Reduce, Reuse, Reduplicate: “Wrong Side” Reduplication in Twana*

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Abstract: Twana C_1C_2 reduplication poses challenges for Base-Reduplicant Correspondence Theory in Optimality Theory; the reduplicant in the “wrong side” form does not copy adjacent segments. In this squib, I show that a constraint-based analysis of plural reduplication in Twana is possible with a combination of Generalised Nonlinear Affixation and Stratal Optimality Theory. Reduplication in Twana first yields əC-, which then triggers deletion, metathesis, or additional reduplication at a subsequent stratum to ensure every syllable has an onset.

Keywords: Twana, reduplication, Stratal Optimality Theory, phonological repairs

1 Introduction

Optimality Theory (OT) has proven suitable for the analysis of complex patterns, such as those that involve both triggering and blocking patterns (Zuraw 2003; McCarthy 2007: 260–262). OT can account for phonological phenomena cross-linguistically in a constrained manner: language-specific patterns emerge from how the set of universal constraints are ranked (Prince & Smolensky 2004), rather than requiring learners to posit both language-specific rules and orders.

While early analyses of Salish phonology relied on ordered rules (e.g., Davis 1970), drawing on the approach laid out in Chomsky and Halle’s (1968) *Sound Pattern of English*, more recent analyses have shown that the same phenomena can be analysed using OT (e.g., Blake 2000). OT can capture the same empirical facts as rule-based analyses with additional advantages, such as predicting emergence of the unmarked phenomena (McCarthy & Prince 1994). However, there is one type of reduplication in Salish where even modern analyses use rules instead of constraints: “wrong side” plural reduplication in Twana and Tillamook, shown in (1).

(1)	a.	s-**q**~téqaw	‘horses’	(Drachman 1969: 86, Twana)
	b.	s-**q**~ɬéqil	‘Someone is sitting.’	(Egesdal & Thompson 1998: 249, Tillamook)

The Twana pattern was analysed first in Drachman (1969); it was later reanalysed in Kim (2017). The Tillamook pattern has only been analysed in Kim and Gardiner (2016). The three rule-based analyses converge on the idea what “wrong side” reduplication is a reduced form of plural C_1C_2 reduplication, which means that the examples in (1) have the same morpheme as those in (2).[1]

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[1] Voiceless stops are reduplicated as voiced obstruents in Tillamook (see Egesdal & Thompson 1998: 235).

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(2)	**bəd**~bə́də(h)	‘children’	(Drachman 1969: 225, Twana)
	dən~t̓ə́ni	‘ears’	(Egesdal & Thompson 1998: 3, Tillamook)

Previous rule-based analyses therefore establish that a constraint-based analysis must be able to predict both “wrong side” and C_1C_2 reduplication from the same underlying morpheme; constraint-based analyses must be able to achieve the same empirical coverage with the added limitation that both patterns must be predicted from the same constraint ranking(s).

In this squib, I present the first constraint-based analysis of “wrong side” reduplication in Twana. Section 2 introduces the data and presents a description of the pattern that shows that C_1C_2 and “wrong side” reduplication are phonologically conditioned allomorphs of a single morpheme. The phonological framework for the analysis is given in Section 3. I provide my analysis of C_1C_2 and “wrong side” reduplication in Section 4. While “wrong side” reduplication can be analysed in a constraint-based framework, it requires a combination of Generalised Nonlinear Affixation and Stratal Optimality Theory. Section 5 concludes the paper with discussion of the theoretical implications of this analysis.

2 C_1C_2 and “Wrong Side” Reduplication in Twana

Twana is a Central Salish language; it is like Lushootseed with respect to its phonology (see descriptions of Lushootseed in Hess 1967, Urbanczyk 1996, and Kye 2023). For example, both Twana and Lushootseed have voiced stops that developed from Proto-Salish nasals (Czaykowska-Higgins & Kinkade 1998: 8). I assume that voiced obstruents in the language pattern as sonorants in Twana, following Urbanczyk’s (1996) treatment of Lushootseed. I adopt the feature [SV], which stands for sonorant voicing, to group voiced obstruents and sonorants together in Salish (Mellesmoen 2018). Examples of reduplication in this paper come from Drachman (1969).

I follow Drachman (1969) and Kim (2017) by analysing “wrong side” reduplication as a type of C_1C_2 reduplication. Drachman (1969) does not provide translations for most examples; he marks them as “augmentative”. I include “C_1C_2” in the translations to mark that these are reduplicated, though it is unclear if C_1C_2 reduplication marks properties in addition to plurality, as in other Salish languages (see Czaykowska-Higgins 1993a and Van Eijk 1998). Examples with C_1C_2 reduplication are provided in (3). The first two consonants of the root are copied with an epenthetic [ə] between the two copied consonants; prefixes are outside the domain for reduplication, as shown in (3e–j).

(3)	a.	**xʷəd**~xʷə́d	‘tired (C_1C_2)’	(Drachman 1969: 89)
	b.	**təb̦**~tə́baxʷ	‘land, earth (C_1C_2)’	(Drachman 1969: 39)
	c.	**q̓ʷə̣l̓**~q̓ʷə́lde(h)	‘ear (C_1C_2)’	(Drachman 1969: 41)
	d.	**yəd**~yə́das	‘tooth (C_1C_2)’	(Drachman 1969: 41)
	e.	ʔəs-**ɬəb**~ɬób	‘scarred (C_1C_2)’	(Drachman 1969: 57)
	f.	ʔəs-**qəb̦**~qə̦́bac	‘shrunk (C_1C_2)’	(Drachman 1969: 47)
	g.	ʔəs-**cəl̦**~cə́l̓as	‘rattled (C_1C_2)’	(Drachman 1969: 129)
	h.	ʔəs-**x̣əl̓**~x̣ə́l̓	‘marked, written (C_1C_2)’	(Drachman 1969: 41)
	i.	ʔəs-**kʷəd**~kʷə́dad	‘held (C_1C_2)’	(Drachman 1969: 39)
	j.	sə-**bəd**~báde	‘mountain (C_1C_2)’	(Drachman 1969: 81)

The examples in (3) have an epenthetic [ə] between the two copied consonants; this is present when the second consonant in the root has the feature [SV] (i.e., it is a sonorant or a voiced obstruent), unless the second consonant is a glide. If the second consonant is a /y/ or /w/, C_1C_2 reduplication surfaces as [Ceʔ] or [Coʔ], respectively. Examples are given in (4). I treat [Ceʔ] and

[Coʔ] as surface realisations of /Cəy/ and /Cəw/ that occur as part of general processes of glide vocalisation in the language (see Drachman 1969: 113–115 for discussion of this pattern).

(4)	a.	ṣ-**c̓eʔ**~c̓áy̓at	'salmon gill (C_1C_2)'	(Drachman 1969: 41)
	b.	**k̓ʷeʔ**~k̓ʷóy	'mother (C_1C_2)'	(Drachman 1969: 41)
	c.	ʔəs-**kʷeʔ**~kʷóy	'bent (C_1C_2)'	(Drachman 1969: 41)
	d.	**ɬoʔ**~ɬáwalbəš	'person (C_1C_2)'	(Drachman 1969: 41)
	e.	**šoʔ**~šáw̓	'bone (C_1C_2)'	(Drachman 1969: 37)

If the second consonant in the root has the feature [SV] (i.e., it is a sonorant or a voiced obstruent, as in (3) and (4) above), then C_1C_2 reduplication is always realised as CəC-. If the second consonant is a voiceless obstruent, then C_1C_2 reduplication is realised as CC- or with "wrong side" reduplication. The CC- realisation is identical to CəC-, aside from the fact that [ə] is not present, as shown in (5). In my analysis, I unify the patterns by assuming that both have epenthetic [ə] at the point of reduplication; an unstressed [ə] may be omitted later in the derivation if it is not before a sonorant. In the remainder of this squib, I group the patterns under the label CəC-.

(5)	a.	**pk̓**~pə́k̓ʷ	'spotted (C_1C_2)'	(Drachman 1969: 61)
	b.	**kʷt**~kʷə́təbəc	'husband (C_1C_2)'	(Drachman 1969: 51)
	c.	**q̓ʷp**~q̓ʷópaptəd	'cushion (C_1C_2)'	(Drachman 1969: 38)
	d.	**čṭ**~čə́ṭ	'older brother (C_1C_2)'	(Drachman 1969: 38)
	e.	**šƛ̓**~šóƛ̓	'grind (C_1C_2)'	(Drachman 1969: 37)
	f.	š-**č̓t**~č̓ə́tay	'pan (C_1C_2)'	(Drachman 1969: 47)
	g.	s-**pq̣̓ʷ**~pə̣́q̓ʷ	'feather (C_1C_2)'	(Drachman 1969: 54)
	h.	s-**q̓ƛ̣̓**~q̓áƛ̓ạd	'snail (C_1C_2)'	(Drachman 1969: 38)
	i.	ʔəs-**k̓ʷp**~k̓ʷáp	'correct, straight (C_1C_2)'	(Drachman 1969: 54)
	j.	ʔəs-**pq**~pə́q	'white (C_1C_2)'	(Drachman 1969: 54)
	k.	ʔəs-**q̓ʷt**~q̓ʷə́taxʷ	'thin (C_1C_2)'	(Drachman 1969: 48)
	l.	ʔəs-**q̓x̣ʷ**~q̓áxʷ	'frozen (C_1C_2)'	(Drachman 1969: 38)
	m.	ʔəs-**q̣̓ʷƛ̓**~q̓ʷóƛ̓	'hidden (C_1C_2)'	(Drachman 1969: 38)
	n.	ʔəš-**ṣ̌č̓**~šéč̓	'paid (C_1C_2)'	(Drachman 1969: 38)
	o.	ʔəs-**ƛ̓c̓**~ƛ̓óc̓	'knotted (C_1C_2)'	(Drachman 1969: 38)
	p.	ʔəs-**t̓č̓**~t̓éč̓	'pulled (C_1C_2)'	(Drachman 1969: 38)
	q.	ʔəs-**p̓c**~p̓óc	'floating (C_1C_2)'	(Drachman 1969: 38)
	r.	ʔəs-**pq̓ʷ**~pə́q̓ʷqʷəd	'feather in hair (C_1C_2)'	(Drachman 1969: 37)

"Wrong side" reduplication includes C- and Cə- realisations of C_1C_2 reduplication; this pattern is called "wrong side" reduplication because the second consonant of the root is copied and positioned on the opposite edge of the word. In other words, the reduplicated consonant surfaces at the left edge of the root but does not copy adjacent segments. Examples of the C- form are given in (6); the Cə- form is shown in (7). An epenthetic [ə] separates the reduplicated consonant from the root in words with the Cə- realisation. The C- form is attested with roots that have voiceless obstruents as both the first and second consonants; the Cə- form is used when the first consonant is a sonorant or voiced obstruent and the second is a voiceless obstruent.

(6)	a.	**k**~t̓ə́keʔəs	'basket (C_1C_2)'	(Drachman 1969: 37)
	b.	**x̣ʷ**~sə́x̣ʷtəd	'grease, fat (C_1C_2)'	(Drachman 1969: 54)
	c.	**k̓ʷ**~tə́k̓ʷapšəd	'shoe (C_1C_2)'	(Drachman 1969: 54)

	d.	**p̓**~səp̓təd	‘stick (C_1C_2)’	(Drachman 1969: 54)
	e.	**p**~čáp	‘aunt (C_1C_2)’	(Drachman 1969: 54)
	f.	**q̓**~c̓ə́q̓pe(h)	‘fir tree (C_1C_2)’	(Drachman 1969: 54)
	g.	s-**k**~cə́kabšəd	‘shin (C_1C_2)’	(Drachman 1969: 54)
	h.	s-**q̓ʷ**~łəq̓ʷqs	‘nostril (C_1C_2)’	(Drachman 1969: 54)
	i.	s-**q̓**~sə́q̓če(h)	‘finger (C_1C_2)’	(Drachman 1969: 51)
	j.	s-**q̓**~łə́q̓x̣əd	‘arm (C_1C_2)’	(Drachman 1969: 51)
	k.	s-**q**~tə́q	‘log jam (C_1C_2)’	(Drachman 1969: 54)
	l.	ʔəs-**q̓**~x̣ə́q̓	‘landed (C_1C_2)’	(Drachman 1969: 55)
	m.	ʔəs-**t**~xʷót	‘soaked (C_1C_2)’	(Drachman 1969: 55)
	n.	ʔəs-**t̓**~x̣ə́t̓	‘flicked (C_1C_2)’	(Drachman 1969: 55)
	o.	ʔəs-**c̓**~xʷə́c̓	‘measured (C_1C_2)’	(Drachman 1969: 55)
	p.	ʔəs-**c**~xʷécas	‘fighting (C_1C_2)’	(Drachman 1969: 55)
	q.	ʔəs-**p̓**~łə́p̓	‘hung over and down (C_1C_2)’	(Drachman 1969: 54)
	r.	ʔəs-**p̓**~c̓ə́p̓	‘flooded (C_1C_2)’	(Drachman 1969: 54)
	s.	ʔəs-**x̣ʷ**~céx̣ʷ	‘boiled (C_1C_2)’	(Drachman 1969: 54)
	t.	ʔəs-**kʷ**~t̓ə́kʷ	‘pierced (C_1C_2)’	(Drachman 1969: 54)
	u.	ʔəs-**q̓ʷ**~łə́q̓ʷ	‘extinguished (C_1C_2)’	(Drachman 1969: 54)
	v.	ʔəs-**qʷ**~šáqʷ	‘smeared (C_1C_2)’	(Drachman 1969: 54)
	w.	ʔəs-**q**~c̓éq	‘red (C_1C_2)’	(Drachman 1969: 54)
	x.	ʔəs-**q**~təqcədəxʷ	‘closed (C_1C_2)’	(Drachman 1969: 51)
	y.	ʔəs-**xʷ**~c̓ə́xʷəl̓əs	‘steamed (C_1C_2)’	(Drachman 1969: 51)

(7)	a.	**qə**~bə́qsəd	‘nose (C_1C_2)’	(Drachman 1969: 61)
	b.	**q̓ʷə**~wəq̓ʷátəb	‘sunk (C_1C_2)’	(Drachman 1969: 37)
	c.	**q̓ə**~wə́q̓ab	‘box (C_1C_2)’	(Drachman 1969: 41)
	d.	ʔəs-**q̓e**~yə́q̓	‘filed (C_1C_2)’	(Drachman 1969: 55)
	e.	ʔəš-**č̓ə**~déč̓	‘grazed, scratched (C_1C_2)’	(Drachman 1969: 54)
	f.	ʔəs-**ƛ̓ə**~mə́ƛ̓	‘proud (C_1C_2)’	(Drachman 1969: 54)
	g.	ʔəs-**t̓ə**~bót̓	‘suckled (C_1C_2)’	(Drachman 1969: 54)
	h.	ʔəs-**q̓ə**~wə́q̓cədəxʷ	‘open (C_1C_2)’	(Drachman 1969: 51)
	i.	ʔəs-**x̣ə**~báx̣	‘worn out (C_1C_2)’	(Drachman 1969: 228)

For words with the “wrong side” realisations of C_1C_2 reduplication, there may be two or three segments separating the reduplicated segment from the root segment it copies. For example, there are two (underlined) segments separating the reduplicated consonant from the corresponding root segment in *kt̓ə́keʔəs* ‘basket (C_1C_2)’ in (6a); there are three (underlined) segments between the identical consonants in *qəbə́qsəd* ‘nose (C_1C_2)’ in (7a).

Table 1 shows that the choice of CəC-, C-, or Cə- reduplication is informed by the identity of the first and second consonant in the root. A sonorant or voiced obstruent in C_2 position will always trigger the CəC- form. With a voiceless obstruent in C_2 position, roots with an initial sonorant or voiced obstruent will take the Cə- type of “wrong side” reduplication. Roots with voiceless obstruents as the first and second consonant allow CəC- and the C- type of “wrong side” reduplication.

Table 1: Realisations of C_1C_2 Reduplication by First and Second Root Consonant

↓ C1 \ C2 →	Sonorant/Voiced Obstruent	Voiceless Obstruent
Sonorant/Voiced Obstruent	CəC-	Cə-
Voiceless Obstruent	CəC-	CəC-/C-

Only voiceless obstruent-voiceless obstruent roots appear to be attested with more than one realisation of C_1C_2 reduplication. The choice between CəC- and C- is predictable, however. Table 2 breaks the voiceless obstruents by primary place of articulation, based on major place feature. I adopt a feature geometry where the main place features are Labial, Coronal, and Dorsal (see, e.g., Halle 1995). Coronal includes dental, alveolar, and palatal sounds; dorsal includes velars and uvulars. Labial only includes /p/ and /p̓/ in Twana. The CəC- form occurs when the root has a labial in C_1 position, as well as for $C_{dorsal}C_{labial}$ and $C_{coronal}C_{coronal}$ roots. The C- form occurs for $C_{coronal}C_{dorsal}$ and $C_{coronal}C_{labial}$ roots. It is only when C_1 is a dorsal and C_2 is either a coronal or a dorsal that both deletion and reduplication are attested. Table 3 shows that C- occurs when the C_1 dorsal is a fricative; CəC- occurs when the C_1 dorsal is a stop or affricate. The phonological feature responsible for this is [+/- continuant]: fricatives are [+ continuant], while stops and affricates are [-continuant].

Table 2: Realisations of C_1C_2 Reduplication by Place Feature of Voiceless Obstruent

↓ C_1 \ C_2 →	Labial	Coronal	Dorsal
Labial	no examples	CəC-	CəC-
Coronal	C-	CəC-	C-
Dorsal	CəC-	CəC-/C-	CəC-/C-

Table 3: Realisations of C_1C_2 Reduplication by C_1 Dorsal Manner of Articulation

↓ C_1 \ C_2 →	Coronal/Dorsal
Dorsal Fricative	C-
Dorsal Stop/Affricate	CəC-

The patterns concerning place of articulation can be reduced to a two-way distinction: [Coronal] sounds and [Labial]/[Dorsal] sounds. The findings summarised in Table 2 are informed by 56 examples from Drachman (1969) showing different C_1C_2 combinations in roots. There are only two labial consonants in the language (/p/ and /p̓/), which means there are fewer attested forms for combinations with [Labial] obstruents than for [Coronal] or [Dorsal] obstruents. For example, combinations with dorsal and coronal obstruents include combinations of velar and uvular fricatives, stops, and affricates; there are also rounding and laryngeal contrasts among velar and uvular consonants. If there were an example with p_p̓ or p̓_p, then the predicted form in the $C_{labial}C_{labial}$ cell in Table 2 would be CəC-. If there were voiceless labial fricatives in Twana, then C- should be a possible realisation of reduplication with a $C_{labial}C_{labial}$ root. There is not sufficient data to determine whether C- would be a permitted realisation with $C_{dorsal}C_{labial}$ or $C_{labial}C_{dorsal}$ roots if the first consonant were a fricative; the only example is *s-x̣p̓x̣əp̓ab* 'cockles' formed on the base *s-x̣p̓ab* 'cockle', which is hard to directly compare because the root-initial cluster also requires [ə] epenthesis in the reduplicated form (Drachman 1969: 61). Based on the available data, I conclude that labial, velar, and uvular segments pattern together in Twana with respect to C_1C_2 reduplication, which is consistent with Drachman's (1969: 62) analysis of the pattern.

The choice between CəC-, C-, and Cə- reduplication is predictable based on the sonority, place specification, and manner of articulation of the first two consonants of the root, which means that they can be analysed as different surface realisations of the same morpheme.

3 Theoretical Assumptions

A constraint-based analysis of Twana requires two components: a serial derivation and a prosodic approach to reduplication. A serial derivation is required to allow reduplication to yield an intermediate form that will trigger repair at a subsequent stratum; a prosodic approach to reduplication is needed to predict that reduplication may yield a marked output.

3.1 Stratal Optimality Theory (Stratal OT)

I assume a modified version of Stratal OT (cf. Kiparsky 2015; Bermúdez-Otero 2017), as proposed in Mellesmoen (2025). Stratal OT combines the core assumptions of OT with Stratal Phonology.

OT consists of an operational component (Gen) and a grammar component (Eval), as summarised in McCarthy (2007). Gen is responsible for producing an infinite set of candidates that each represent a potential output. The possible outputs are filtered by Eval, which is the constraint component of the grammar. Constraints are different priorities the grammar has for what is avoided (markedness) or retained (faithfulness), as well as where phonological material is positioned (alignment). All languages have the same set of constraints; languages vary in how these constraints are ranked (i.e., which of the constraints are prioritised over others). The ranking of constraints determines which candidate is the most optimal, such the attested form fares better than all other candidates. OT assumes that constraints are violable: an attested form may be the most optimal candidate despite violating several constraints.

OT traditionally assumes a single global derivation, such that the phonology occurs in a single step, with evaluation in parallel (McCarthy & Prince 2001); Parallel OT uses a single ranking to derive the full word in a single pass. In contrast, Stratal Phonology assumes a serial derivation that works from the innermost domain to the outermost (Kiparsky 2015). The output of the first stratum is the input to the second, which is then the input to the third; this continues until the output of the final stratum, which corresponds to the surface form (pre-phonetic implementation). When combined with the assumptions of OT, each stratum corresponds to a phonological domain with its own constraint ranking. The strata are ordered, such that every word must go through each stratum in a fixed order. I diverge from previous work in Stratal OT by assuming that the strata correspond to strictly phonological domains following Mellesmoen (2025), rather than morphological domains like "stem" or "word" (cf. Kiparsky 2015; Bermúdez-Otero 2017). I use numbered labels for strata that correspond to their order in the derivation (i.e., "first stratum" or "second stratum").

I adopt Stratal OT because Parallel OT is not well-suited to Salish languages. Work on Salish languages has shown that there are phonological patterns that apply in certain domains, which means that not every affix will be affected by the same processes. For example, Czaykowska-Higgins (1993b) describes differences between affixes with respect to stress in Nxaʔamxcín. An analysis within Parallel OT predicts that all affixes should be subject to the same constraint ranking at the same point in the derivation. Another examples where phonological domains are pertinent is with respect to prefixes: the examples of reduplication given in Section 2 show that prefixes are outside the domain for reduplication. Stratal OT offers a straightforward account for the exclusion of prefixes: they are parsed into the phonological word at a later stratum than the reduplicative morpheme.

3.2 Generalised Nonlinear Affixation (GNLA)

Generalised Nonlinear Affixation (GNLA) proposes that non-concatenative morphology involves the affixation of "deficient" or "empty" phonological forms that lack the appropriate segmental content (Bermúdez-Otero 2012; Bye & Svenonius 2012; Zimmermann 2013). GNLA is a prosodic approach to reduplication; prosodic approaches to reduplication, including GNLA, have been applied to other patterns in Salish (e.g., Nłeʔkepmxcín in Jimmie 1994).

In GNLA, reduplication is seen as a repair, parallel to other repairs like epenthesis, deletion, or metathesis. Reduplication refers to the process of fission: one input segment (top line) corresponds to two output segments (bottom line). This is contrasted with epenthesis in Figure 1: reduplication creates a 1:2 input-output mapping between segments (C_3), while epenthesis corresponds to a mapping between nothing (**Ø**) and something (C_x).

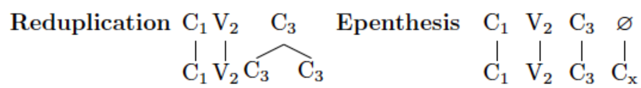

Figure 1: Input-Output Mapping for Reduplication and Epenthesis

Reduplication is the process of fission, which violates INTEGRITY, a faithfulness constraint that is violated by any 1:2 input-output mapping (McCarthy & Prince 1999); epenthesis violates DEP, a faithfulness constraint that penalises epenthesis. The constraint *FLOAT penalises any prosodic unit that is not associated with sufficient segmental content. These constraints are given in (8).

(8) a. INTEGRITY: No element of the input has multiple correspondents in the output.

b. DEP: Output segments must have input correspondents (Kager 1999: 68).

c. *FLOAT: $\forall p \in O$, where p is a prosodic unit: $\exists s$, where s is a segment, and p dominates s (Kirchner 2010: 232).

The tableau in (9) includes candidates that fill the affixed syllable with epenthesis (9a) or reduplication (9b), as well as one that leaves the affixed syllable floating in the output (9c). *FLOAT and DEP are ranked above INTEGRITY, which means that reduplication will occur to ensure that the prosodic affix is associated with segmental content. Solid lines are used to indicate crucial rankings, while dotted lines indicate that the given data does not provide conclusive evidence to establish a ranking. The pointing hand is used to indicate the winning candidate. If (9) is the first stratum, assuming Stratal OT, then (9b) would then be the input to the second stratum.

(9) Reduplication: *FLOAT, DEP >> INTEGRITY

		/$\sigma + C_1V_2C_3$/	*FLOAT	DEP	INTEGRITY
a.		$(C_xV_x)_\sigma.C_1V_2C_3$		*!*	
b.	☞	$(C_1V_2)_\sigma.C_1V_2C_3$			**
c.		$\sigma\ C_1V_2C_3$	*!		

Reduplicative morphemes do not have any special status in GNLA. Fission is a repair that follows from the underlying form of the morpheme (e.g., σ) and the ranking DEP (and other faithfulness constraints) >> INTEGRITY. GNLA differs from Base-Reduplicant Correspondence

Theory, which is an alternate approach to reduplication. The definition of a reduplicative morpheme in Base-Reduplicant Correspondence Theory is provided in (10).

(10) RED_k is a morpheme lexically unspecified for segmentism, but requiring a correspondence relation with its BASE, the phonological structure to which it attaches. The reduplicant is the phonological material that serves as the exponent of RED_k. (McCarthy & Prince 1994, as cited in Urbanczyk 1996: 15)

A crucial assumption of Base-Reduplicant Correspondence Theory is that the base is defined as an adjacent string to the reduplicant (e.g., the Adjacent String Hypothesis in Urbanczyk 1996). McCarthy and Prince (1986: 94) state that "the Reduplicant R and the Base B must share an edge element, initial in prefixing reduplication, final in suffixing reduplication". "Wrong side" reduplication poses a challenge for Base-Reduplicant Correspondence Theory because the reduplicant is positioned as a prefix in a word like *ʔəs-q̓x̣əq̓* 'landed (C_1C_2)', which was given in (6l), despite the copied segment being on the opposite edge in the unreduplicated word *ʔas-x̣əq̓* 'landed'. This pattern is therefore better suited to an analysis using GNLA, which does not require string adjacency between a "base" and a "reduplicant".

4 Analysis of C_1C_2 and "Wrong Side" Reduplication in Twana

The underlying form of plural reduplication in Twana is the same as elsewhere in Salish: $\sigma_{N+\mu}$. The prosodic affix is a syllable with a nucleus and a mora. The structure of this affix is shown in (11): the dependent nucleus and mora are not connected to each other, which is what allows for the invariable monomoraic closed syllable (see Mellesmoen 2025: 349–351).

(11) $\sigma_{N+\mu} \Leftrightarrow$ PL

I assume that $\sigma_{N+\mu}$ is parsed into the phonological word at the first stratum. The prosodic affix $\sigma_{N+\mu}$ is filled by əC, an onsetless syllable that fills the nucleus with [ə] and the mora with a reduplicated consonant. The input to the subsequent stratum starts with a vowel, which is not permitted in the language; repairs are triggered to ensure that the surface form is a well-formed prosodic word in Twana. The CəC-, Cə-, and C- realisations represent reduplication, metathesis, and deletion as repairs, respectively.

4.1 First Stratum: Marked Intermediate Form

Affixed $\sigma_{N+\mu}$ is filled by əC for all three realisations of C_1C_2 reduplication, where C is a copy of the second consonant of the root. The relevant constraints at the first stratum are *FLOAT, INTEGRITY-C, DEP-C, DEP, ONSET, and OCP. *FLOAT, INTEGRITY, and DEP were defined in Section 3.2. The C in INTEGRITY-C and DEP-C indicate that these constraints are only violated by any 1:2 mapping between consonants or epenthesis of a consonant, respectively. ONSET, defined in (12a), requires every syllable to have an onset. OCP, defined in (12b), is violated by any sequence of identical segments.

(12) a. OCP: Adjacent identical elements are prohibited. Assign a violation for each sequence of identical elements (modified from Myers 1997: 847)

b. ONSET: Syllables have onsets (Blake 2000: 244).

The tableau in (13) shows the derivation of a form that lacks an onset (13a). This candidate violates INTEGRITY-C, DEP, and ONSET because vowel epenthesis fills the nucleus and consonant fission fills the mora of the prosodic affix $\sigma_{N+\mu}$. Candidate (13b) avoids having an onsetless syllable by reduplicating an additional consonant, which leads to a second (and fatal) violation of INTEGRITY-C. Candidate (13c) only reduplicates a single consonant, which means the nucleus is not associated with segmental content and therefore fatally violates *FLOAT. Two candidates with consonant epenthesis instead of reduplication fatally violate Dep-C (13d,e). Candidate (13f) copies the consonant on the same side it is affixed, which incurs a fatal violation of OCP.

(13) Stratum 1: *šoƛ̓* 'grind' with C_1C_2 reduplication

	/šoƛ̓ + $\sigma_{N+\mu}$/	*FLOAT	DEP-C	INT-C	DEP	ONSET	OCP
a.	☞ əƛ̓.šóƛ̓			*	*	*	
b.	šəƛ̓.šóƛ̓			**!	*		
c.	ƛ̓šóƛ̓	*!		*			
d.	ʔəƛ̓.šóƛ̓		*!	*	**		
e.	əʔ.šóƛ̓		*!		*	*	
f.	əš.šóƛ̓			*	*	*	*!

The crucial ranking for the first stratum is summarised in (14). OCP is not crucially ranked relative to the other constraints. Candidate (13a) and candidate (13f) violate the same constraints as each other; candidate (13f) can never be selected over candidate (13a).

(14) *FLOAT, DEP-C >> INT-C, DEP >> ONSET

4.2 Second Stratum: Phonological Repairs

The input to the second stratum is the output from the first, which will never be a permissible surface form in Twana if it lacks an onset (e.g., **əƛ̓šóƛ̓* from the previous section). There are three different repairs to provide an onset at the second stratum: deletion, reduplication, and metathesis. Reduplication includes forms that surface as CəC- and CC-; I assume deletion of an unstressed [ə] occurs at a later point in the derivation. The label "wrong side" reduplication includes forms with either metathesis or deletion. Repairs and surface forms are summarised in Table 4.

Table 4: Realisations of C_1C_2 Reduplication by Repair and Root Shape

Form	Repair	Root Shape
CəC- (and CC-)	Reduplication	CS Roots (voiced obstruent or sonorant as C_2) and Certain OO Roots (voiceless obstruent as C_1 and C_2)
C-	Deletion	Certain OO Roots (voiceless obstruent as C_1 and C_2)
Cə-	Metathesis	SO Roots (Voiced Obstruent or Sonorant as C_2)

Each repair corresponds to a violation of a faithfulness constraint. Reduplication violates INTEGRITY-C, discussed in the previous section. Deletion of [ə] in the C- forms violates MAX, which is defined in (15a). Metathesis entails a change in linear order (i.e., segments are switched around), which violates LINEARITY, defined in (15b). S_1 in (15b) refers to the input string, while S_2 refers to the output string.

(15) a. MAX: All segments in the input have a correspondent in the output. Assign a violation mark for every segment in the input that does not have a correspondent in the output. (McCarthy & Prince 1995: 16)

b. LINEARITY: S_1 is consistent with the precedence structure of S_2, and vice versa. (McCarthy & Prince 1995: 123)

For repairs to occur at the second stratum, INTEGRITY-C, MAX, and LINEARITY must all be ranked lower than ONSET. In the subsequent sections, I show how they must be ranked relative to other markedness and alignment constraints to account for root shape as a conditioning factor.

4.2.1 Second Stratum: Obstruent-Obstruent (OO) Roots

For roots with voiceless obstruents as the first two consonants (OO), both reduplication and deletion are attested repairs. The choice of repair for OO roots is determined by the place of articulation and the specification of the segment for [+/- continuant].

With respect to place of articulation, the division is between [Labial]/[Dorsal] and [Coronal] consonants (i.e., labials/velars/uvulars vs. alveolars/palatals). I follow Drachman (1969) in adopting the feature [+/- grave] to capture this pattern. Grave was first proposed as a distinctive feature in Jakobson, Fant and Halle (1952); grave and acute were used to distinguish between sounds produced with energy concentrated in the lower vs. upper frequencies of the spectrum (Jakobson and Halle 1956). In terms of articulation, it corresponds to a difference between peripheral sounds (i.e., [+grave] includes labials, dorsals, and uvulars) and medial sounds (i.e., [-grave] includes dentals, alveolars, and palatals) (Hyman 1973).[2]

The availability of deletion with OO roots depends on the complex cluster that deleting the initial schwa would create. I propose two alignment constraints based on Generalised Alignment in McCarthy and Prince (1993) to account for permissible OO onset clusters: ALIGN-R-O[-GRAVE] and ALIGN-L-O[+GRAVE,-CONT]. ALIGN-R-O[-GRAVE] is violated for every coronal or palatal segment in an onset that is not immediately before the vowel (i.e., aligned to the right edge of an onset). If a complex onset cluster has two [-grave] segments, it will always incur a violation because only one of the segments can be rightmost in the onset. ALIGN-L-O[+GRAVE,-CONT] requires velar or dorsal stops or affricates to be first (leftmost) in the onset; it is violated by any complex onset with a velar or dorsal stop or affricate in a non-initial position.

(16) a. ALIGN-R-O[-GRAVE]: Any [-grave] segment in an onset must align with the right edge of the onset.

[2] Labial, dorsal, and uvular sounds grouping together is evidence for the feature [+/- grave]. While this feature was removed in Chomsky and Halle (1968), Hyman (1973) argues that it is necessary to capture a natural class in African languages that groups labial and velar sounds in opposition to dental and palatal consonants.

b. ALIGN-L-O[+GRAVE,-CONT]: Any [+grave] and [-continuant] segment in an onset must align with the left edge of the onset.

The ranking ALIGN-L-O[+GRAVE,-CONT], ONSET, and MAX above INT-C is established in (17) with $O_{[+grave,-continuant]}O_{[+grave,-continuant]}$ roots. I focus on the rankings of INT-C/MAX and candidates with reduplication/deletion in this section; LINEARITY and candidates with metathesis are excluded from the tableaux until Section 4.2.3. The faithful candidate in (17a) fatally violates ONSET. Reduplication provides an onset for the attested candidate in (17b), which violates INT-C. The candidate with deletion ("wrong side" reduplication) fatally violates either ALIGN-L-O[+GRAVE,-CONT] or MAX. While ranking MAX above INT-C would predict the correct output without the alignment constraint in this tableau, both constraints will prove necessary for predicting where deletion may occur.

(17) Stratum 2: *ʔəs-pq̓pəq̓ʷqʷəd* 'feather in hair (C_1C_2)'

	/əq̓ʷpə́q̓ʷqʷəd/	ONSET	ALIGN-L-O [+GRAVE,-CONT]	MAX	INT-C
a.	əq̓ʷ.pə́q̓ʷ.qʷəd	*!			
b. ☞	pəq̓ʷ.pə́q̓ʷ.qʷəd				*
c.	q̓ʷpə́q̓ʷ.qʷəd		*!	*!	

The constraint ALIGN-R-O[+GRAVE] must also be ranked above INT-C to predict reduplication with $O_{[-grave]}O_{[-grave]}$ words, as shown in (18). The winning candidate is given in (18b); it only violates INT-C. The vowel is deleted in candidate (18c), which creates a cluster that violates ALIGN-R-O[-GRAVE].

(18) Stratum 2: *šƛ̓šoƛ̓* 'grind (C_1C_2)'

	/əƛ̓šóƛ̓/	ONSET	ALIGN-L-O [+GRAVE,-CONT]	ALIGN-R-O [-GRAVE]	MAX	INT-C
a.	əƛ̓.šóƛ̓	*!				
b. ☞	šəƛ̓.šóƛ̓					*
c.	ƛ̓šóƛ̓			*!	*!	

To allow for deletion as a possible repair, MAX must be ranked lower than ONSET. The constraint *STRUC-σ must be also crucially ranked, such that it will motivate deletion of vowels if it is possible to reduce the number of syllables. The constraint in (19) is violated by every syllable in the output.[3] *STRUC-σ must be ranked above MAX; otherwise reduplication will always be predicted because MAX is ranked above INT-C.

(19) *STRUC-σ: No syllables. Assign a violation mark for every syllable (modified from Zoll 1996: 170).

For OO roots where deletion does not create clusters violate either of the alignment constraints, deletion is the optimal repair because it incurs one fewer violation of *STRUC-σ than forms that

[3] Higher ranked faithfulness constraints protecting moraic (non-schwa) vowels and stressed vowels combined with constraints on well-formed onsets and codas will prevent this constraint from deleting more vowels than attested to reduce the number of syllables in a word.

retain [ə]. This is shown in (20) where candidate (20c) with deletion wins over candidate (20b) with reduplication.

(20) Stratum 2: *s-qtéqaw* 'horses'

		/əqtéqaw/	ONSET	ALIGN-L-O [+GRAVE,-CONT]	ALIGN-R-O [-GRAVE]	*STRUC-σ	MAX	INT-C
a.		əq.té.qaw	*!			***		
b.		təq.té.qaw				***!		*
c.	☞	qté.qaw				**	*	

4.2.2 Second Stratum: Consonant-Voiced Obstuent/Sonorant (CS) Roots

Reduplication provides an onset at the second stratum for any root with a sonorant as the second consonant (CS roots), regardless of the identity of the first consonant. For CS roots, the input to the second stratum has the shape əSCVS. If deletion were the selected repair, this would create a complex onset SC.

The "wrong side" candidates that satisfy ONSET via deletion can be ruled out for CS roots because SCVS would have an onset that does not rise in sonority. Syllables typically rise in sonority until the peak (nucleus) and then decline in sonority (see, e.g., Parker 2011). Voiced obstruents and sonorants in Twana have the feature [SV]; I assume that segments with the feature [SV] are the most sonorous consonants. The best complex onset will be one that rises in sonority, which means that a sonorant is closest to the vowel. There are several options that have been proposed to ensure an onset rises in sonority in Salish, such as BESTONSET (Urbanczyk 1996) or *ONSRC (Matthewson 1994).[4] However, as it will be shown in the following section that Twana avoids sonorants in complex clusters even with rising sonority, I use the constraint *BRANCHINGONSET-[SV] to account for both patterns. *BRANCHINGONSET-[SV], defined in (21), is violated by any [SV] segment in a complex onset.

(21) *BRANCHINGONSET-[SV]: (*BRANCHO-[SV]) — Voiced obstruents and sonorants are not in complex onsets.

The tableau in (22) shows that the candidate with reduplication wins when *BRANCHINGONSET-[SV] and ONSET are ranked above INT-C.

(22) Stratum 2: *ʔəs-łəbłób* 'scarred (C_1C_2)'

		/əbłób/	ONSET	*BRANCHO-[SV]	*STRUC-σ	MAX	INT-C
a.		əb.łob	*!		**		
b.	☞	łəb.łób			**		*
c.		błób		*!	*	*	

Reduplication is predicted if deletion would create a cluster with a sonorant as the initial consonant because *BRANCHINGONSET-[SV] is ranked above *STRUC-σ. The roots with a glide as a second consonant follow this same pattern. For example, *šáw̓* 'bone' has /əw̓šáw̓/ as the output

[4] R stands for resonant, which is another term for sonorant.

of the first stratum, while the output of the second stratum is /šəw̓šáw̓/; glide vocalisation at a later point in the derivation will yield [šoʔšáw̓] on the surface.

4.2.3 Second Stratum: Voiced Obstruent/Sonorant-Obstruent (SO) Roots

Metathesis provides an onset for roots with a sonorant or voiced obstruent as C_1 and an obstruent as C_2 (SO roots). The input to the second stratum is əOSVO; [ə]-deletion would result in a [SV] segment in a complex onset, which violates *BRANCHINGONSET[SV], introduced in the previous section. Metathesis is chosen over reduplication due to the ranking of SYLLCON relative to LINEARITY, defined in (15b) above. I adopt the definition of SYLLCON given in Urbanczyk (1996: 177), which is stated in (23). SYLLCON is violated whenever a coda consonant is followed by an onset consonant that is more sonorous (i.e., if sonority rises across an coda-onset cluster).

(23) SYLLCON: In the heterosyllabic sequence $C_1]_\sigma[C_2$, $|C_1| \geq |C_2|$ (Urbanczyk 1996: 177)

Ranking ONSET, *BRANCHINGONSET[SV], and SYLLCON above LINEARITY allows candidates with metathesis to win, as exemplified by candidate (24d). The candidate with reduplication in (24b) fatally violates SYLLCON because a coda obstruent is followed by a voiced obstruent. The candidate with deletion in (24c) fatally violates *BRANCHINGONSET[SV] because a voiced obstruent is part of a complex onset.

(24) Stratum 2: *qəbə́qsəd* 'noses'

/əqbə́qsəd/	ONSET	*BRANCHO [SV]	SYLLCON	LINEARITY	*STRUC-σ	MAX	INT-C
a. əq.bə́q.səd	*!		*		***		
b. bəq.bə́q.səd			*!		***		*
c. qbə́q.səd		*!			**	*	
d. ☞ qə.bə́q.səd				*	***		

The analysis now can account for metathesis with SO roots, while allowing for deletion and reduplication as repairs in other contexts. Tableau (25) shows that including the constraints needed to account for metathesis with SO roots does not make incorrect predictions elsewhere (cf. OO roots in Section 4.2.1); all three patterns are derived from an intermediate form without an onset.

(25) Stratum 2: *šƛ̓šoƛ̓* ‘grind (C_1C_2)’

/əƛ̓šóƛ̓/		Onset	Dep	Align-L-O [+grave, -cont]	SyllCon	*BranchO [SV]	Align-R-O [-grave]	Linearity	*Struc-σ	Max	Int-C
a.	əƛ̓šóƛ̓	*!							**		
b. ☞	šəƛ̓šóƛ̓								**		*
c.	ƛ̓šóƛ̓						*!		*	*	
d.	ƛ̓əšóƛ̓							*!	**		
e.	ʔəƛ̓šóƛ̓		*!						**		

The constraint ranking for the second stratum is summarised in (26).

(26) Onset, Dep, Align-L-Onset[+grave,-cont], SyllCon, *BranchingOnset[SV], Align-R-Onset[-grave] >> Linearity >> *Struc-σ >> Max >> Integrity-C

One question for future work is whether the patterns involving [+/- grave] and [+/- continuant] can be integrated into a sonority scale for Twana that allows for fewer constraints to capture the same patterns. Specifically, if [+/- grave] contributes to the sonority hierarchy in Twana, it may also be the case that SyllCon can be used to rule out candidates where *Struc-σ is used to rule out unattested candidates. As the focus of this paper is on ungrammatical intermediate forms, I leave this line of research for future study.

5 Conclusion

In this squib, I have shown that a constraint-based analysis is able to account for “wrong side” reduplication in Salish, if it integrates a prosodic approach to reduplication within a serial derivation. A strength of the Stratal OT analysis is that it allows for the benefits and restrictiveness of a constraint-based analysis, while being able to capture similar insights to the rule-based analyses proposed in previous work (cf. Drachman 1969).[5]

Kim (2017: 119) motivates his rule-based analysis as a simpler alternative to “Drachman’s often complex rules of cluster reduction”; he still requires up to five rules for a single word (out of a larger set relevant to pattern), which correspond to five different outputs that need to be derived. A constraint-based analysis needs only two strata to predict the correct forms (three if schwa deletion and glide vocalisation are treated as phonological, rather than phonetic, processes), which correspond to two different outputs that need to be derived. Given that research on working memory finds that humans can retain around three to five items at once (see, e.g., Cowan 2010), fewer distinct intermediate forms between underlying and surface representations is a desirable result of the Stratal OT analysis. Instead of needing to individually apply many rules to derive a single morpheme, the constraint-based analysis can be summarised in two steps, as shown in Figure 2. To reduplicate a root (represented as CVC), the first step is to prefix əC, where C is a copy of the

[5] This pattern provides evidence for not only a serial derivation, but also one where the constraints are ranked differently throughout the derivation. It would be challenging to predict the ungrammatical intermediate forms in a framework where the constraints where fixed, such as Harmonic Serialism (see, e.g., McCarthy 2010).

second consonant. One of three possible forms is selected at the second step, where the root shape is matched to one of the repair strategies. A constraint-based analysis therefore offers a strong alternative to a rule-based account of "wrong side" reduplication in Salish.

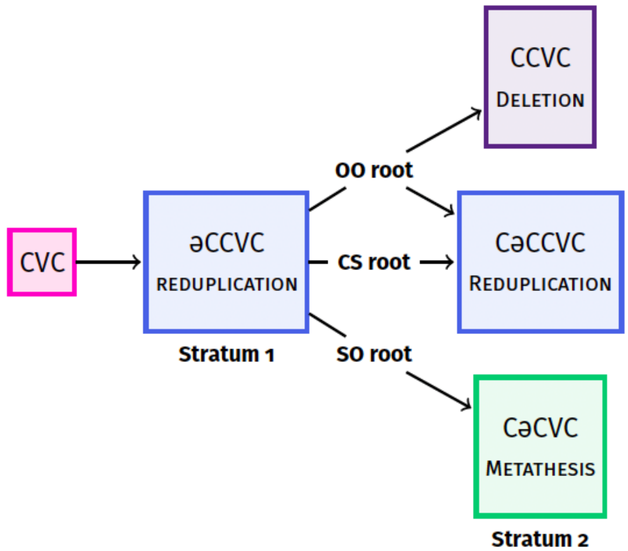

Figure 2: Deriving Twana Reduplication at Two Strata

References

Bermúdez-Otero, R. (2012). The architecture of the grammar and division of labor in exponence. In J. Trommer (Ed.), *The Morphology and Phonology of Exponence* (pp. 8–83). Oxford: Oxford University Press.

Bermúdez-Otero, R. (2017). Stratal phonology. In *The Routledge Handbook of Phonological Theory*, 100–134. Routledge.

Blake, S. (2000). *On the Distribution and Representation of Schwa in Sliammon (Salish).* Doctoral dissertation, University of British Columbia.

Bye, P. & Svenonius, P. (2012). Non-concatenative morphology as epiphenomenon. In J. Trommer (Ed.), *The Morphology and Phonology of Exponence* (pp. 427–495). Oxford: Oxford University Press.

Chomsky, N. & Halle, M. (1968). *The Sound Pattern of English.* New York: Harper and Row.

Cowan, N. (2010). The magical mystery four: How is working memory capacity limited, and why? *Current Directions in Psychological Science, 19*(1), 51–57.

Czaykowska-Higgins, E. (1993a). The phonology and semantics of CVC-reduplication in Moses-Columbian Salish. In A. Mattina & T. Montler (Eds.), *American Indian Linguistics and Ethnography in Honor of Laurence C. Thompson* (pp. 47–72). Missoula: University of Montana Occasional Papers in Linguistics.

Czaykowska-Higgins, E. (1993b). Cyclicity and stress in Moses-Columbia Salish (Nxaʔamxcin). *Natural Language & Linguistic Theory 11*(2): 197–278.

Czaykowska-Higgins, E., & Kinkade, D. (1998). Salish languages and linguistics. In E. Czaykowska-Higgins & D. Kinkade (Eds.), *Salish Languages and Linguistics* (pp. 1–70). Berlin: Mouten de Gruyter.

Davis, J. (1970). *Some Phonological Rules in Mainland Comox.* MA Thesis, University of Victoria.

Drachman, G. (1969). *Twana Phonology*. Doctoral dissertation, Ohio State University.

Egesdal, S., & Thompson, M. T. (1998). A fresh look at Tillamook (Hutyéyu) inflectional morphology. In E. Czaykowska-Higgins & D. Kinkade (Eds.), *Salish Languages and Linguistics* (pp. 235–274). Mouten de Gruyter.

Halle, M. (1995). Feature geometry and feature spreading. *Linguistic Inquiry, 26*(1), 1–46.

Hess, T. (1967). *Snohomish Grammatical Structure.* Doctoral dissertation, University of Washington.

Hyman, L. M. (1973). The feature [grave] in phonological theory. *Journal of Phonetics, 1*(4), 329–337.

Jakobson, R., Fant, C. G. M. & Halle, M. (1952). Preliminaries to Speech Analysis. *Technical Report No. 13*, Acoustics Laboratory, M.I.T.

Jakobson, R. & Halle, M. (1956). *Fundamentals of Language.* The Hague: Mouton.

Jimmie, M. (1994). *A prosodic analysis of Nłeʔkepmx reduplication.* MA thesis, University of British Columbia.

Kager, R. (1999). *Optimality Theory.* Cambridge: Cambridge University Press.

Kim, H. (2017). The truncated reduplication in Twana: Another case of synergistic weakening. In A. Anghelescu, M. Fry, M. Huijsmans, & D. Reisinger (Eds.), *Papers for the 52nd International Conference on Salish and Neighbouring Languages (ICSNL 52)* (pp. 119–136). Vancouver: University of British Columbia Working Papers in Linguistics.

Kim, H., & Gardiner, D. (2016). The truncated reduplication in Tillamook and Shuswap: weakening by synergy of dissimilation and cluster simplification. In M. Huijsmans, T. J. Heins, O. Tkachman, & N. Weber (Eds.), *Papers for the 42nd International Conference on Salish and Neighbouring Languages (ICSNL 42)* (pp. 93–107). Vancouver: University of British Columbia Working Papers in Linguistics.

Kiparsky, P. (2015). Stratal OT: A synopsis and FAQs. *Capturing Phonological Shades Within and Across Languages 2:* 1–45.

Kirchner, J. S. (2010). *Minimal Reduplication.* Doctoral dissertation, University of California, Santa Cruz.

Kisseberth, C. W. (1970). On the functional unity of phonological rules. *Linguistic Inquiry, 1*(3), 291–306.

Kye, T. (2023). *A Grammar of Lushootseed: Phonetics, Phonology, Morphology.* Doctoral dissertation, University of Washington.

Matthewson, L. (1994). Syllable structure in St'át'imcets. In P. Koskinen (ed.), *Proceedings of the 1994 Annual Conference of the Canadian Linguistics Association (Toronto Working Papers in Linguistics).* Toronto: Department of Linguistics, University of Toronto.

McCarthy, J. J. (2007). What is Optimality Theory? *Language and Linguistics Compass, 1*(4), 260–291.

McCarthy, J. J. (2010). An introduction to Harmonic Serialism. *Language and Linguistics Compass, 4*(10), 1001–1018.

McCarthy, J. J., & Prince, A. (1986). *Prosodic Morphology.* Manuscript, University of Massachusetts and Brandeis University.

McCarthy, J. J., & Prince, A. (1993). *Prosodic Morphology: Constraint Interaction and Satisfaction.* Unpublished Manuscript, Rutgers Optimality Archive.

McCarthy, J. J., & Prince, A. (1994). The emergence of the unmarked: Optimality in Prosodic Morphology. In M. Gonzàlez (Ed.), *Proceedings of the North East Linguistic Society (NELS) 24* (pp. 333–379). Amherst: GLSA.

McCarthy, J. J., & Prince, A. (1995). Faithfulness and reduplicative identity. In J. Beckman, L. Walsh Dickey & S. Urbanczyk (Eds.), *Papers in Optimality Theory* (pp. 249–384). Amherst: GLSA.

McCarthy, J. J., & Prince, A. (1999). Faithfulness and identity in prosodic morphology. In R. Kager, H. van der Hulst, & W. Zonneveld (Eds.), *The Prosody-Morphology Interface* (pp. 218–309). Cambridge: Cambridge University Press.

Mellesmoen, G. (2018). Sonorant voicing ([SV]) in Comox-Sliammon. In M. Huijsmans, R. Lo, O. Tkachman, & D. Reisinger (Eds.), *Papers for the 53rd International Conference on Salish and Neighbouring Languages (ICSNL 53)* (pp. 125–141). Vancouver: University of British Columbia Working Papers in Linguistics.

Mellesmoen, G. (2025). *The Grammar of Salish Reduplication.* Doctoral dissertation, University of British Columbia.

Myers, S. (1997). OCP effects in Optimality Theory. *Natural Language & Linguistic Theory, 15*(4), 847–892.

Parker, S. (2011). Sonority. In M. van Oostendorp, C. J. Ewen, E. Hume, & K. Rice (Eds.), *The Blackwell Companion to Phonology* (Vol. 2, pp. 1160–1184). Malden: Wiley-Blackwell.

Prince, A., & Smolensky, P. (2004). *Optimality Theory: Constraint Interaction in Generative Grammar*. John Wiley & Sons.

Urbanczyk, S. (1996). *Patterns of Reduplication in Lushootseed.* Doctoral dissertation, University of Massachusetts Amherst.

Van Eijk, J. (1998). CVC reduplication in Salish. In E. Czaykowska-Higgins & D. Kinkade (Eds.), *Salish Languages and Linguistics* (pp. 453–476). Berlin: Mouten de Gruyter.

Zimmermann, E. (2013). Non-concatenative allomorphy is generalized prosodic affixation: The case of Upriver Halkomelem. *Lingua, 134*, 1–26.

Zoll, C. C. (1996). *Parsing Below the Segment in a Constraint-Based Framework*. Doctoral dissertation, University of California, Berkeley.

Zuraw, K. (2003). Optimality Theory in linguistics. *The Handbook of Brain Theory and Neural Networks, 2,* 819–822.