for any of the coronal minor place features. That is, there are no attested patterns of dissimilation for retroflexion, palatality, dentality, or sibilance.

9.7.4.5.1. Sibilant dissimilation

I have found no cases of productive sibilant dissimilation – cases where sibilants systematically alternate with non-sibilants in a dissimilatory way. The two closest approximations of this type of pattern are presented below; they come from Hungarian and Turkish. Both involve alternations between sibilants and non-sibilants; but, both also appear to be morphologically based. Sibilant dissimilation may also have occurred as a diachronic change in Zan languages, but does not hold as a synchronic pattern.

9.7.4.5.1.1. Hungarian - sibilant dissimilation?

In Hungarian (Paster 2006:41-42)[63], second-person singular agreement is typically marked on present tense verbs by the suffix [-s]; however, after stems that end in a sibilant, we find [-El] instead (where E is a harmonizing mid vowel). This is illustrated in (95).

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[63] Paster attributes this generalization to Kenesei, Vago & Fenyvesi (1997) & Rounds (2001); the examples in (95) she attributes to Abondolo (1988:102). I have not consulted these sources.

(95) Hungarian suppletive morphological sibilant dissimilation (Paster 2006:42)

a.	vaːr-s	'you wait'	(2nd sg. suffix is sibilant /-s/)
	ɲom-s	'you press'	
	rak-s	'you place'	
	mond-a-s	'you say'	
b.	vonz-ol	'you attract'	(*vonz-s; suffix is [-Vl] after sibilants)
	edz-el	'you train'	(*edz-s)
	hajhaːs-ol	'you seek'	(*hajhaːs-s)
	føːz-ol	'you cook'	(*føːz-s)

This is not actually dissimilation of sibilance. While it does involve a sibilant vs. non-sibilant alternation ([s]~[l]), and it is induced by the presence of another sibilant, it is clearly morphological in nature. This is based on two main observations noted by Paster (2006:42). First, the alternation involves more than just a difference on [±sibilant]: the "dissimilated" allomorph [-El] has a vowel that isn't there in its usual [-s] counterpart. Second, it is not a general phonological pattern: Hungarian does have sibilant-sibilant clusters elsewhere, and does *not* exhibit this dissimilation except in this particular suffix.

So, the Hungarian pattern is not a bona fide case of long-distance sibilant dissimilation.

9.7.4.5.1.2. Turkish - Sibilant dissimilation?

The other possible – though marginal – example of synchronic dissimilation comes from Turkish (Yu 1999; see also Wedel 1999), where combinations of sibilants are avoided in fixed-segment reduplication.[64] Turkish has a process of emphatic reduplication which copies the initial (C)V portion of an adjectival root, and inserts an

[64] The same pattern also occurs in Adiyaman Kurmanji, a Kurdish language spoken in Adiyaman in eastern Turkey, and the generalizations about sibilants appear to be the same (I thank Ümit Atlamaz, p.c., for informing me of this).

extra consonant; Yu terms this consonant the ‘linker’. This linker consonant varies: it may be {p m s r}, and is not consistently predictable based on the consonants of the base. Some examples are given in (96). The dissimilation generalization is that the one sibilant linker consonant [-s-] never appears with bases that contain another sibilant. This is shown in (97): the bases in (97b-e) all contain sibilants, and their reduplicated forms may have any of the linker consonants *except for* [-s-].

(96) Turkish: emphatic reduplication inserts a linker consonant {p m s r} (Yu 1999:4)

	Base		Reduplication		
a.	deɹin	‘profound’	de-p-deɹin	‘extremely profound’	(-p- as linker)
b.	dʒɯlk	‘rotten’	dʒɯ-m-dʒɯlk	‘extremely rotten’	(-m- as linker)
c.	belli	‘obvious’	be-s-belli	‘unmistakably obvious’	(-s- as linker)
d.	sefil	‘miserable’	se-r-sefil	‘very miserable’	(-r- as linker)

(97) Turkish: linker -s- doesn’t occur if the base contains a sibilant (Yu 1999:4)

a.	dʒaʋlak	‘naked’	dʒa-s-dʒaʋlak	‘totally naked’	(no root sibilant, ✓-s-)
b.	zor	‘difficult’	zo-p-zor	‘very difficult’	(*zo-s-zor)
c.	buɹuʃuk	‘wrinkled’	bu-m-buɹuʃuk	‘very wrinked’	(*bu-s-buɹuʃuk)
d.	temiz	‘clean’	te-r-temiz	‘spotlessly clean’	(*te-s-temiz)
e.	eski	‘ancient’	e-p-eski	‘very ancient’	(*e-s-eski)

This appears to be a dissimilatory prohibition against the co-occurrence of sibilants; however, there are good reasons to think this is a morphological pattern and not a genuine example of phonological dissimilation. First, like the Hungarian case above, this is a pattern limited to this one morpheme – Turkish has multiple affixes with sibilants, but sibilant dissimilation effects are not reported except in this emphatic reduplication. Second, the dissimilatory effect is not a predictable alternation: bases containing sibilants may not have [-s-] as their linker consonant, but they *may* have *any* of the other three possibilities, as seen in (97b-e) above. Third, the sibilant dissimilation pattern is not the only restriction imposed on the linker (Yu 1999:5)[65]: it may not be the same as the first consonant of the base, may not be the same as the last consonant of the base, and it gradiently avoids similarity with all consonants of the base. All of these observations suggest that the determination of the linker consonant is morphological in nature; it may be (partially) phonologically conditioned, but it is not the same phenomenon as other cases of long-distance dissimilation considered here.

9.7.4.5.1.3. Dissimilatory de-affrication in Zan languages

Strident dissimilation is reported diachronically in the Zan languages Mingrelian (a.k.a. Megrelian) & Laz, by Gudava (1964). This report does not appear to be a genuine case of productive synchronic dissimilation.

The dissimilatory observation is that proto-Zan voiced strident affricates *dz and *dʒ have changed to [d] in Mingrelian/Laz only in words containing a later strident affricate *ts or *tʃ. Gudava's (1964:502-503) examples are given in (98).

(98) Zan: Diachronic dissimilatory de-affrication: *dZ...tS > d...tS [66]

a.	*d͡ʒimt͡ʃ'k'u	> dimt͡ʃ'k'u	'ant'
b.	*d͡ʒint͡ʃ'k'id͡ʒ-	> dint͡ʃ'k'id͡ʒ-	'nettles'
c.	*d͡ʒirt͡ʃe	> dirt͡ʃe	(type of plant)
d.	*d͡ʒat͡ʃ'v-	> dat͡ʃ'v-	'chain'
e.	*d͡zit͡sxir-	> dit͡sxir-	'blood'
f.	*d͡zot͡sxu	> dut͡sxu	'linden'
g.	*d͡zit͡s-	> dit͡s-	'(to) laugh'
h.	*d͡zat͡ʃxur-	> dat͡ʃxur-/dat͡ʃxir-	'fire'

[65] Yu attributes these generalizations to Demirican (1989), a source which I have not consulted here.
[66] My thanks to Vera Gor for her assistance in translating the glosses for these forms from Russian.

The change in (98) could be interpreted as dissimilation of stridency, or continuancy: [d͡ž d͡ʒ] are both strident affricates, while [d] is neither. However, neither strident dissimilation nor continuant dissimilation holds as a synchronic generalization in Mingrelian, as the data in (99) shows. The forms in (a) & (b) show that the language does allow words where voiced strident affricates co-occur with another strident affricate. These words may even have the same combinations that underwent de-affrication diachronically: compare (98f) *[d͡žot͡sxu] vs. (99a) [d͡žit͡sa]. The voiced strident affricates can also occur synchronically before non-strident continuants (c-e), and before sibilants (f-k). The same is true of the voiceless strident affricates (l-m).

(99) Mingrelian: strident de-affrication isn't synchronic (data from Harris 1991)

a.	d͡žit͡sa	'laugh/Nom'
b.	o-rd͡ʒgin-an-t͡s-ə	'he outdoes him'
c.	d͡ʒoɣorepi	'dogs-Nom'
d.	mard͡žɣvani	'right side'
e.	d͡žɣabi-k	'girl-Nar'
f.	t'orond͡ʒ-i-s	'dove-Dat'
g.	d͡ʒa-ʃ-i-ʃ	'wood-Gen-Emph-Gen'
h.	d͡ʒar-sə	'grief-Dat'
i.	va-d͡ʒer-s	'Neg-believe-3.sg.subj'
j.	d͡ʒma-sə	'brother-Dat'
k.	ud͡ʒguʃ	'good'
l.	t͡ʃ'q'ant͡ʃ'q'ua	'crush'
m.	birt͡sxa-ʃ	'fingernail-Gen'

Based on the Mingrelian data in (99), I do not consider the historical de-affrication in (98) to reflect a valid case of dissimilation. This is a purely diachronic change, and it doesn't appear to correspond to a synchronically real restriction on strident affricates.

9.7.4.6. Pharyngealization dissimilation?

By pharyngealization, I mean consonants that have a Labial, Coronal, or Dorsal primary place of articulation, but with a secondary pharyngeal articulations. A canonical example is the "emphatic" consonants found throughout many varieties of Arabic, and in other Semitic languages (see Hoberman 1989, McCarthy 1994, a.o.).

Pharyngealization dissimilation is considered unattested: the survey found very few potential cases, and none are clearly synchronic, long-distance, consonant-to-consonant patterns. None of the potential cases involve productive alternations; the dissimilatory effects are evident only as historical changes or static restrictions. Furthermore, all of them are languages with strictly local spreading of pharyngealization to both consonants and vowels; this makes them dubious as genuinely long-distance consonant interactions. The relevant languages are discussed below in more detail.

9.7.4.6.1. Kurmanji (Kurdish)?

The best evidence of synchronic dissimilation of pharyngealization is found in Kurmanji Kurdish, an Indo-Iranian language. The generalization noted in previous work is a static dissimilatory restriction: roots may contain at most one of the 'emphatic' (≈pharyngealized) consonants (Kahn 1976; see also Hoberman 1989, McCarthy 1994). The synchronic reality of this restriction is evident in borrowings from Iraqi Arabic, where source words with two emphatics have one reduced to its non-pharyngealized counterpart (Kahn 1976:314).

(100) Kurmanji Kurdish: only one emphatic consonant retained in Arabic loanwords

a.	Ar. quːtˤijja	> qoti	*qotˤi	'box'
b.	Ar. sˤuħbat	> sibħæt	*sˤibħæt	'conversation'

The Kurdish pattern is marginal as a case of long-distance pharyngealization dissimilation: the reduction seen in Arabic loanwords in (100) is evidence for a dissimilatory effect, but not one that holds between non-adjacent consonants. In Iraqi Arabic, pharyngealization spreads from emphatic consonants to adjacent segments, affecting both consonants and vowels, and may spread across multiple segments (Erwin 1963:36). As such, the intervening segments in forms like (100) are not inert, they are also pharyngealized: this means the pharyngealization dissimilation is an interaction between adjacent segments, and not a long distance one.[67]

9.7.4.6.2. Other cases of pharyngealization dissimilation

Patterns similar to the Kurdish one are reported in Palestinian Arabic (Davis 1995:480) and Maltese Arabic (Walter 2006), but these cases are similarly marginal. The generalization, in both of these varieties, is that emphatic fricatives in Classical Arabic lost their pharyngealization before a historical uvular. This seems to be a dissimilatory effect, but it is only evident from diachronic changes. Moreover, both varieties have local spreading of emphasis, so they exhibit the same confound as Kurdish. Pharyngealization dissimilation is also reported in Jewish Koy Sanjaq variety of Neo-Aramaic (Mutzafi 2004:27), but appears to be a sporadic diachronic change only. Moses-Columbia (Nxa'amxcin) Salish is also reported to have a static restriction that

[67] This also fits with Kahn's (1976:314) observation that certain Arabic loanwords have pharyngealization, with unstable position, e.g. [tˤas]~[tasˤ] 'metal cup'. This variation suggests that the entire word is phonetically pharyngealized; there is no evidence of pharyngealized consonants interacting across intervening, non-pharyngealized, segments.

prohibits velars, uvulars, pharyngeals and pharyngealized coronals after a pharyngeal consonant (Bessel & Czaykowska-Higgins 1992, 1993:43), though this restriction is not clearly a long-distance interaction.

Dissimilation of emphatic consonants is also reported diachronically in Akkadian (Caplice & Snell 1988, Fallon 2002). However, as Fallon (2002) points out, the emphatic consonants of Akkadian are thought to be phonetically ejectives, rather than obstruents with secondary pharyngealization. As such, I consider them [+constricted glottis], and this case is on the same order as other cases of [+cg] dissimilation noted in §9.7.3.3.1 above.

9.7.5 Liquid features

Dissimilation among liquids is very robustly attested (previously noted by Walsh-Dickey 1997, Suzuki 1998, Hansson 2001:5, Bye 2011, among many others). Most commonly, liquid dissimilation involves alternations between one liquid and another (e.g. r~l) - typically between a rhotic and a lateral. However, other patterns are also attested, such as dissimilation of one rhotic to another (non-lateral) rhotic, as in Yindjibarndi. And, in some languages, liquid dissimilation yields a non-liquid consonant instead (Kənni, Yimas).

It is worth noting that dissimilation of liquids is common in sporadic historical changes (Lloret 1997, Proctor 2009); these are ignored here. For example, English *colonel* is pronounced [kɹ̩nl̩] (author's variety); presumably this is due to dissimilation of the first "l" (cf. *[kl̩nl̩]) somewhere along the line, historically. But, this dissimilation is clearly not a systematic pattern (cf. other words with [l...l] like *colonial, lily, ladleful, liminal,* etc.). Such cases of historical dissimilation are potentially interesting, and definitely informative on the matter of whether dissimilation is in any way connected to phonetics (cf. Ohala 1981). But, they are not clearly input-output mappings produced by a single grammar, and therefore are well outside the scope of this investigation.

It is quite common for languages to have two liquid consonants, one that is "R-like", and one that is "L-like" (e.g. English, German, Greek, Latin, Sundanese, etc.). In this situation, the featural specifications of each liquid often cannot be fully determined based on the liquids alone: an R/L distinction could potentially be viewed in terms of any of the features [±lateral], [±rhotic], [±retroflex], [±distributed], [±continuant], or various combinations thereof – all of these possibilities would be descriptively sufficient. Consequently, it is often impossible to determine precisely which features are crucial in liquid dissimilation. For example, a dissimilatory alternation like /l…l/→[r…l] could be dissimilation "for" [+lateral], or [−rhotic], or [−retroflex], or [+distributed], or [−continuant], etc.

From the standpoint of the theory, this boils down to the question of precisely which Corr constraint requires correspondence between the two /l/s. Since dissimilation entails escape from the scope of a Corr constraint, the relevant Corr constraint must be one that requires L~L correspondence, but not L~R correspondence. Thus the crucial Corr constraint must refer to at least some feature that R & L differ on. This space of possibilities can in principle be narrowed down more, but only for languages with more than 2 liquids.

In light of this descriptive confound, dissimilation involving liquids is treated separately from other features. The most "typical" sort of liquid dissimilation involves dissimilation of rhotics (as coronal approximants, taps, or trills) to laterals (coronal approximants), or vice versa. Both of these patterns are attested.

From the perspective of a primarily descriptive analysis, it is often not necessary to pull apart the features [±rhotic] and [±lateral] - in a language with one rhotic and one lateral, the distinction between them can be understood as either [+rhotic] vs. [–rhotic], or as [–lateral] vs. [+lateral]. For this reason, [±lateral] dissimilation in liquids is treated separately from [±lateral] in other (non-liquid) consonants.

9.7.5.1. R-dissimilation ([+rhotic]/[–lateral])

Dissimilation among liquids for [+rhotic] ([–lateral]) is very robustly attested. Patterns of R→L dissimilation are found in various Kartvelian languages, including Georgian (Fallon 1993; see also ch. 8), Mingrelian (Harris 1991), Svan (Tuite 1997); Manambu (Aikhenvald 2008:56); and Sundanese (Cohn 1992; see also ch. 4). Dissimilatory blocking effects, whereby other alternations fail to produce sequences of R…R, are also found in Latin (Walsh-Dickey 1997; see also Cser 2007/2010), and Yidiny (Dixon 1977:99).[68]

9.7.5.2. L-dissimilation([+lateral]/[–rhotic])

Dissimilation among liquids for [+lateral] ([–rhotic]) is moderately attested. Patterns of overt L→R dissimilation are found in Latin (Steriade 1987, a.o.), Kuman (Walsh-Dickey 1997, Lynch 1983), and Sabzevari Persian (Kambuziya et al. 2009:70), and as blocking effects in Yidiny (Dixon 1977).

[68] Modern Greek is often cited as another example of rhotic dissimilation (Walsh-Dickey 1997, Suzuki 1998, Fukuzawa 1999, Bye 2011, a.o.), but this unfounded. As far as I can tell, Greek does not exhibit any productive synchronic R~L alternations of this sort, and Manolessou & Toufexis (2008:303) observe that less than 1% of the lexicon shows any evidence for rhotic dissimilation even as a diachronic change.

9.7.5.3. Dissimilation among rhotics

There are also a small number of cases where one rhotic dissimilates to another rhotic, rather than to a lateral. These cases of dissimilation involve alternations among the [+rhotic] consonants, but for some other feature like [±anterior] or [±retroflex] - whatever is responsible for distinctions among different rhotic liquids.

9.7.5.3.1. Yindjibarndi

Yindjibarndi (Wordick 1982) exhibits dissimilation from one rhotic to another rhotic: that is, dissimilation happens *among* the [+rhotic] liquids, *for* the [±anterior] (but not *for* [+rhotic]).

Yindjibarndi has two rhotic consonants: /r/ (which varies freely between a tap and a trill) and /ɻ/ (a retroflex approximant). Wordick (1982:12) describes the distinction between the two rhotics as an apical vs. retroflex contrast (which runs parallel to a distinction observed in stops, nasals, and laterals). I interpret this contrast as a distinction for the feature [±anterior]: the alveolar rhotic /r/ is [+anterior], while the retroflex rhotic /ɻ/ is [–anterior].

Both of Yindjibarndi's rhotics are subject to parallel co-occurrence restrictions, stated in (101) below.

(101) Yindjibarndi rhotic co-occurrence restrictions (Wordick 1982:13-14)
  a. *rVr, for heteromorphemic sequences only
  b. *ɻVɻ, generally

Wordick's (1982:13-14) description of the situation explicitly characterizes it as an active process of dissimilation: "The restrictions on the occurrence of the two rhotics, *r* [=ɻ] and *rr*, [=r] are quite interesting, being of the co-occurrence type...If the sequence [ɻV] occurs first, and a second syllable containing a rhotic plus vowel follows, then the second rhotic will be [r]...The situation with respect to [rVr] is similar except that the alternation restriction only applies, if a morpheme boundary comes between the two syllables."

The *rVr constraint is illustrated by the data below. The examples in (102) show inchoative verbalizer suffix /-ri/ normally surfaces with the alveolar rhotic [r]. However, after roots ending in /...rV/, the suffix appears instead with the retroflex rhotic [ɻ] (103).

(102) Yindjibarndi inchoative verbalizer suffix /-ri/: (Wordick 1982:87)

a. kutapa ‘short’
kutapa-ri ‘shrink’

b. warkamu- ‘work’
warkamu-ri ‘be working’

c. jiriɻi ‘sick’
jiriɻi-ri ‘get sick’

d. wanka ‘alive’
wanka-ri ‘come alive’

(103) Yindjibarndi suffix /-ri/ undergoes /rV-r/→[rV-ɻ] dissimilation: (Wordick 1982:87)

a. wanara ‘long’
wanara-ɻi ‘get long’

b. ɲucuwiri ‘soft’
ɲucuwiri-ɻi ‘get soft’

c. parawara ‘shiver’
parawara-ɻi ‘shiver (v.)’

d. jiʈiɲkara ‘lined up’
jiʈiɲkara-ɻi ‘line up (v.)’

The *[ɻVɻ] restriction is observed as a static pattern: Wordick (1982:14) reports that this sequence is absent in the lexicon (though [ɻVr], the expected output of dissimilation, does occur). Yindjibarndi does not appear to have any productive suffixes with /-ɻV/, but Wordick does note a number of "contentless" suffixes, where apparent alternations can be seen. The lexical doublets in (104) suggest the existence of a suffix /-ɻa/, with the retroflex rhotic.

(104) Yindjibarndi "contentless" suffix /-ɻa/ (Wordick 1982:124-125)

a. kakuḷi 'species of milkweed'
kakuḷi-ɻa (no other gloss given)

b. kaɳʈa 'tear (drop)'
kaɳʈa-ɻa 'cloud'

c. maʈuɣuni 'Martuyhunira' (name of a language)
maʈuɣuni-ɻa (no other gloss given)

Wordick's grammar contains no examples of this /-ɻa/ suffix after roots ending in /...ɻ(V)/. There is, however, another "contentless" suffix [-ra], which *does* occur after roots containing /ɻ/ (105)[69]. This is consistent with the dissimilation of /ɻ/ to [r] that Wordick describes.

(105) Apparent /ɻVɻ/ → [ɻVr] dissimilation: (Wordick 1982:124-125)

a. kuɻa 'spiderflower'
kuɻa-ra 'native mesquite'

b. maɻa 'hand'
maɻa-ra 'index finger'

Thus, Yindjibarndi is a language in which "rhotic dissimilation" is dissimilation of both [+anterior] and [–anterior], but only among rhotics. In other words, the dissimilation

[69] Note that the contentless suffix /-ra/ does *not* occur exclusively after roots with /ɻ/, as shown by words like [paʈura] 'plain turkey' (cf. [paʈu] 'feather') and [campura] 'left-handed implement' (cf. [campu] 'left (hand)').

turns one rhotic into the other (and vice versa), leaving the underlying [+rhotic] specifications of both liquids intact.

9.7.5.3.2. Warlpiri

Warlpiri (Nash 1980) is another potential case of dissimilation within the class of [+rhotic] consonants, but not *for* the feature [+rhotic]. Warlpiri has three rhotics: an apical alveolar flap [ɾ], a retroflex (apico-domal) flap [ɽ], and a retroflex approximant [ɻ]. The relevant generalization (Nash 1980:76) is that a CVC sequence may not contain two identical rhotic consonants. This holds as a static lexical restriction, but is observable in remnants of diachronic change (Nash 1980:77, Laughren 1978:15, f.n. 7): a suffix /-ɾa/ which forms directional terms appears as [-ɻa] in the word [kakaɾa-ɻa] 'east' where the root ends in [...ɾV], but appears as [-ɾa] elsewhere (cf. [jatiɟa-ɾa] 'north'). This can be interpreted as evidence that an older form of Warlpiri may have had synchronic dissimilation, with /ɾVɾ/ surfacing as [ɾVɻ]. This dissimilation would have occurred among rhotic consonants, but crucially would be dissimilation for some other feature, e.g. [+anterior], and not [+rhotic].

Warlpiri is a marginal case of dissimilation, though, since the dissimilatory effect is not productive synchronically. Nash notes two exceptions to the lexical restriction: [juɾuɾu] 'big pile of firewood stacked up to make sufficient coals to cook big game', and [kuɻaɻa] '(species of) prickly hardwood'. He also observes that no dissimilation occurs synchronically when the clitic /-ɾa/ 'forth' follows a stem ending in /...ɾV/, e.g. [muɟumuɟu-ɟaɾi-ɾa] 'spread out (of creek)' (with [...ɾV-ɾV], not *[...ɾV-ɻV]). This morpheme is identical in form and extremely close in meaning to the formative /-ɾa/, the only morpheme that shows the diachronic dissimilation noted above. These facts suggest that if an ancestor of modern Warlpiri did have synchronic dissimilation of /ɾVɾ/ it was limited and/or sporadic in nature.

9.7.5.4. Dissimilation of [+liquid]

Dissimilation in liquids can also lead to alternations between a liquid and another, non-liquid consonant – a pattern characterizable as dissimilation for [+liquid]. Active dissimilation of this sort is attested in Kɔnni (Cahill 2007), and possibly also Yimas (Foley 1991). Reconstructions of Proto-Indo-European suggest comparable liquid dissimilation as a static pattern (Cooper 2009:59).

9.7.5.4.1. Kɔnni

Kɔnni (Cahill 2007) exhibits dissimilation for the feature [+liquid]. Kɔnni has two liquid consonants: an alveolar tap or flap [ɾ] (transcribed in Cahill's examples as <r>), and a lateral approximant [l][70]. Kɔnni has two synchronically active affixes that show visible, dissimilatory, alternations: an agentive suffix /- rU/ (<U> represents a high, back vowel that harmonizes for ATR), and a suffix /-raaŋ/ meaning 'male'. In both cases, the alternation is between a liquid and a stop, not between two liquids. And, in both cases, the dissimilatory alternation is observed in the context of both of the liquids, /r/ *and* /l/. These generalizations, together with facts Cahill (2007) observes about static co-occurrence patterns, mean that Kɔnni's dissimilation is not about the features [±rhotic] or [±lateral], but both at once - i.e. the class of [+liquid] consonants.

[70] Cahill does not explicitly state that Kɔnni <l> is [l], but this seems like the most obvious realization given his choice of transcription. Moreover, the waveform he gives (p. 101) for the word [balɪsɪ] shows that <l> is clearly an approximant (and not, e.g. a lateral flap).

Kɔnni has an agentive suffix /-rU/. This suffix normally surfaces with [r], as illustrated by the examples in (106).

(106) Kɔnni agentive suffix /-rU/: (Cahill 2007:144)[71]

a.	gù-gùù-rú	'burier'
b.	tɪ̀-tàà-rʊ́	'shooter, thrower'
c.	dì-dìgì-rú	'cook'
d.	gàà-rʊ́	'thief (deceiver)'
e.	wʊ-wɔ̀sɪ̀-rʊ́	'greeter'
f.	mɪ̀-mɪ̀-rʊ̀	'builder'
g.	bʊ́ntʊ̀ʊ̀-ɲɪ̀ɪ̀-rʊ́	'hoodless cobra (lit. toad-swallower)'

The agentive suffix /-rU/ also has a second allomorph, [-tU], with a stop [t] instead of the liquid [r]. This allomorph appears when the preceding syllable contains [r] (107), or [l] (108).

(107) Kɔnni suffix /-rU/ dissimilates to [-tU] after /r/: (Cahill 2007:145)

a.	fɪ̀-fààrɪ́-tʊ́	'groomsman (lit. marrier)'
b.	bʊ̀-bʊ̀rɪ̀-tʊ́	'sower'
c.	bìm-vààrɪ́-tʊ́	'feces collecter'
d.	gbɪ̀-gbàrɪ̀-tʊ́	'watcher'

(108) Kɔnni /-rU/ dissimilates to [-tU] after /l/: (Cahill 2007:145)

a.	bɪ̀-bàlɪ̀-tʊ́	'talker'[72]
b.	jʊ̀-jʊ̀àlɪ̀-tʊ́	'climber'
c.	mʊ̀-mʊ̀lɪ̀-tʊ́	'announcer'
d.	yàlì-tʊ́	'hunter'

The generalization evident from these forms is that suffixal /r/ surfaces as [t] after a syllable-adjacent [+liquid] consonant, whether that liquid is a lateral or a rhotic. Since

[71] NB: Kɔnni data is presented here as in the same practical orthography that Cahill presents it in. <j> is used for [dʒ], <y> for [j], and <r> for [ɾ].

[72] Cahill (2007:145) gives this word as <bɪ̀-bàlɪ̀-ʊ́>. I assume this is a misprint, since it is presented explicitly as an example of where the agentive suffix appears as [-tʊ] instead of [-rʊ].

the interaction is between two liquids, and involves mapping a [+liquid] consonant to a [–liquid] one, this is necessarily dissimilation for the feature [+liquid].[73]

Kɔnni also has a suffix /-raaŋ/ 'male' that also shows dissimilation from /r/ to a stop. This suffix normally surfaces with an [r] (109); however, when there is an [r] in the preceding syllable, it appears as [-daaŋ] instead (110). When the preceding syllable contains [l], the same /r/~[d] dissimilation occurs, albeit variably (111) (at least in the speech of Cahill's consultant[74].

(109) Kɔnni suffix /-raaŋ/ 'male': (Cahill 2007:147)

a.	dù-ràáŋ	'male horse'
b.	zùù-ràáŋ	'male vulture'
c.	ná-↓rááŋ	'male cow'
d.	dàkʊ́á-rááŋ	'male parrot'
e.	kpá-↓rááŋ	'male guinea fowl'

(110) Kɔnni suffix /-raaŋ/ dissimilates to [-daaŋ] after /r/: (Cahill 2007:147)

a.	ŋmárí-dá↓áŋ	'male dove'	(*ŋmárí-rá↓áŋ)
b.	gàɲìàrà-dàáŋ	'male weaver-bird'	

(111) Kɔnni suffix /-raaŋ/ variably dissimilates after /l/: (Cahill 2007:147)

a.	kùlì-dàáŋ ~ kùlì-ràáŋ	'male tortoise'
b.	gáán↓lù-dàáŋ ~ gáán↓lù-ràáŋ	'male cat'
c.	jʊ̀là-dàáŋ ~ jʊ̀là-ràáŋ	'male whydah'

[73] Cahill (2007:145) also notes two other circumstances where the agentive suffix surfaces with its [-tU] allomorph. The first is after a segment-adjacent [n] (ex: [dì-dààn-tʊ́] 'forgetter', from root /daaN/). Cahill suggests this is post-nasal hardening, and notes that [Nr] sequences never occur in the language. The [-tU] allomorph also occurs optionally when following a syllable-adjacent underlying /ŋ/ (ex: [pì-pàŋì-rʊ́] ~ [pì-pàŋì-tʊ́] 'borrower'); there is little to be said about this, and other nasals do not behave in this way.

[74] Cahill (2007:147): "When the final consonant of the noun is [l], my language consultant pronounced both"; it is not clear if this is typical or not, or which option should be viewed as canonical here. Note that the [-daaŋ] form of the 'male' suffix also occurs after a segment-adjacent /n/: bɔ̀n-dàáŋ 'male donkey' (Cahill 2007:147). This can be understood as post-nasal hardening of the same kind as the agentive suffix noted above.

Cahill also notes two static co-occurrence generalizations that are consistent with Kɔnni's liquid dissimilation process. First, there are no CVC sequences of the form [lVr], [rVl], or [rVr] in the lexicon (Cahill 2007:85)[75]. Second, besides the two suffixes discussed above, Kɔnni has a third affix with /r/, which systematically fails to give rise to Liquid-V-Liquid sequences. The definite singular marker for noun class 1 is a suffix /-rI/; Cahill (2007:147) notes that this noun class contains no nouns ending in [...rV], though other classes do contain nouns of this shape.

To recap: Kɔnno shows overt dissimilation, with [r]~[t] and [r]~[d] alternations - the segment dissimilating is a liquid, and the result is a non-liquid (a stop). Since this dissimilation is induced not only by [r] but also by [l], the crucial feature involved in triggering dissimilation must be [+liquid], and cannot be simply [+rhotic] or [+lateral].

9.7.5.4.2. Yimas

Yimas (Foley 1991) exhibits dissimilation where liquids systematically dissimilate to non-liquids, a pattern interpretable as dissimilation for the feature [+liquid] itself (rather than any of the sub-features of liquids, like [±rhotic] or [±lateral]).

Yimas has two liquid consonants. One is an apical liquid, transcribed by Foley (1991:40) as <r>, which varies (more or less freely) between a lateral approximant [l] and an alveolar tap [ɾ]. The other liquid, transcribed as <l>, is a palatalized lateral approximant realized variably as [ʎ] or [l^{j}]. Odden (1994:316-317) suggests that both liquids should be considered [+lateral]; this seems reasonable to me, but I will follow Foley's convention of representing them as ⟨r⟩ & ⟨l⟩ for simplicity.

[75] Cahill's summary of co-occurrence combinations lists lVl as possible, but there are no productive affixes containing /l/. I have found only one example in Cahill's grammar of an [lVl] sequence, the word [bàllílí] 'children (def. pl.)', which Cahill notes is an irregularly inflected form.

Foley (1991:53) notes that “Yimas does not permit two liquids to appear in adjacent syllables separated only by a vowel. If this is to be the case, the second becomes *t*.” This /r/~[t] alternation is observed in several suffixes (112)-(114), and in partial reduplication (115)-(116) (reduplicant & base underlined in these examples).

(112) Yimas /r/ to [t] dissimilation in inchoative suffix /-ara/: (Foley 1991:244)

a.	pak-ara-	‘break up, open’	(suffix /-ara/)
b.	apr-ata-	‘open, spread’	(dissimilation: /rVr/→[rVt]; *[apr-ara])

(113) Yimas /r/ to [t] dissimilation in perfective suffix /-r/: (Foley 1991:244, 310)

a. /kra-r-akn/ → [kratakn] (*[krarakn]; /rVr/ → [rVt])
cut-perf-3sg dat
‘(I) cut (his hair)’

b. nam p-ka-kan-ŋa-r-akn (/r/ otherwise)
skin 7sg t-1sgA-COM-pierce-BEN-PERF-3sg D
‘I pierced the skin for him’

(114) Yimas /r/ to [t] dissimilation in nominalizing suffix /-ru/:

a. /tu-ru-awt/ → [turawt] (suffix has [r] typically)
kill-Nmlz-M Sg
‘killer’

b. /ira-ru-awt/ → [iratawt][76] (*[irarawt]; dissimilation)[77]
cry-Nmlz-M Sg
‘cry baby’

(115) Yimas iterative partial reduplication in roots: (Foley 1991:53-54)

a.	tɨ<u>pa</u>ŋ-	tɨ<u>papa</u>ŋ-	‘bathe’
b.	apan-	apapan-	‘spear’
c.	arpal-	arpapal-	‘go out’

[76] Foley (1991:426) also gives examples of another surface form for this word, [iracawt]. It is not clear from the available data whether this is due to some sort of variation, or something else. But, notably, even this alternate form has the underlying liquid /r/ dissimilated to a stop, rather than another liquid.

[77] The disappearance of the /u/ in the Yimas nominalizing suffix /-ru/ is typical for suffixes containing /u/ in general, part of a consistent pattern that Foley (1991:63) describes with a rule of unstressed /u/ deletion.

(116) Yimas /r/ to [t] dissimilation in partial reduplication: (Foley 1991:53-54)

a.	iray-	iratay-	‘cry’	(cf. *[iraray])
b.	wark-	waratɨk	‘make’	
c.	park-	paratɨk	‘cut up’	
d.	yara-	yarata-	‘pick up’	

In all of the cases shown above, the underlying liquid /r/ dissimilates not to the other liquid /l/, but instead to a voiceless stop [t].

Yimas also exhibits a similar liquid ~ [t] alternation with the palatal liquid [l^j] (transcribed as /l/, following Foley’s conventions). Alternations can be seen in the same partial reduplication pattern shown in (116) above. Somewhat surprisingly, the reduplicated /lVl/ sequences surface not as [lVt], but rather as [rVt], with the apical liquid instead of the palatal one. This is shown in (117) below.

(117) Yimas /l/ to [t] dissimilation in partial reduplication: (Foley 1991:54)

a.	tal-	tarat-	‘hold’
b.	mul-	murɨt-	‘run’
c.	wul-	wurɨt-	‘put down’

The appearance of /r/ instead of /l/ here is unexpected, and most likely has something to do with the fact that Yimas’s palatal /l/ developed historically from **ri* sequences[78].

The behavior of underlying /rVl/ or /lVr/ sequences in Yimas is unclear. Dissimilation is expected in this case, and would prove that the crucial shared feature is [+liquid] (not [+lateral] or [+rhotic], e.g.). However, such sequences are exceedingly rare for independent reasons: roots never begin with /r/ or /l/ or end with /...lV/, relatively few morphemes contain these consonants, many of the morphological combinations that would yield /rVl/ or /lVr/ sequences are ruled out by

[78] Thus, the reduplicated form *tarat-* presumably comes from a historical form **tarari*; where dissimilation to [rVt] would be normal.

morphosyntactic restrictions (e.g. gender agreement), and systematic fortition of /r/ in word-final and pre-nasal contexts causes /r/ to frequently surface as [t], even independently of any dissimilation. I was able to find only one example in Foley's (1991) grammar of a CVC configuration containing both liquids: the word [na-n-tal-iray] '(he) made (him) cry'. Here, dissimilation appears to fail, but the significance of this data point is wildly open to interpretation: none of the observed contexts where dissimilation occurs involve prefixes, and the morpheme involved, the causative prefix /tal-/~/tar-/ varies (in some contexts freely) between /r/ & /l/ in any case. Consequently, it's not clear what the correct generalization is: it could be that dissimilation happens only to identical liquids, or that dissimilation is limited to roots & suffixes, or that something else is going on in this one data point.

Yimas dissimilation is viewed as dissimilation of [+liquid] because this is the feature that (a) is always shared by the interacting consonants in the input, and (b) always changes in the mapping to the output form.

One might entertain an alternative analysis of Yimas, in which dissimilation happens for the features [+lateral] an [+rhotic] instead of [+liquid]. This does not offer an adequate way to characterize the Yimas pattern. The crucial data comes from the partial reduplication of /l/: when reduplication produces /lVl/ sequences, they surface as [rVt], not *[rVl] or *[lVr]. This shows that Yimas avoids a sequence of *any* two liquids, even liquids of two different types.

9.7.5.4.3. [+liquid] dissimilation recap

Dissimilation of [+liquid] is deemed moderately attested. The case in Kɔnni is a clear example. The cases in Yimas and Proto-Indo-European are less clear, but it nonetheless confirms that the Kɔnni pattern is not a mere fluke.

9.8. Conclusion

In this chapter, I've presented my typological findings, compiled from a large and comprehensive cross-linguistic survey of consonant dissimilation patterns. The typology presented in §9.3 is based on a sample of 148 potential long-distance dissimilation cases, and informed by 102 other reported dissimilatory patterns not judged to be real cases of long-distance synchronic dissimilation – a survey I believe to be the largest empirical study of cross-linguistic dissimilation done to date. The main conclusions drawn from this survey are summarized in (118) below.

(118) Main typological findings

a. *The typology of dissimilation is unexpectedly limited, and asymmetrical*
Many types of dissimilation are not robustly attested, but are not completely missing from the typology, and the interpretation of these cases is unclear. Further investigations are worthwhile to determine which gaps are coincidental, and which are meaningful.

b. *For structural factors, the mismatch prediction is clearly borne out*
All of the structural limiter constraints posited in chapter 2 are supported based on both harmony and dissimilation.

c. *For features, the mismatch prediction is borne out less clearly*
Some predicted types of dissimilation occur, others don't. Some counter-predicted types are indeed unattested, but not all. Many predictions are difficult to assess because the data is unclear. Overall

d. *The Match hypothesis is wrong: dissimilation is not the reverse of assimilation*
The predictions made by the Mismatch property of the SCTD are more accurate than those made by the intuitive alternative – the Match hypothesis. There are significant disparities between harmony and dissimilation. While not all of the mismatch predictions are borne out, it is a more accurate characterization of the harmony ~ dissimilation relationship than the match alternative. The two phenomena are intuitively similar, but empirically are quite different.

e. *Segment-adjacent & long-distance dissimilation aren't the same*
There is an intuitive expectation that long-distance dissimilation is the same thing as local dissimilation, just applied across intervening segments. This expectation appears to be off the mark: the typology of long-distance dissimilation isn't the same as the typology of segment-adjacent dissimilation (though further comparisons between them are certainly warranted).

f. *Dissimilation is not about markedness*
Some theories approach dissimilation using general markedness constraints (Alderete 1996, 1997; Itô & Mester 1996, 1998). These also make the wrong typological predictions.

These results support the surface correspondence theory of dissimilation developed and applied in this dissertation. Further study of the typological database (see appendix) presents numerous opportunities for future work on dissimilation, and its relation to other phenomena.

Chapter 10
Concluding Remarks

10.1. Summary of proposal

In this dissertation, I have proposed the Surface Correspondence Theory of Dissimilation (SCTD), applied it to analyze specific cases of dissimilation in a variety of languages, and explored its broader theoretical and typological consequences.

The SCTD derives dissimilation from the same surface correspondence relation posited for long-distance consonant harmony (Walker 2000a, 2000b, 2001; Hansson 2001/2010, 2007; Rose & Walker 2004). The theory is based on a novel and more precise formalization of the surface correspondence relation, introduced in chapter 2, as an equivalence relation – a relation that partitions the surface consonants into correspondence classes. Representing surface correspondence in this way has welcome results, both empirically and conceptually. On a conceptual level, it restricts the space of correspondence possibilities, and structures the candidate set into coherent classes. From an empirical standpoint, it also makes a clear prediction: if there are multiple correspondence-driven processes in the same language, all of them must derive from the same correspondence structure. Thus, harmony and dissimilation are not totally orthogonal to each other – constraints on surface correspondence cut across both types of patterns. This prediction is borne out in languages like Kinyarwanda (ch. 3) and Sundanese (ch. 4), as well as in cross-linguistic comparisons, as in Cuzco Quechua & Obolo (ch. 5).

In the SCTD, dissimilation arises from the interaction of two constraint types: CORR constraints, and CC·Limiter constraints. A CORR constraint makes demands of similar consonants: it requires that if consonants are similar in a specified respect, and are in the same domain, they must be in surface correspondence with each other. A CC·Limiter constraint makes demands of correspondents: it requires that if consonants correspond with each other, then they also satisfy some further condition. Together, these two types of constraints disfavor similar consonants that occur under a certain set of conditions. This outcome emerges because a CC·Limiter constraint can prohibit having correspondence between similar consonants, while a CORR constraint also prohibits *non*-correspondence between them. Dissimilation satisfies both of these demands, by changing similar consonants that would be required to correspond into less similar ones that are acceptable non-correspondents.

In the SCTD, dissimilation builds on *non*-correspondence: dissimilated consonants crucially *do not* correspond with each other. Dissimilation occurs as an escape from a correspondence requirement. Dissimilating consonants satisfy a CORR constraint without being in correspondence, by not being similar on the relevant feature. Dissimilation does not happen *via* a correspondence relationship between the interacting consonants; it happens *instead of* that correspondence.

This is an important difference between the SCTD and some other correspondence-based approaches to dissimilation (Roberts 2011, Rose 2011b; see also Krämer 1998). In these theories, dissimilation happens among correspondents, as the result of OCP or anti-identity constraints that operate over the surface correspondence dimension. The SCTD has two distinct differences from these other approaches. First, it does not require a new class of CC·Limiter constraints that require *dis*agreement.

Second, it does not require us to posit surface correspondences between dissimilated segments – an extension of the theory that departs from the fundamental idea that correspondence is based on similarity.

The Surface Correspondence Theory has not been modified in any way to *make* it apply to dissimilation; it *is* a theory of dissimilation by its very nature. Since correspondence is required on the basis of similarity, constraints that penalize correspondence have the effect of favoring dissimilarity. Dissimilation is predicted as a possible outcome of the interaction of CORR constraints, CC·Limiter constraints, and input-output faithfulness. This result falls out whether it is intended or not – proposals that analyze consonant harmony as Agreement By Correspondence (Rose & Walker 2004, Hansson 2001/2010, a.o.) also have consequences for dissimilation. The main conceptual point of this dissertation is not that Surface Correspondence can be adapted or modified to apply to dissimilation; rather, it is that the theory necessarily makes predictions about both dissimilation and harmony in tandem.

The cross-linguistic predictions of the SCTD have been explored in the analyses of Kinyarwanda, Sundanese, Quechua, Obolo, Chol, Ponapean, Zulu, Yidiny, Latin, and Georgian proposed in this dissertation. The dissimilation patterns in 133 languages have been surveyed to evaluate the predictions of the theory from a typological perspective. The survey findings refute the obvious hypothesis that dissimilation and harmony are parallel: the features that undergo long-distance dissimilation are *not* the same features that undergo long-distance assimilation.

The finding that harmony and dissimilation aren't parallel is consistent with the SCTD: the Mismatch property of the theory leads to the prediction that dissimilation and harmony should *not* have matching typologies. Because dissimilation is an escape from correspondence, it is the CORR constraints – the constraints that demand correspondence – that determine which features dissimilate. Therefore, features that undergo dissimilation are predicted to manifest in harmony as the shared features that determine *which consonants must agree*, but not what they must agree for. By the same token, constraints that limit correspondence have the effect of *limiting* harmony, but *favoring* dissimilation. Therefore, the structural factors (domain edges, syllable role differences, etc.) that limit harmony are predicted to *cause* dissimilation, not limit it. Thus, both phenomena are sensitive to the same things, but not in the same ways. Though not all features bear out the Mismatch effect as predicted, the survey findings show that the SCTD's predictions are right more often than wrong, and characterize the typology of dissimilation more accurately than the extant alternatives.

The Mismatched relationship between harmony and dissimilation predicted by the SCTD is considerably different from the matching relationship expected and/or predicted by much previous work (Kent 1936; Mester 1986; Yip 1988, 1989; Shaw 1991; Odden 1994; Alderete 1996, 1997; Krämer 1998, 1999; MacEachern 1999; Nevins 2004; Gallagher 2008, 2010; Jurgec 2010; see also Walker 2000b, 2001; Rose 20111, 2011b; Roberts 2011, a.o.). This difference seems to be an advantage of SCTD: it allows long-distance assimilation & dissimilation to be explained by the same mechanism, without making the wrong prediction that they must be structurally and typologically the same.

10.2. The OCP and anti-similarity constraints

The Surface Correspondence Theory of Dissimilation derives dissimilation from the interaction of constraints on correspondence; it does not posit any constraint that expressly forbids similar consonants. Previous theories of dissimilation have focused heavily on such constraints, particularly the OCP; the surface correspondence theory obviates the need for them. I have shown in the preceding chapters that a variety of dissimilation patterns can be derived from constraints that are independently motivated by consonant harmony, and that these constraints offer detailed explanations of dissimilation patterns in Kinyarwanda, Sundanese, Cuzco Quechua, Zulu, and Latin.

The SCTD offers some conceptual advantages over OCP and anti-similarity theories of dissimilation. First, it requires less stipulation. In the theory I have proposed here, the constraints that drive dissimilation are the same constraints responsible for consonant harmony: they are not new constraints applicable only to dissimilation. In this way, the SCTD differs from most implementations of the OCP in Optimality Theory, which replace the traditional autosegmental notion of the OCP with segment-level anti-similarity constraints. Second, the SCTD is also a more restrictive theory: it makes a class of falsifiable predictions that aren't made by OCP/anti-similarity approaches. Because harmony and dissimilation are products of the same surface correspondence relation, and the same set of constraints, the SCTD predicts that they can only be related in certain ways. The essence of these predictions is a complementarity between the two phenomena: because harmony is based on correspondence and dissimilation on non-correspondence, factors that support dissimilation inhibit harmony, and vice versa. This Mismatch property of the SCTD leads to specific and investigable predictions for languages that exhibit both harmony and dissimilation, as well as predictions for the cross-linguistic typologies of both phenomena. Anti-similarity theories of dissimilation are less restrictive because they do not make predictions of this nature.

There are also empirical reasons for choosing the SCTD over an OCP-based theory of dissimilation: the surface correspondence theory can explain attested patterns of dissimilation that OCP and anti-similarity approaches do not. These include cross-edge dissimilation, blocking of dissimilation by non-similar segments, and non-blocking by similar intervening segments.

The traditional autosegmental understanding of the OCP predicts that dissimilation is possible only when consonants are adjacent at the melodic level. This means blocking based on intervention on a tier is unavoidable: [+lateral] dissimilation can *never* occur across an intervening consonant with a [–lateral] specification, and vice versa. While some languages do exhibit this kind of blocking (Georgian, and perhaps Latin; see ch. 8), others do not, including Sundanese (see ch. 4, §4.3.1) and some dialects of Svan (see ch. 8, §8.5.6). At the same time, the OCP predicts that dissimilation should *not* be affected by consonants that don't matter for adjacency at the melodic level: [+lateral] dissimilation should never be blocked by intervening consonants that have no representation on the [±lateral] tier. This is the wrong result for Latin (seen in ch. 8), where L-dissimilation may be blocked by intervening labials and velars – consonants that are neither [+lateral] nor [–lateral]. Segmental blocking patterns like these can be explained by the SCTD as shown in chapter 8, but they are problematic for the OCP because they aren't readily characterized in terms of melodic-level adjacency.

While there are non-autosegmental reformulations of the OCP (Alderete 1996, 1997; Itô & Mester 1996, 1998; Suzuki 1998) that don't make the same wrong predictions about blocking, these approaches fail to derive cross-edge dissimilation patterns: they predict that if dissimilation happens across the edge of a domain, then it must also happen within that domain. Redefining the OCP to hold at the segment level reduces it to a class of purely anti-similarity constraints (a point noted by Coetzee & Pater 2006:17). Instead of referring to adjacency at the melodic level, these constraints can be formulated to hold only within a particular locality domain (Alderete 1996, 1997; Itô & Mester 1996, 1998), or only over a specified proximity threshold (Suzuki 1998). The former predicts that dissimilation in a larger domain implies dissimilation in a smaller one; the latter predicts that dissimilation over a given distance implies dissimilation over shorter ones. Neither formulation allows for an OCP-like that penalizes similar segments only when they *aren't* in the same domain, so neither offers a way to characterize cross-edge dissimilation patterns like the ones found in Kinyarwanda (ch. 3) and Zulu (ch. 7).[1]

Finally, it should be noted that the predictions of the SCTD are not a superset of those made by OCP and anti-similarity theories. The OCP predicts dissimilation patterns that the SCTD advanced here does not predict. An example is blocking by tier-based intervention, as noted above. The OCP cannot be characterized as a special case

[1] The traditional autosegmental conception of the OCP *can* produce cross-edge dissimilation, using Itô & Mester's (1994) CRISPEDGE constraints, though it isn't sufficient to explain all cases (see ch. 7, §7.5.3).

of the SCTD, nor vice versa. The choice between the two theories is not simply a conceptual or notational one: they have different consequences, and make different predictions.

10.3. Unresolved issues for future work

10.3.1. Segment-adjacent dissimilation

I have applied the surface correspondence theory to only long-distance dissimilation patterns. This is a limit on the scope of this work, not a limit on the theory itself. Nothing prevents correspondence constraints from applying to consonants that are directly adjacent, and no principle prevents them from producing dissimilation in clusters in the same manner as non-local dissimilation. The analysis of Zulu in chapter 7 considered such a case, in fact: Zulu labial dissimilation happens irrespective of distance, and does apply to clusters in the same way as non-clustered labials in the root.

There is, however, nothing that requires that local dissimilation be explained in the same way as long-distance dissimilation. This is a point of difference between this work and previous cross-linguistic studies of dissimilation, which conflate local and long-distance dissimilation as one phenomenon (Suzuki 1998, Fukazawa 1999, Alderete & Frisch 2007, Bye 2011). The problem with this conflation (pointed out in ch. 9) is that segment-adjacent dissimilation can arise from constraints on consonant clusters which are completely irrelevant for long-distance dissimilation. One of the secondary findings of the typological survey is that local and long-distance dissimilation are not empirically the same: not all attested types of local dissimilation patterns also happen over distance. There may be diagnostics to separate correspondence-driven dissimilation from local dissimilation due to other causes, in much the same way that correspondence-based agreement can be distinguished from local spreading (Rose & Walker 2004, Hansson 2001/2010, 2010b).

The interpretation of segment-adjacent dissimilation also bears on the on the interpretation of some of the data encountered in the typological survey in chapter 9: it might help clarify the status of features that are questionably attested. If segment-adjacent dissimilation requires a different explanation than long-distance dissimilation, it follows that dissimilation is not a homogenous phenomenon. If this is the case, then it's conceivable that whatever mechanism is responsible for local dissimilation might also occur at a distance under the right circumstances. If some of the marginal cases discussed in chapter 9 turn out to follow from the theory of segment-adjacent dissimilation, it would clarify some of the unevenness observed in the typology.

10.3.2. Correspondence Structure when no alternations occur

Positing surface correspondence involves a non-trivial change to GEN; as such, it's reasonable to ask how it bears on languages with no evidence of correspondence-driven patterns. A crucial premise of the theory proposed here is that every candidate has a particular surface correspondence structure. This entails that every winning candidate in every input-output mapping in every language has some correspondence structure. The question is what role this correspondence plays in languages that have neither long-distance dissimilation nor consonant harmony.

A recurring theme in the analyses in the preceding chapters is that correspondence structures are deduced from patterns in the output: dissimilation indicates non-correspondence, while harmony indicates correspondence. When neither of these occurs, there is no basis for positing correspondence or non-correspondence. In cases where potential correspondents surface faithfully, or are otherwise not affected by correspondence-related constraints, this leads to a disjunctive choice between analyses: there can be different grammars that produce the same combinations of output forms, just with different correspondence structures. Correspondence relations are discernable only when they are the basis for some disparity in the input-output mapping.

There is a further point worth noting: the only circumstance where correspondence structure cannot be uniquely determined is when it doesn't affect the input-output mapping – i.e. when it *doesn't matter*. In these situations, the only reason correspondence is under-determined is because there are multiple candidates that have the correct overt segmental form, and differ only in their correspondence structure, and perform equally well on all relevant surface correspondence constraints. Ambiguity between different correspondence structures is not a problem, because it arises only when the choice among those structures is not crucial for obtaining the right output form.

It should be noted that there is not necessarily any situation where the correspondence structure can be determined without alternations. This would be possible if there were some configuration that no CC·Limiter constraint assigned violations to. This ultimately comes down to a question of which constraints are empirically supported – whether or not there exists a structural configuration that allows two consonants to satisfy all the CC·Limiter constraints depends on what the set of CC·Limiter constraints includes. The analyses offered in the preceding chapters suggest that there is no such situation – there is no configuration in which correspondence is not penalized by any constraint, and thus no situations in which dissimilation can never occur. This is because CC·EDGE-(σ) prohibits correspondence between two different syllables, while CC·SROLE prohibits correspondence between different positions within the same syllable. There is no arrangement of consonants that satisfies both of these constraints, so there is no situation where correspondence is completely un-penalized, and non-correspondence is harmonically bounded.

10.3.3. Directionality

Directionality is an unresolved issue in surface correspondence theory. One of the findings of chapter 2 is that the direction of alternations can be affected by multiple constraints. There is no obvious way to build something like a directionality parameter into the theory, since there is no one piece of the theory consistently responsible for determining whether correspondence-based alternations happen from left to right, or from right to left. So, the direction of assimilation and dissimilation in surface correspondence theory is a complex issue, and is not likely to have one straightforward solution. Note that this is not a novel issue in the Surface Correspondence Theory of Dissimilation: directionality is also unexplained in previous OCP & anti-similarity theories of dissimilation.

The reason directionality is not fully explained in the SCTD is because the surface correspondence constraints that drive harmony and dissimilation do not control the directionality of those processes. In other words, the SCorr constraints that cause alternations to happen cannot distinguish between left-to-right and right-to-left directionality. CC·IDENT constraints can favor agreement; in principle, this agreement can be obtained just as well by progressive or regressive assimilation. Similarly, CORR constraints – by working in tandem with CC·Limiter constraints – can favor disagreement. But, they cannot distinguish between right-to-left and left-to-right directionality. This is illustrated in the tableau in (1). The combination of one CORR constraint and one CC·IDENT constraint favors harmony (a)-(b) or dissimilation (c)-(d) over fully faithful candidates (e)-(f). But, neither constraint has any preference between progressive or regressive directionality: (a) & (b) are tied on these constraints, as are (c) & (d).

(1) CORR & CC·LIMITER constraints that drive alternations don't control directionality

Input: /p ... b/		CORR·[Lab]	CC·IDENT-[±voice]	Remarks
☛ a.	b ... b $\mathcal{R}$:{b b}	(0)	(0)	RtoL harmony
☛ b.	p ... p $\mathcal{R}$:{p p}	(0)	(0)	LtoR harmony
☛ c.	k ... b $\mathcal{R}$:{k}{b}	(0)	(0)	RtoL dissimilation
☛ d.	p ... g $\mathcal{R}$:{p}{g}	(0)	(0)	LtoR dissimilation
~ e.	p ... b $\mathcal{R}$:{p b}	e (0~0)	W (0~1)	Faithful, Corr.
~ f.	p ... b $\mathcal{R}$:{p}{b}	W (0~1)	e (0~0)	Faithful, No Corr.

So, directionality of correspondence-driven alternations is not determined by the constraints that drive them. The choice between right-to-left and left-to-right assimilation or dissimilation falls to other constraints.

This stance on directionality is different from the view taken in previous literature on Surface Correspondence. Previous work on Agreement By Correspondence aims to derive the direction of assimilation by building directional biases into either the CC·IDENT constraints (Rose & Walker 2004), or the CORR constraints (Walker 2000b, Hansson 2001/2010). As chapter 2 showed, building directionality conditions into the theory in either of these ways can only restrict the 'triggering' of alternations; it cannot restrict the direction a process 'applies' in. For instance, asymmetric right-to-left correspondence can produce harmony that occurs for consonants in one order and not the other: it can make /t...d/ undergo agreement while /d...t/ does not. But, directional correspondence does not restrict how agreement can be achieved: asymmetries in the CORR constraints cannot make /t...d/ assimilate to [d...d] instead of [t...t].

This has nothing to do with surface correspondence being formalized here as a symmetric relation; it is because agreement and disagreement are both symmetric by nature. Whether correspondence is symmetric or not, agreement can always be achieved by assimilation from right to left, or by assimilation from left to right. The same is true for disagreement and dissimilation. As long as the CORR & CC·IDENT constraints assign violations based on agreement or disagreement between output segments, they cannot in principle force assimilation or dissimilation to happen in one direction over the other. So, directionality in correspondence-driven patterns cannot be fully explained by building directional asymmetries into the core of the SCorr theory.

While the theory advanced here does not offer a comprehensive account of directionality, the theory is by no means silent on this issue: it offers a number of potential ways to analyze directionality. These mechanisms include positional "control", and value dominance, two interactions familiar from other non-correspondence theories of agreement (e.g. Baković 2000). Chapter 2 explored how these interactions arise in correspondence-driven harmony, and the analysis of Obolo nasal harmony in chapter 5 employed them.

The positional control interaction also offers a pathway to strictly directional harmony systems. As chapter 2 pointed out, positional faithfulness constraints lead to positional control effects; positing a positional faithfulness constraint defined relative to correspondence structure allows the control effects to manifest as strict directionality. Thus, CC·ANCHOR-R, a constraint that requires the rightmost member of a correspondence class to surface faithfully (with respect to some feature) can produce harmony systems where agreement is controlled by the rightmost correspondent, and therefore where assimilation happens strictly from right to left. How the SCTD can best be extended to derive the same type of strict directionality in *dissimilation* is a matter that awaits future work.

Appendix: Cross-linguistic Survey of Dissimilation

This appendix is a list of the long-distance dissimilation patterns discovered in the typological survey discussed in chapter 9 (see §9.2.3 for details on survey methodology). References given here are not an exhaustive list of sources. Two dissimilation patterns, 'Meinhof's Rule' (also known as the 'Ganda Law') and Dahl's Law (cf. ch. 3), are found in varying forms across numerous Bantu languages; although some of these are only diachronic changes, I have listed all cases of these patterns together here for consistency. Schematic descriptions are given here only for ease of reference; they do not necessarily reflect all details of each case. Dissimilation patterns that manifest synchronically by affecting other regular patterns or alternations are categorized as 'Similarity avoidance'.

List of long-distance dissimilation patterns found in survey:

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Acehnese	*Austronesian (Malao-Sumbawan)*	Labial dissimilation	Limited alternations	BVB → sVB (labials dissimilate to s)	Zuraw & Lu 2009:210, Durie 1985
Akan	*Kwa*	Coronal dissimilation	Similarity avoidance	k → č/_i, but not before anoter coronal	Suzuki 1998, 1999, McCarthy and Prince 1995, Welmers 1946, Schachter & Fromkin 1968
Akkadian	*Semitic*	Constricted Glottis dissimilation?	Diachronic changes	*C'~C' in roots; reduction of roots with 2 ejectives	Caplice & Snell 1988:83, Fallon 2002
		Labial dissimilation	Alternations	m-...B → n-...B	Barth 1887, Hume 1994, Odden 1994, Lubowicz 2010, Suzuki 1998, Caplice & Snell 1988

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Arabic: Maltese	*Semitic*	Pharyngealization dissimilation?	Diachronic changes	Cˤ > C/_...{Q, Ħ}	Walter 2006
Arabic: Palestinean	*Semitic*	Pharyngealization dissimilation?	Diachronic changes	Sˤ...Qˤ > Sˤ...K	Davis 1995:480
Atayal: Mayrinax	*Austronesian (Atayalic)*	Labial dissimilation?	Limited alternations	infix um+B... → m-... (*B=um=...)	Zuraw & Lu 2009:201
Aymara: Bolivian	*Aymaran*	Constricted Glottis dissimilation? (and Laryngeal harmony?)	MSC	*C'~C' unless homorganic	MacEachern 1999, Gallagher 2010
Aymara: Peruvian	*Aymaran*	Constricted Glottis dissimilation	MSC	*ʔ~C', *C'~C' unless identical	MacEachern 1999:35, Gallagher 2010
		Spread Glottis dissimilation	MSC	*Cʰ~Cʰ in roots, unless identical	MacEachern 1999:35, Gallagher 2010
Bakairi	*Carib (Southern)*	Voiceless dissimilation?	MSC	only 1 non-initial [-voice] C per word	Bye 2011, Wetzels & Mascaro 2001, De Souza 1991
Bardi	*Australian (Nyulnyulan)*	NC dissimilation	Limited alternations	NC.NC → NC.C	Bowern 2004:95
Basque: Zuberoan (Souletin)	*Basque*	Spread Glottis dissimilation	MSC	*Cʰ~Cʰ, *Cʰ~h in roots	MacEachern 1999
Bemba	*Bantu (M)*	NC dissimilation? (Nasal harmony?)	Alternations	NCVNC → NNVNC	Meinhof 1932:184, Kula 2006
Bena	*Bantu (G)*	Voiceless dissimilation	Diachronic changes	kVC[-voice] > ɣVC[-voice] in roots	Nurse 1979:109
Berber: Ayt Ndhir Tamazight	*Berber*	Labial dissimilation	Limited alternations	m-...B → n-...B	Penchoen 1972
Berber: Imdlawn Tashlhiyt	*Berber*	Labial dissimilation	Alternations, MSC	m-...B → n-...B; also *B~B in roots	Elmedlaoui 1995a, 1995b; Suzuki 1998, Lahrouchi 2005
Berber: Tadaksahak	*Songhai*	Labial dissimilation	Alternations	m-...B → n-...B	Christiansen-Bolli 2010, Christiansen & Christiansen 2002
Berber: Tamashek Tuareg	*Berber*	Labial dissimilation	Alternations	m-...B → n-...B	Heath 2005
Bilinara	*Australian (Pama-Nyungan)*	NC dissimilation	Limited alternations	NC...NC→NC...C	McConvell 1988:151
Cantonese	*Chinese (Yue)*	Labial dissimilation	MSC, Limited alternations?	*BVB in syllables; B...B → B...T in redup. (in lg. game)	Yip 1988:82-83

Language	***Family***	***Dissimilation type***	***Manifestation***	***Description of pattern***	***References***
Chaha	*Semitic (Ethiopian)*	Continuancy dissimilation?	Limited alternations	/x/ → k before continuants	Banksira 2000, Kenstowicz & Banksira 1999
Chamorro	*Austronesian (Malayo-Polynesian)*	Sonority dissimilation?	Similarity avoidance (allomorphy)?	/VN/ infixes → [NV-] pfxs before sonorants (optional for some speakers only)	Zuraw & Lu 2009:212, Klein 2005
Chol	*Mayan (Cholan)*	Constricted Glottis dissimilation?	MSC	*C'~C' in roots, unless homorganic (or identical)	Gallagher & Coon 2009, Gallagher 2010, Attinasi 1973
EkeGusii	*Bantu (E)*	Voiceless dissimilation	Alternations?	kVC[-voice] → ɣVC[-voice]	Davy & Nurse 1982, Bickmore 1998
Ekoti/Makhuwa	*Bantu (P)*	Spread Glottis dissimilation	Limited alternations, MSC	C^h…{C^h,h} → C…{C^h,h} (deaspiration)	Schadeberg 1999, 2000; Kisseberth 2003
Embu	*Bantu (E)*	Voiceless dissimilation	Alternations	kVC[-voice] → ɣVC[-voice]	Davy & Nurse 1982
Endo	*Nilotic (Southern)*	Liquid type dissimilation?	Diachronic changes	diachronic liquid changes	Proctor 2009, Larsen 1991
Ganda	*Bantu (J)*	NC dissimilation? (Nasal harmony?)	Limited alternations?	N-CVN(C) → N-NVN(C)	Hyman 2003:51
Georgian	*Caucasian (Kartvelian)*	Rhotic dissimilation	Alternations	r…r → r…l	Fallon 1993, Walsh-Dickey 1997, Aronson 1989
Georgian (old)	*Caucasian (Kartvelian)*	Constricted Glottis dissimilation?	MSC	*C'~C' in roots unless homorganic	MacEachern 1999
Gogo	*Bantu (J)*	Voiceless dissimilation	Diachronic changes	TVT > DVT in roots	Nurse 1979:71
Gojri	*Indo-Aryan*	Spread Glottis dissimilation?	MSC	*C^h~C^h in roots, unless identical	MacEachern 1999
Gooniyandi	*Australian (Bunaban)*	NC dissimilation	Limited alternations	NCVNC → NCVC	Evans 1995, McGregor 1990, Odden 1994
Gurindji	*Australian (Pama-Nyungan)*	NC dissimilation	Alternations	NC…NC→NC…C (sometimes to NC…CC or NC…NN)	Evans 1995, McConvell 1988, Odden 1994
Ha	*Bantu (J)*	Voiceless dissimilation	Alternations	TVT → DVT (voiceless dissim.)	Nurse 1979:17-18, Bastin 2003:514
Harauti	*Indo-Aryan*	Spread Glottis dissimilation	MSC	*C^h~C^h in roots	MacEachern 1999, Allen 1957
Hausa	*Chadic*	Constricted Glottis dissimilation?	MSC	*C'~C' in roots unless identical	Newman 2000, MacEachern 1999, Hansson 2001/2010

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Havu	*Bantu (J)*	Voiceless dissimilation	Alternations	TVT → DVT	Bastin 2003:513
Haya	*Bantu (J)*	Voiceless dissimilation	Diachronic changes	TVT > DVT in roots	Nurse 1979:9
Huave	*Huavean*	Spread Glottis dissimilation?	Limited alternations	deaspiration after {h s ʃ}	Kim 2008:81
Hungarian	*Uralic (Ugric)*	Sibilant dissimilation?	Limited alternations (one suffix)	S…-s → S…-Vl (suppletive)	Paster 2006:40
Iban	*Austronesian (Malayo-Polynesian)*	Continuancy dissimilation?	Diachronic changes	sVs > tVs; dʒVdʒ > dVdʒ; tsVts > tVts; sVts > tVts	Blust 1996, Proctor 2009:28
Jah Hut	*Mon-Khmer (Aslian)*	Rhotic dissimilation	MSC?	*.rVr.	Kruspe 2004:67, f.n., Diffloth 1976
Jahai	*Mon-Khmer (Aslian)*	Rhotic dissimilation	MSC?	*.rVr.	Kruspe 2004:67, f.n., Burenhult 2002
Japanese	*Japonic*	Voicing dissimilation	Similarity avoidance (blocking), MSC	*D~D: MSC in native lexicon, blocks rendaku voicing in compounds	Alderete 1996, 1997, Itô and Mester 1986, 1996, 1998, Kawahara et al. 2006, 2012
Japanese (Old)	*Japonic*	NC dissimilation	MSC, Similarity avoidance?	*NC~NC in roots	Kawahara 2008, Unger 1993; Vance 2005
Jewish Koy Sanjaq	*Semitic (Aramaic)*	Pharyngealization dissimilation?	Diachronic changes	hist: *Cˤ > C / _(V){ħ ʕ}	Mutzafi 2004:27
Judeo-Spanish (Ladino)	*Romance*	Dorsal dissimilation	Limited alternations?	suffix -ikV → -itV after dorsals	Bradley & Travis 2011
Kalkatungu	*Australian (Pama-Nyungan)*	NC dissimilation	Limited alternations	NC…NC → NC…C	Blust 2012:377
Kammu	*Mon-Khmer (Northern)*	Rhotic dissimilation	MSC	*.rVr.	Kruspe 2004:67, f.n., Svantesson 1983:16
Kanakanavu	*Austronesian (Tsouic)*	Labial dissimilation? Nasal dissimilation?	Similarity avoidance (allomorphy)?	infix /um/ appears as prefix [mu-] before roots with initial B or N (*{N,B}=um=…)	Zuraw & Lu 2009:214-215
Kikuria	*Bantu (E)*	Voiceless dissimilation	Alternations?	kVC[-voice] → ɣVC[-voice]; optional across intervening kV	Bennett 1967, Davy and Nurse 1982, Odden 1994
Kikuyu	*Bantu (E)*	Voiceless dissimilation	Alternations?	(kV)kVC[-voice] → (ɣV)ɣVC[-voice]	Bennett 1957, Armstrong 1967, Davy and Nurse 1982
		NC dissimilation? (Nasal harmony?)	Limited alternations?	N-rVN(C) → NVN(C)	Piggott 1994, Armstrong 1967

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Kinyarwanda	*Bantu (J)*	Voiceless dissimilation	Alternations	TVT → DVT (voiceless dissim.)	Kimenyi 1978, 1979; Davy & Nurse 1982
Kiput	*Austronesian (Malayo-Polynesian)*	Continuancy dissimilation?	Diachronic changes (few examples)	SVS > tVS	Blust 2002
Kirundi	*Bantu (J)*	Voiceless dissimilation	Limited alternations	TVT → DVT (voiceless dissim.)	Hyman 2003; Meussen 1959:42, Davy & Nurse 1982
Kɪɪya	*Bantu (F)*	Voiceless dissimilation	Limited alternations?	kVC[-voice] → ɣVC[-voice]	Nurse 1979:46
Kɔnni	*Gur*	Liquid dissimilation	Limited alternations, MSC	*LVL; LVL→LVt	Struijke & de Lacy 2000, Cahill 2007
Kuman	*Trans-New Guinea (Chimbu-Wahgi)*	Lateral dissimilation?	Limited alternations	ɫVɫ → ɾVɫ	Walsh-Dickey 1997:144, Lynch 1983, Trefry 1969
Kurmanji	*Indo-Iranian (Iranian)*	Pharyngealization dissimilation?	MSC	*Ħ~Ħ in roots	Kahn 1976, Hoberman 1989, McCarthy 1994:61
Kwanyama	*Bantu (R)*	NC dissimilation	Gradient MSC?	NCVNC > NCVC	Schadeberg 1987, Hyman 2003
Lamba	*Bantu (M)*	NC dissimilation? (Nasal harmony?)	Limited alternations	N-CVNC → NVNC	Piggott 1994, Doke 1938:22, Herbert 1977
Latin	*Romance*	Lateral dissimilation	Limited alternations	lVl → lVr (maybe l...l → l...r?)	Walsh-Dickey 1997, Steriade 1987, Cser 2007/2010, Hurch 1991
Limos Kalinga	*Austronesian (Malayo-Polynesian)*	Labial dissimilation	Limited alternations	B=-um-=... → K=-um-=...	Zuraw & Lu 2009
Linngithigh	*Australian (Pama-Nyungan)*	NC dissimilation?	Diachronic changes	NVNCV > NVCV (obscured by later change to ØCV)	Blust 2012:377
Lugulu	*Bantu (G)*	Voiceless dissimilation	Diachronic changes (sporadic?)	TVT > DVT (voiceless dissim.)	Nurse 1979:79
Lumasaaba	*Bantu (J)*	NC dissimilation? (Nasal harmony?)	Limited alternations	N-CVN(C) → NØVN(C)	Piggott 1994, Herbert 1977:340
Luyia/Luhya	*Bantu (J)*	Voiceless dissimilation	diachronic change MSC?	kVC[-voice] > gVC[-voice]	Bennett 1967
Manambu	*Sepik*	Rhotic dissimilation	Limited alternations	rVr# → rVl#	Aikhenvald 2008:56
Mayali	*Australian (Gunwingguan)*	Labial & Dorsal dissimilation?	Similarity avoidance	PVŋV, KVŋV reduplicate as CV[n]V (*ŋ...ŋ)	Evans 1995:758
Meitei	*Tibeto-Burman*	Spread Glottis dissimilation	Limited alternations	$C^h...C^h \rightarrow C^h...C$	Vijayakrishnan 1999, Chelliah 1997
Meru (Chuka)	*Bantu (E)*	Voiceless dissimilation	Alternations?	kVC[-voice] → gVC[-voice]	Davy & Nurse 1982

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Meru (Imenti)	*Bantu (E)*	Voiceless dissimilation	Alternations?	kVC[-voice] → gVC[-voice]	Davy & Nurse 1982
Mingrelian	*Caucasian (Kartvelian)*	Sibilant dissimilation? Continuancy dissimilation?	Diachronic changes	*dz,dʒ > d / _...ts,tʃ	Gamkrelidze & Mačavariani 1982, Gudava 1964
Mingrelian	*Caucasian (Kartvelian)*	Rhotic dissimilation	Alternations	r...r → r...l	Harris 1991
Minor Mlabri	*Mon-Khmer (Khmuic)*	Voiceless dissimilation	Limited alternations	pa-C[-voice] → ba-C[-voice]	Rischel 1995:90
Mokilese	*Austronesian (Oceanic)*	Labio-velar harmony	MSC	*Pw~P in roots	McCarthy 1989:79, Mester 1986
Mori Bawah	*Austronesian (Malayo-Polynesian)*	NC dissimilation	Alternations, similarity avoidance?	NTVNT → NVNT	Blust 2012
Moro	*Kordofanian*	Voiceless dissimilation	Alternations, MSC?	TVT → DVT; TVT rare in roots unless identical	Rose 2011b
Mudbura	*Australian (Pama-Nyungan)*	NC dissimilation	Limited alternations	NC...NC→NC...C	McConvell 1988:152
Muna	*Austronesian (Malayo-Polynesian)*	NC dissimilation	Limited alternations, MSC	*NC~NC in roots	Coetzee & Pater 2006:17, Zuraw & Lu 2009, van den Berg 1989
		Labial dissimilation?	Limited alternations, Similarity avoidance (allomorphy)	um-B... → m... or Ø-B... (*B=um=...)	Zuraw & Lu 2009:205, van den Berg 1989:32-35
Murut: Timugon	*Austronesian (Malayo-Polynesian)*	NC dissimilation	Limited alternations, MSC?	*NC...NC; → N...NC	Prentice 1971, Coetzee & Pater 2006, Blust 2012
Murut: Timugon (cont)	*Austronesian (Malayo-Polynesian)*	Labial dissimilation?	Similarity avoidance (allomorphy)	um-B... → m... (*B=um=...)	Zuraw & Lu 2009:201, Prentice 1971:130
Mwimbi	*Bantu (E)*	Voiceless dissimilation	Alternations	kVC[-voice] → gVC[-voice]	Bennett 1967
Ndebele	*Bantu (S - Nguni)*	Labial dissimilation	Limited alternations	B...-w → J...-w (labial palatalization)	Sibanda 2004
Ngaju Dayak	*Austronesian (Greater Barito)*	NC dissimilation	Limited alternations?	NCVNC → NVNC	Blust 2012
		Continuancy dissimilation?	Diachronic changes (sporadic?)	sVs > tVs (?)	Blust 1996, Bye 2011

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Nhanda	*Australian (Pama-Nyungan)*	NC dissimilation	Limited alternations?	NCVNC → NCVC	Blevins 2001:32-33, Blust 2012
Ni'ihau Hawai'ian	*Austronesian (Oceanic)*	Coronal dissimilation (and Dorsal dissimilation?)	Diachronic changes, Similarity avoidance (loan adaptation)?	tVt > kVt (and/or kVk > kVt?)	Blust 2004
Nyamwezi	*Bantu (F)*	Voiceless dissimilation	Diachronic changes	TVT > DVT (voiceless dissim.)	Bennett 1967, Meinhof 1915:67, 1932:181, Nurse 1979:57
Ofo	*Souian (Southeastern)*	Spread Glottis dissimilation	Limited alternations	$*C^hVC^h$; → CVC^h	De Reuse 1981:244, MacEachern 1999
Paiwan: Ljaljawran	*Austronesian (Paiwan)*	Labial dissimilation	Limited alternations	/=əm=/-B… → B=ən=…	Lee 2011, Chen 2006:93
Paiwan: other (various)	*Austronesian (Paiwan)*	Labial dissimilation	Limited alternations	/=əm=/-B… → B=ən=…	Zuraw & Lu 2009:212; Chen 2006:93; Ho 1977, 1987
Paiwan: Tjuabar	*Austronesian (Paiwan)*	Labial dissimilation	Limited alternations	/=əm=/-B… → B-ən-…; also əm-CəB → C=ən=(ə)B	Zuraw & Lu 2009:211
Palauan	*Austronesian (Malayo-Polynesian)*	Continuancy dissimilation? (Labial dissimilation?)	Limited alternations	m-B → w-B; or → {o, u_=B}	Zuraw & Lu 2009:205, Lubowicz 2010, Suzuki 1998
Persian: Sabzevari	*Indo-Iranian (Iranian)*	Lateral dissimilation	Alternations?	lVl → lVr	Kambuziya et al 2009:70
Phuthi	*Bantu (S - Sotho-Tswana)*	Labial dissimilation	Limited alternations	B…-w → J…-w (optional over distance)	Donnelly 2007
Proto-Indo-European	*Indo-European*	Voicing dissimilation?	MSC	*DVD in roots	Cooper 2009
		Liquid dissimilation	MSC	*LVL in roots	Cooper 2009
Quechua: Bolivian	*Quechuan*	Constricted Glottis dissimilation	MSC	*C'~C' in roots	Gallagher 2010, Carenko 1975
		Spread Glottis dissimilation	MSC	$*C^h{\sim}C^h$ in roots	Gallagher 2010, Carenko 1975
Quechua: Cuzco	*Quechuan*	Constricted Glottis dissimilation	Similarity avoidance, MSC	*C’~C’ in roots; alternations in epenthetic C (ʔ~h)	Parker & Weber 1996, Parker 1997, Rowe 1950, Carenko 1975
		Spread Glottis dissimilation	MSC	$*C^h{\sim}C^h$, $*h{\sim}C^h$ in roots	Parker & Weber 1996, Parker 1997, Rowe 1950, Carenko 1975, MacEachern 1999

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Salish: Moses-Columbia	*Salishan*	Constricted Glottis dissimilation	Limited alternations	C’-RED → C(')VC' (optional deglottalization in redup.)	Fallon 2002:213, Thompson & Thompson 1985:140
Salish: Okanagan	*Salishan*	Constricted Glottis dissimilation	Limited alternations	C’...C’ → C...C’ in reduplication	Thompson & Thompson 1985:138
Salish: Shuswap	*Salishan*	Constricted Glottis dissimilation	Limited alternations	C’...C’ → C...C’ in reduplication	Fallon 2002:206, Thompson & Thompson 1985, MacEachern 1999
Salish: Tillamook	*Salishan*	Constricted Glottis dissimilation	Limited alternations	C’...C’ → C...C’ in reduplication	Fallon 2002:214
Sanskrit	*Indo-Aryan*	Spread Glottis dissimilation	Alternations, MSC?	$C^hVC^h \rightarrow CVC^h$	Anderson 1970, MacEachern 1999
Semelai	*Mon-Khmer (Aslian)*	Rhotic dissimilation	Limited alternations, Similarity avoidance	*.rVr., *_r.(C)Vr.	Kruspe 2004:67
Seri	*Isolate*	Glottal stop dissimilation	Limited alternations	ʔVʔ → ʔVØ (in syllable?)	Marlett and Stemberger 1983
Shambala	*Bantu (G)*	Voiceless dissimilation	Diachronic changes	TVT > DVT (voiceless dissim., sporadic?)	Nurse 1979:93
Shi	*Bantu (J)*	Voiceless dissimilation	Limited alternations	TVT → DVT (voiceless dissim.)	Bastin 2003:513
Spanish: Colombian	*Romance*	Coronal dissimilation	Limited alternations, Similarity avoidance?	diminutive -ito → -iko after t (and variably after s?)	de Ramirez 1996:27, Garcia et al. 2004:288
Sre	*Mon-Khmer (Eastern)*	Rhotic dissimilation	MSC?	*.rVr.	Kruspe 2004:67, f.n., Manley 1972
Sundanese	*Austronesian (Malao-Sumbawan)*	Rhotic dissimilation	Limited alternations	r...r → l...r (simplified; see ch. 4)	Cohn 1992, Holton 1995, Suzuki 1998, Eringa 1949
Svan	*Caucasian (Kartvelian)*	Rhotic dissimilation	Limited alternations	r...r → r...l	Tuite 1997
Swati	*Bantu (S - Nguni)*	Labial dissimilation	Limited alternations	B...-w → J...-w	Chen & Malambe 1998, Malambe 2006
Tagalog	*Austronesian (Philippine)*	Labial and nasal dissimilation?	Similarity avoidance (allomorphy?)	Paradigm gap: *m=um=-...	Zuraw & Lu 2009:199, Orgun & Sprouse 1999
Tahitian	*Austronesian (Oceanic)*	Coronal dissimilation	Alternations	tVt → kVt (in fast speech)	Blust 2004
		Labial dissimilation	Limited alternations (one affix)	f...B → h...B	Paster 2006:39
Takelma	*Penutian*	Nasal dissimilation	Limited alternations	n...-m, n...-n → l...-m; also m...-n → m...-l	Goodman 1992, Sapir 1912, Lee 1994

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Takelma (cont)	*Penutian*	Coronal dissimilation	Limited alternations	n...-n → l...-m (*l...-n)	Goodman 1992, Sapir 1912, Lee 1994
Thao	*Austronesian (Formosan, Northern)*	Labial dissimilation?	Similarity avoidance (allomorphy)	*B=um=...; various fixes	Zuraw & Lu 2009, Lu 2008, 2011
Tharaka	*Bantu (E)*	Voiceless dissimilation	Alternations	TVT → DVT (voiceless dissim.)	Bennett 1967
Tigre	*Semitic (Ethiopian)*	Guttural dissimilation	Similarity avoidance (allomorphy), MSC	*ĦVĦ in roots; paradigm gaps w/ ĦV- pfxs	Rose 2000a, Raz 1983
Tigrinya	*Semitic (Ethiopian)*	Guttural dissimilation	MSC	*ĦVĦ in roots	Rose 2000a, Raz 1983
Toba Batak	*Austronesian (Malayo-Polynesian)*	Labial dissimilation? Nasal dissimilation?	Similarity avoidance (allomorphy)	*{B,N}=um=...; infix /um/ is prefix before initial B or N, and /m/ assimilates fully	Zuraw & Lu 2009:213, Klein 2005
Turkish	*Turkic*	Sibilant dissimilation?	Similarity avoidance	s.S avoidance in reduplication	Yu 1999, Wedel 1999
Tzeltal	*Mayan (Tzeltalan)*	Constricted Glottis dissimilation?	MSC?	*C'~C' in roots, unless homorganic	Kaufman 1971, Suzuki 1999
Tzutujil	*Mayan (Quichean)*	Constricted Glottis dissimilation?	MSC	*C'~C' in roots, unless homorganic	Dayley 1985, MacEachern 1999
		Backness dissimilation?	Diachronic changes, MSC?	Historical *KVK > K^{j}VK	Ohala 1993, Campbell 1977
Umbundu	*Bantu (R)*	NC dissimilation? (Nasal harmony?)	Limited alternations?	NCVNV → NVNV	Kula 2006, Schadeberg 1982
Warlpiri	*Turkic*	Rhotic type dissimilation	Diachronic changes, MSC	*RVR (if ident)	Walsh-Dickey 1997:92, Nash 1980, Laughren 1978
Western Bade	*Chadic*	Voicing dissimilation	Alternations, MSC	DVDV → TVDV (?)	Schuh 1977, 1997, 2002
Xhosa	*Bantu (S - Nguni)*	Labial dissimilation	Limited alternations	B...-w → J...-w	Vondrasek 2001; Anderson 1992:45-46, Doke 1954
Xiamen	*Chinese (Min nan)*	Nasal dissimilation?	Diachronic changes, MSC	*NṼN; confounded with V nasality	Lien 1998
		Labial dissimilation	MSC	*BVB in syllables	Lien 1998
Yao (ChiYao)	*Bantu (P)*	NC dissimilation	Limited alternations?	N-dVNC → N-ØVNC	Hyman 2003:52

Language	*Family*	*Dissimilation type*	*Manifestation*	*Description of pattern*	*References*
Yidiny	*Australian (Pama-Nyungan)*	Lateral dissimilation (and Rhotic dissimilation?)	Limited alternations, Similarity avoidance	l…l→r…l dissimilation blocked after {r,ɻ}; also ɻ.l→r.l	Crowhurst and Hewitt 1995, Dixon 1977, Steriade 1995, Walsh-Dickey 1997
Yimas	*Sepik*	Liquid dissimilation	Alternations	rVr → rVt; lVl → rVt too	Foley 1991, Walsh-Dickey 1997, Odden 1994, Bye 2011
Yindjibarndi	*Australian (Pama-Nyungan)*	Rhotic type dissimilation	Alternations?	ɹVɹ → ɹVɾ; ɾV–ɾ → ɾV–ɹ	Wordick 1982:13, Suzuki 1998
		NC dissimilation	Alternations	NCV(C)NC→NCV(C)C	Odden 1994, Wordick 1982
Yucatec	*Mayan (Yucatecan)*	Constricted Glottis dissimilation?	MSC (Identity effects)	*C'~C' unless identical; *C'~C when homorganic	Yip 1989, Lombardi 1990, McCarthy 1989, Straight 1976
Zalamo	*Bantu (G)*	Voiceless dissimilation	Diachronic changes	TVT > DVT (voiceless dissim.)	Nurse 1979:85
Zulu	*Bantu (S - Nguni)*	Laryngeal harmony?	Limited alternations	Labial palatalization	Doke 1926, 1927, 1954

Cases excluded from survey

The patterns listed below were identified in the survey, but are judged not to be genuine examples of long-distance dissimilation: they include cases of segment adjacent dissimilation, gradient similarity avoidance, and patterns that do not seem to be dissimilatory in nature. I have not attempted to catalog cases of this sort in a systematic way, and references listed here are not exhaustive.

Language	*Family*	*Dissimilation type*	*Reason excluded*	*References*
Acehnese	*Austronesian (Malao-Sumbawan)*	Continuancy dissimilation?	not dissim.	Durie 1985:34
		Nasal harmony?	not dissim., segadj?	Durie 1985:35
Ainu	*Isolate*	Rhotic dissimilation?	segadj	Shibatani 1990:13
Alur	*Nilotic (Southern)*	Dental harmony	not dissim.	Tucker 1969:126, Mester 1986
Apache (various)	*Athapaskan*	Anteriority harmony	not dissim.	McCarthy 1988:104, Hansson 2001/2010
Arabana	*Australian (Pama-Nyungan)*	Continuancy dissimilation?	not dissim.	Hercus 1972, 1994; McManus, p.c.

Language	***Family***	***Dissimilation type***	***Reason excluded***	***References***
Arabic: (general)	*Semitic*	Gradient similarity avoidance	gradient	Greenberg 1950, Padgett 1991, Yip 1989, Pierrehumbert 1993, Frisch et al. 2004
		Pharyngealization dissimilation?	gradient	Ohala 1981:190, Lehn 1963
Arabic: Classical	*Semitic*	Anterior dissimilation?	not dissim.	Greenberg 1950:175
Arabic: Moroccan	*Semitic*	Labialization dissimilation	segadj	Elmedlaoui 1995a, 1995b
Armenian: Agulis	*Armenian*	Rhotic type dissimilation?	segadj, not dissim.	Vaux 1998b:184
Armenian: Classical	*Armenian*	Voicing dissimilation?	segadj	Vaux 1998b:222
Armenian: New Julfa	*Armenian*	Laryngeal harmony	not dissim.	Vaux 1998:215-216
Bari	*Nilotic (Eastern)*	Labialization dissimilation?	not dissim.	Cahill 2008, Owen 1908
Basque (general)	*Basque*	Continuancy dissimilation?	segadj	Fukazawa 1999, Hualde 1991:134
Bengali	*Indo-Aryan*	Gradient similarity avoidance	gradient	Kahn 2007
Berber: Imdlawn Tashlhiyt	*Berber*	Labialization dissimilation	segadj, not C-to-C	Elmedlaoui 1995a, 1995b; Selkirk 1993
Berber: Kabyle (=Taqbaylit)	*Berber*	Labial dissimilation?	spurious	Lahrouchi 2005, Selkirk 1993:18
Bukawa	*Austronesian (Oceanic)*	Voicing dissimilation?	not dissim.	Ross 1993, 1995
Caddo	*Caddoan*	Glottal stop dissimilation?	segadj	Paster 2006:42
Cambodian	*Mon-Khmer (Khmer)*	Place dissimilation?	segadj	Yip 1989, Suzuki 1998
ChiMwiini	*Bantu (J)*	Liquid type dissimilation? (liquid type harmony?)	not dissim.	Hansson 2001/2010; Kisseberth & Abasheikh 1975, 2004
Chontal	*Mayan (Cholan)*	Voicing dissimilation? Spread Glottis dissimilation?	segadj	Bye 2011:19, Suzuki 1998, Maddieson et al 2009, Waterhouse 1962
Chukchi	*Chukotko-Kamchatkan*	Nasal dissimilation?	segadj	Odden 1987, 1994
Chumash: Barbareño	*Chumash*	Anterior dissimilation	segadj	Beeler 1970, Mithun 1998
Chumash: Ineseño	*Chumash*	Anterior dissimilation	segadj	Applegate 1972, Harrington 1974
Chumash: Obispeño	*Chumash*	Anterior dissimilation? Coronal dissimilation?	segadj	Klar 1977
Chumash: Ventureño	*Chumash*	Anterior dissimilation	segadj	Harrington 1974, Mamet 2008
Dakota	*Souian (Central)*	Coronal dissimilation?	segadj	Shaw 1980, 1985
Dyirbal	*Australian (Pama-Nyungan)*	Rhotic dissimilation? Lateral dissimilation?	not dissim.	Dixon 1972:289-290
Efaté	*Austronesian (Oceanic)*	Obstruent dissimilation?	spurious?	Churchill 1909, Lynch 2000, Tieberger 2006
Ekoti/Makhuwa	*Bantu (P)*	Anteriority harmony	not dissim.	Schadeberg 1999, 2000; Kisseberth 2003
Finnish	*Uralic (Finnic)*	Length dissimilation?	not dissim.	Suzuki 1998, Bye 2011

Language	***Family***	***Dissimilation type***	***Reason excluded***	***References***
Georgian	*Caucasian (Kartvelian)*	Labialization dissimilation?	segadj	Butskhrikidze & Van de Weijer 2001, Butskhrikidze 2002, Howe 2003
German: Imst (Southern)	*Germanic*	Liquid dissimilation?	segadj	Hall 2009
German: standard	*Germanic*	Anteriority dissimilation?	not dissim.	Wiese 1996:268, Alber 2001
Gothic	*Germanic*	Voicing dissimilation?	spurious	Thurneysen 1897, Chomsky and Halle 1968, Flickinger 1981
Greek (general)	*Greek*	Rhotic dissimilation?	not dissim.	Walsh-Dickey 1997, Manolessou & Toxefix 2008, Suzuki 1998
Greek: Modern	*Greek*	Continuancy dissimilation?	segadj, not dissim.	Kaisse 1989, Suzuki 1998
Greek: Northern	*Greek*	Sibilant dissimilation?	segadj	Newton 1971, Suzuki 1998
Hausa	*Chadic*	Liquid harmony?	not dissim.	Newman 2000, Hansson 2001/2010
Horpa (Shangzhai)	*Tibeto-Burman (Tangut-Qiang)*	Sibilant dissimilation?	segadj	Sun 2007
Ijo: Izon	*Ijọ*	Laryngeal harmony	not dissim.	Efere 2001, Mackenzie 2009, Hansson 2001/2010
Ijo: Kalabari	*Ijọ*	Laryngeal harmony	not dissim.	Jenewari 1977:68-69, Mackenzie 2009, Hansson 2001/2010
Ikalanga	*Bantu (S - Shona)*	Labial dissimilation?	segadj	Sibanda 2004:215
Jamsay	*Dogon*	Rhotic dissimilation?	not dissim.	Proctor 2009:34
Japanese	*Japonic*	Length dissimilation?	not dissim.	Tsuchida 1995, Itô & Mester 1996, Suzuki 1998
Javanese	*Austronesian (Malayo-Polynesian)*	Gradient similarity avoidance	gradient	Mester 1986, Padgett 1991, Uhlenbeck 1950, Dudas 1976
Jibbāli	*Semitic (South Arabian)*	Voicing harmony? (Spurious Lateral dissimilation)	not dissim.	Walsh-Dickey 1997, Johnstone 1975, 1981
Kaanse	*Gur*	Labial dissimilation?	not dissim.	Cahill 1999:159, 2008, Showalter 1997
Kaingang	*Macro-Ge*	Voiceless assimilation?	segadj	McCarthy 1988, Henry 1948
Kapampangan	*Austronesian (Malayo-Polynesian)*	Labial dissimilation?	segadj	Zuraw & Lu 2009:203
Kavalan	*Austronesian (Formosan, East)*	Labial dissimilation?	segadj, not dissim.?	Zuraw & Lu 2009:208
Kinyarwanda	*Bantu (J)*	NC dissimilation?	sporadic, not dissim?	Kimenyi 1979
Korean	*Korean*	Constricted Glottis dissimilation?	not dissim.	Kim 2003, Kim 1995

Language	***Family***	***Dissimilation type***	***Reason excluded***	***References***
Korean	*Korean*	Dorsal dissimilation?	not dissim.	Kim 2003, Kim 1995
Kukú	*Nilotic (Eastern)*	Labial dissimilation?	spurious?	Cahill 1999:159, 2008; Cohen 2000:53
Lakota	*Souian (Central)*	Coronal dissimilation?	segadj	Ingham 2003
Latin	*Romance*	Rhotic dissimilation?	spurious	Walsh-Dickey 1997:165, Gorman 2011
		Length dissimilation?	not C-to-C	Suzuki 1998, Ito and Mester 1996
Lezgian	*Caucasian (North Caucasian)*	Constricted Glottis dissimilation?	segadj	Fallon 2002:215-6, Haspelmath 1993
Luiseño	*Uto-Aztecan (Northern)*	Continuancy dissimilation?	segadj	Mester 1986, Davis 1976, Orgun 1995:411
Malayalam	*Dravidian (Southern)*	Retroflex dissimilation?	gradient	Punnoose & Khattab 2011, Punnose 2011
Mandan	*Souian (Central)*	Continuancy dissimilation?	segadj	Mixco 1997
Maori	*Austronesian (Oceanic)*	Gradient similarity avoidance	gradient	de Lacy 2006:364, Krupa 1968:43
		Labialization dissimilation	segadj	de Lacy 1997, 2006:365
Mingrelian	*Caucasian (Kartvelian)*	Rhotic dissimilation	segadj	Hewitt 2004:35
Muher	*Semitic (Ethiopian)*	Continuancy dissimilation?	gradient	Rose 2000b:111
Muna	*Austronesian (Malayo-Polynesian)*	Gradient similarity avoidance	gradient	Coetzee & Pater 2006, 2008
Ndebele	*Bantu (S - Nguni)*	Laryngeal harmony?	not dissim.	Hansson 2001/2010, Sibanda 2004
		Anterior dissimilation?	not dissim.	Sibanda 2004, Doke 1954
Ngbaka	*Niger-Congo (Adawama-Ubangi)*	Labio-velar harmony	not dissim.	Cahill 2008, Thomas 1963, Sagey 1986, van de Weijer 1994
		Nasal/NC harmony?	not dissim.	Thomas 1963, Walker 2000b, Sagey 1986, Rose & Walker 2004
Ngiyambaa	*Australian (Pama-Nyungan)*	Anteriority harmony?	not dissim.	Donaldson 1980, McCarthy 1988:104
Oowekyala	*Wakashan*	Continuancy dissimilation?	segadj	Howe 2000, Flynn 2006:127
Osage	*Souian (Central)*	Continuancy dissimilation?	segadj	Bye 2011, Quintero 2004
Paiwan: Kulalao	*Austronesian (Paiwan)*	Labial dissimilation	segadj	Zuraw & Lu 2009:211
Pomo: Kashaya	*Hokan*	Gradient similarity avoidance	gradient	Yip 1989:367
Ponapean	*Austronesian (Oceanic)*	Anteriority harmony?	not dissim.	Mester 1986, Rehg 1981, Hansson 2001/2010
		Labio-velar harmony	not dissim.	Mester 1986, Rehg 1981, Hansson 2001/2010
Punjabi	*Indo-Aryan*	Retroflex dissimilation?	segadj	Hamann 2003:119
Russian	*Slavic*	Gradient similarity avoidance	gradient	Padgett 1991, Suzuki 1998
Saami: Inari	*Uralic (Sami)*	Spread Glottis dissimilation?	not dissim.	Bye 2011:6
Sabaot	*Nilotic (Southern)*	Liquid type dissimilation?	sporadic, not dissim?	Larsen 1991, Proctor 2009

Language	***Family***	***Dissimilation type***	***Reason excluded***	***References***
Salish: Kalispel	*Salishan*	Constricted Glottis dissimilation	segadj	Fallon 2002:211, Thompson & Thompson 1985
Salish: Moses-Columbia	*Salishan*	Pharyngealization dissimilation?	segadj?	Suzuki 1998; Bessel & Czaykowska-Higgins 1992, 1993
Sarangani Blaan	*Austronesian (Philippine)*	Labial dissimilation?	not dissim.?, segadj?	Zuraw & Lu 2009:202
Sarangani Manobo	*Austronesian (Philippine)*	Labial dissimilation?	not dissim.?, segadj?	Zuraw & Lu 2009:201-202
Serbian	*Slavic*	Gradient similarity avoidance	gradient	Mckay 1970, Bye 2011
Sotho (various)	*Bantu (S - Sotho-Tswana)*	Labial dissimilation?	segadj	Kotze & Zerbian 2008
Spanish (various)	*Romance*	Sonorant type dissimilation	sporadic	Lloret 1997, Proctor 2009
Spanish: North-central peninsular	*Romance*	Place assimilation? (Continuancy dissimilation?)	not dissim.	Gonzalez 2008
Talaud	*Austronesian (Sangiric)*	Length dissimilation?	not C-to-C, not dissim.	Blust 2012
Tangkhul Naga	*Tibeto-Burman (Naga)*	Laryngeal harmony?	not dissim.	Shosted 2007, Bhat 1969
Telugu	*Dravidian*	Gradient similarity avoidance	gradient	Balasu 2011
Tsou	*Austronesian (Tsouic)*	Continuancy dissimilation?	segadj	Bye 2011:19
Tswana	*Bantu (S - Sotho-Tswana)*	Labial dissimilation	segadj	Herbert 1977, 1990, Sibanda 2004:216
Yao (Chiengrai)	*Hmong-Mien*	Labialization dissimilation?	segadj	Ohala 1981, Purnell 1965
Yuwaalaraay	*Australian (Pama-Nyungan)*	Rhotic type harmony	not dissim.	Williams 1980, Ash et al. 2003, Austin Williams & Wurm 1980
Yuwaalayaay	*Australian (Pama-Nyungan)*	Rhotic type harmony	not dissim.	Ash et al 2003, Glacon & Nathan 2009
Zulu	*Bantu (S - Nguni)*	Laryngeal harmony?	not dissim.	Khumalo 1987, Hansson 2001/2010, Gallagher 2010

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