Chapter 3: Introduction to the Final Features: Gemination

1. Introduction

In the previous chapter I accounted for the distribution of voicing and continuancy in consonants within morphemes. In this chapter, I introduce the final features of Gosiute, consonant alternations in hetero-morphemic contexts which parallel the distributional patterns discussed in chapter 2. As an example of how final features work I provide an account of Gemination in the second part of this chapter. I begin though with a discussion of final features and their distributional properties.

2. Final features

Final features are morpheme-final elements which surface when a stop or nasal immediately follows. Data such as that in (1) illustrate Gosiute final features (repeated from chapter 1, section 2); the initial consonant of the suffix -pai 'have NOUN' has four different alternants—voiced stop preceded by a homorganic nasal (1a), geminate voiceless stop (1b), geminate voiceless fricative (1c), and voiced fricative (1d)—depending on the noun stem to which it is attached. Similar alternations occur for stops at all places of articulation.

(1) Numic Final Features

a.	'bead'	[t̪θoː]
	'have beads'	[t̪θoːmbai]
b.	'pine nut'	[tɨβa]
	'have pine nuts'	[tɨβappai]
c.	'money'	[moɾ̃i]
	'have money'	[moɾ̃iɸai]
d.	'house'	[kahɾ̃i]

'have a house' [kahr̃iβai]

There are corresponding alternations for nasal-initial suffixes (2). Here, the initial nasal consonant of the postposition -mai 'with' has three different alternants based on the noun stem to which it is affixed. In (2a) and (2b) [m] alternates with a geminate nasal, in (2c) with a cluster consisting of [h] and a nasalized labio-velar glide, and in (2d) with a nasalized labio-velar glide. Similar alternations occur for morpheme-initial [n] as well.

(2)

a.	'bead'	[t̪θoː]
	'with the bead'	[t̪θoːmmai]
b.	'pine nut'	[tɨβa]
	'with the pine nut'	[tɨβammai]
c.	'mouse'	[por̃ai]
	'with mouse'	[por̃aihw̃ai]
d.	'house'	[kahr̃i]
	'with the house'	[kahr̃iw̃ai]

In section 2 of chapter 1 I discussed the regularity of these alternations, which provide the basis for distinguishing four lexical classes of noun stems. These stem classes are distinguished from each other by the type of final feature which they bear; *Nasalizing* (an oral stop alternates with a cluster of a homorganic nasal and voiced stop, a nasal stop alternates with a geminate nasal stop), *Geminating* (an oral or nasal stop alternates with a geminate oral or nasal stop), *Aspirating* (an oral stop alternates with a voiceless fricative, a nasal stop alternates with a partially voiceless nasalized continuant), and *Spirantizing* (an oral or nasal stop alternates with a voiced continuant).

The occurrence of a final feature on a noun stem in Gosiute is an idiosyncratic, lexical property of the stem and cannot be predicted based on the stem's prosodic or segmental profile. The forms in (3) illustrate minimal pairs in which one member contains a final feature and the other does not. In (3), the first member of each pair is devoid of a final

feature, which is demonstrated by the fact that the voiceless stop of the suffix undergoes Spirantization.[1] The second member of each pair, which in isolation is phonetically identical to the first member, differs with respect to the presence of a final feature; Nasalizing in (3a), Geminating in (3b) and Aspirating in (3c). The effects of the final feature are apparent in the initial consonant of the suffix.

(3) Unpredictable distribution of Gosiute final features

	surface	underlying	
a.	[t̪θoː]	/t̪θoː/	'great-grandparent'
	[t̪θoːβai]	/t̪θoː-pai/	'have a great-grandparent'
	[tθoː]	/t̪θoːn/	'beads'
	[t̪θoːmbai]	/t̪θoːn-pai/	'have beads'
b.	[pui]	/pui/	'blue/green'
	[puiɣai]	/pui-kai/	'be blue/green'
	[pui]	/pui"/	'grass'
	[puippai]	/pui"-pai/	'have grass'
c.	[hai]	/hai/	'uncle (FaBr)'
	[haiβai]	/hai-pai/	'have an uncle'
	[hai]	/haih/	'crow'
	[haiɸai]	/haih-pai/	'have a crow'

For any given stem in Gosiute containing a final feature, the quality of the final feature is also a lexical property of the stem and is not predictable. This is demonstrated in (4) with minimal pairs which differ only in the identity of the final feature.

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[1]It is generally accepted among Numicists that stems which induce the effects of Nasalization, Gemination or Aspiration in a following morpheme contain specific phonological elements which are responsible for the phonetic expression of the final feature, while those stems which induce Spirantization are devoid of any such elements. The transcription of underlying forms of Gosiute reflect this analysis. Thus, Nasalization is transcribed as a morpheme-final /÷n/, Gemination as a morpheme-final /-"/, and Aspiration as a morpheme-final /÷h/; Spirantization, being the absence of a stem-final phonological element, is indicated by a vowel-final morpheme.

(4) Unpredictable quality of final features

	surface	underlying	
a.	[pui]	/pui"/	'grass'
	[puippai]	/pui"-pai/	'have grass'
	[pui]	/puih/	'eye'
	[puiɸai]	/puih-pai/	'have an eye'
b.	[aː]	/aːn/	'horn'
	[aːmbai]	/aːn-pai/	'have a horn'
	[aː]	/aː"/	'grey'
	[aːttoɣo]	/aː"-toko/	'potato bug' (toko 'MoFa')

In phrase-final position, the identity of the final feature is not apparent and only becomes so when a stop follows.

In Gosiute, final features which occur phrase-finally or before vowels or continuants remain silent (5). In (5) the first member of each triplet shows the effects of the final feature; in (5a) the first person plural inclusive pronoun terminates with a Nasalizing final feature, while in (5b) the first person dual inclusive pronoun terminates with an Aspirating final feature. These final features are not realized before vowels or continuants, as shown by the second and third members of each triplet.

(5) Surface absence of final features

	surface	underlying	
a.	[tammɨmbia]	/tammɨn-pia/	'our (PL.INCL) mother'
	[tammɨaɾa]	/tammɨn-ata/	'our (PL.INCL) uncle (MoBr)'
	[tammɨyaippɨ]	/tammɨn-yaippɨ/	'our (PL.INCL) mother-in-law'
b.	[tawɨ̥ɸia]	/tawɨh-pia/	'our (DU.INCL) mother'
	[tawɨaɾa]	/tawɨh-ata/	'our (DU.INCL) uncle (MoBr)'
	[tawɨ̥yaippɨ]	/tawɨh-yaippɨ/	'our (DU.INCL) mother-in-law'

An apparent exception to the pre-vocalic deletion pattern occurs when a noun is inflected for accusative case. The accusative suffix consists of the vowel -a, and so would be

expected to trigger deletion of a Nasalizing or Aspirating final feature, but this does not happen.[2] In the accusative the Nasalizing final feature is realized as [n] (6) and the Aspirating final feature is realized as [h] (7); Spirantizing stems show no intrusive consonant before the accusative suffix (8). In each triplet in (6-8), the first member shows the noun in isolation; the final features are not present on the surface in these cases. The second member of each triplet shows the effects of the final feature (where present) on the stop of the following suffix. The third member of each triplet shows that the final feature surfaces before the accusative suffix; for Nasalizing stems the final feature surfaces as alveolar [n] and for Aspirating stems the final feature surfaces as [h]; (8) shows that when the accusative suffix is attached to a stem devoid of a final feature, a vowel-vowel cluster results.

(6) Accusative case and Nasalizing stems

	surface	underlying	
a.	[paɣa]	/pakan/	'arrow'
	[paɣambai]	/pakan-pai/	'have an arrow'
	[paɣana]	/pakan-a/	'arrow-ACC'
b.	[t̪θoː]	/t̪θoːn/	'beads'
	[t̪θoːmbai]	/t̪θoːn-pai/	'have beads'
	[t̪θoːna]	/t̪θoːn-a/	'beads-ACC'
c.	[taindɨ]	/taintɨn/	'hole'
	[taindɨŋgappa]	/taintɨn-kappan/	'inside the hole'
	[taindɨna]	/taintɨn-a/	'hole-ACC'

(7) Accusative case and Aspirating stems

	surface	underlying	
a.	[pui]	/puih/	'eye'
	[puiɸai]	/puih-pai/	'have an eye'

[2]There are in fact four types of accusative inflection: i) suffixation of *-a*, ii) suffixation of *-i*, iii) qualitative change of a final [ɨ] to [i], and iv) no change. There is a certain amount of predictability in determining how a given stem is inflected for the accusative; for example, stems which bear a Nasalizing or Aspirating final feature take the *-a* suffix and *-i* is suffixed to stems ending in [a]. This predictability is limited, however, and will not be discussed further.

	[puiha]	/puih-a/	'eye-ACC'
b.	[ai]	/aih/	'crow'
	[aiθ̪ukka]	/aih-tukkan/	'under the crow'
	[aiha]	/aih-a/	'crow-ACC'
c.	[sappɨ̥]	/sappɨh/	'belly'
	[sappɨ̥xappa]	/sappɨh-kappan/	'inside the belly'
	[sappɨ̥ha]	/sappɨh-a/	'belly-ACC'

(8) Accusative case and Spirantizing stems[3]

	surface	underlying	
a.	[ẗ̪θo:]	/ẗ̪θo:/	'great grand-parent'
	[ẗ̪θo:βai]	/ẗ̪θo:-pai/	'have a great-grandparent'
	[ẗ̪θo:a]	/ẗ̪θo:-a/	'great-grandparent-ACC'
b.	[appɨ]	/appɨ/	'father'
	[appɨβai]	/appɨ-pai/	'have a father'
	[appɨa]	/appɨ-a/	'father-ACC'

In summary, final features are morpheme-final elements which are realized phonetically before morphemes beginning with a stop or nasal. However, final features are silent in phrase-final position and before continuants and vowels. Exceptionally, the Nasalizing and Aspirating final features are realized as full segments [n] and [h] before the accusative suffix -a, in spite of the fact that the accusative suffix is vowel-initial.

At first sight, the odd mixture of realization and silence which characterizes final features is reminiscent of "ghosts" or *latent segments*. According to Zoll (1996), latent segments are phonological elements which show properties which are distinct from those of *full segments*, or segments which consist of a root node with or without dependent features. These properties include the following: i) The particular quality of a latent segment is a lexical property of the morpheme in which it appears. ii) The presence or absence of a latent segment in a particular morpheme cannot be predicted based on that morpheme's prosodic or featural profile. iii) Latent segments do not appear in all contexts in which a normal

[3]I have been unable to find examples of Geminating noun stems which take the *-a* accusative suffix.

segment may be expected to appear. iv) The inventory of latent segments in a language is a subset of the full segmental inventory of that language. v) Latent segments do not contribute to the weight of syllables in languages which are sensitive to syllable weight. These properties are summarized in (9).

(9) properties of latent segments (Zoll 1996: 29)

a. unpredictable quality
b. unpredictable distribution
c. propensity for exceptional deletion
d. inventory limited in principled ways
e. no underlying length

Zoll demonstrates that these properties follow from the representation of latent segments as phonological elements devoid of a root node (10).

(10) latent segment full segment

® (= root node)
|
[features] [features]

The final features of Gosiute seem to have all of the properties of latent segments. They are unpredictable in quality and their distribution in the lexicon cannot be predicted on prosodic, featural or any other grounds; that is, given a noun stem, it is not possible to determine which of the final features it will bear, if any (9a, b). Final features are subject to deletion, which is not true of other segments in the language (9c). Final features comprise a limited inventory compared with the consonants of Gosiute (9d). Finally, final features do not contribute to syllable weight (9e), a point which will be demonstrated in section 3.2.

However, these diagnostics prove to be misleading. Part of the burden of this chapter, and the two chapters which follow, is to demonstrate the the Gosiute final features are in fact full segments complete with root nodes, rather than latent segments devoid of root nodes. In the remainder of this chapter, I will discuss the distributional properties of Gemination as a final feature and show that the correct representation for Gemination is as a

root node with a [+consonantal] feature. This argument rests on the observation that coda consonants in Gosiute are not moraic; geminates cannot, therefore, be represented as moraic consonants.

3. Gemination

As a demonstration of some of the distributional properties of final features, I will provide an account of Gemination in Gosiute. Although Gemination is more limited in scope than any of the other final features, many of the representational and distributional issues dealing with Gemination are relevant for the analysis of the other final features. The crucial questions in the representation of Gosiute final features are (i) Are final features "latent segments" (Zoll 1996) or full segments in their own right? and (ii) Are coda consonants moraic in Gosiute? In this chapter I provide additional evidence from Gemination that final features are full segments, and that coda consonants are not moraic but are best represented by a separate root node (Selkirk 1990). Some of these arguments will extend to the analysis of Nasalization and Aspiration.

3.1. Descriptive generalizations

Following certain morphemes, a voiceless stop or nasal will surface as a geminate; the examples in (11) demonstrate this with the morphemes tɨpa″ 'pine nut', tua″ 'son', tuː″ 'black', and the instrumental prefix ta″- 'with the foot'.[4]

(11) gemination at morpheme boundaries

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[4]Quote marks ⟨"⟩ mark a Geminating final feature; this convention was introduced in Miller (1972) and has been adopted by most scholars working with Central Numic final features.

	surface	underlying	
a.	[tɨβa]	/tɨpa"/	'pine nut'
	[tɨβappai]	/tɨpa"-pai/	'have pine nuts'
	[tɨβattukka]	/tɨpa"-tukkan/	'under the pine nuts'
	[tɨβakkaβa]	/tɨpa"-kapan/	'among the pine nuts'
	[tɨβammai]	/tɨpa"-mai/	'with the pine nuts'
b.	[tua]	/tua"/	'son'
	[tuappai]	/tua"-pai/	'have a son'
	[tuammai]	/tua"-mai/	'with the son'
c.	[tuː]	/tuː"/	'black'
	[tuːttaiβo]	/tuː"+taipo/	'Negro' ('black'+'European')
	[tuːkk^{w}asu]	/tuː"-k^{w}asun/	'soldier' ('black'+'shirt')
d.	/ta"-/		'with the foot'
	[tattoː]	/ta"-toː/	'put on shoes'
	[tannua]	/ta"-nua/	'push with the foot'

When stems bearing a Geminating final feature occur phrase finally, the final feature is silent (12).[5]

(12) Phrase-final Gemination

[suɾɨ wihỹu suβa wɨːɾa ikkɨ̥ u muhyumma kattɨŋgahr̃iβa suɾɨn denna]
suti wihnu supa wɨːta ikkih u muhyun -ma kattin kahni -pa sutin tenna"
that then on.it bear here it door -at sitting house -on that man
'That man was sitting here at the door of the house of Bear.'

When stems bearing a Geminating final feature occur before vowels or continuants, the final feature is silent (13).

(13) Pre-vocalic and pre-continuant Gemination

[kona wasɨŋgina]
kona" wasɨ -(n)ki -na
wood kill.PL.OBJ -hither -ASP
'The wood has been killing us.'

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[5]Geminating stems account for only 1% of the vocabulary of Gosiute, according to a count I have made of the dictionary found in Miller (1972). For this reason, it is very difficult to find examples of geminating stems in the relevant contexts. This accounts for the scarcity of examples in (12) and (13).

[ɨɣiʈ̪ʈ̪θi wihỹu nɨ ɾua ɨɣiʈ̪ʈ̪θi nɨmiðɨ]
ɨkiʈ̪ʈ̪θi wihnu nɨ tua" ɨkiʈ̪ʈ̪θi nɨmi -tɨn
now-a-days then my son now-a-days live -ASP
'My boy is still living.'

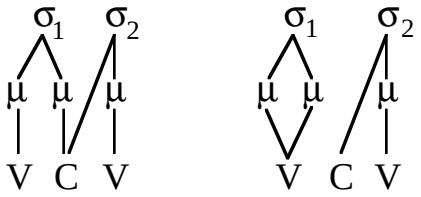
To summarize, Gemination as a final feature is phonetically realized only on stops and nasals; before all other segments and in phrase-final position, Gemination is silent.

3.2. The representation of Gemination

A popular view of the representation of geminate consonants analyzes them as a single root node simultaneously linked to a mora on the left and a syllable node (or a mora) on the right (see among others, Hyman 1985, Hayes 1989, McCarthy and Prince 1986, 1990). Syllables closed by a geminate (14a) thus form a natural class with syllables containing a long vowel (14b).

(14) heavy syllables in moraic phonology (V = vocalic root node, C = consonantal root node)

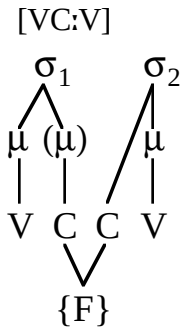
a. [$\underline{VC_1}.C_1V$] b. [$\underline{V\text{ː}}$.CV]



An implication of this representation is that syllables closed by a geminate behave identically with syllables containing long vowels with respect to phenomena such as stress and prosodic morphology (reduplication, infixation, templatic morphology, etc). This prediction has been borne out in many languages of the world (but not all; see Tranel 1991).

A constrasting view of geminates is presented in Selkirk (1990). There, gemination is represented by a single set of features linked to two root nodes (15).

(15) Two-root theory of geminates (Selkirk 1990)



Under this view of gemination, a syllable closed by a geminate consonant may be bimoraic, but need not be. A crucial test to distinguish the moraic theory of geminates from two-root theory of geminates would thus involve a language which can be shown to be sensitive to syllable weight in the assignment of stress, but nevertheless fails to count geminates as contributing to syllable weight (Selkirk 1990: 41). Gosiute is just such a language.

Stress in Gosiute counts moras. The general stress rule is that from the left, every odd numbered mora is stressed, with the leftmost mora receiving primary stress (16).

(16) Gosiute stress: every other mora

[pížahìβiðɨ]	'drinking milk'
[tóimbìðɨ]	'finally came out'

Heavy syllables attract stress. This will move stress from the first mora to the second when the second mora is part of a heavy syllable. In each of the forms in (17) main stress passes by the first mora and becomes fixed on the second, since in each case the second mora is part of a long vowel.

(17) Stress and heavy syllables

[nuɾá:nnu̥]	'ran'
[kottó:x^{w}ḁ]	'made a fire'

However, syllables closed by a geminate are not stressed except when the vocalic mora happens to be an odd numbered one or if the syllable contains a long vowel, which would

have been stressed in any case. In the forms in (18), stress passes by a syllable closed by the first half of a geminate (underlined).

(18) Unstressed syllables closed by geminates

a.	[hí<u>ßik</u>k^{w}à]	'drank'
	*[híßìkk^{w}a]	
b.	[yáɣ<u>et</u>tɨɣixàndɨ]	'crying constantly'
	*[yáɣèttɨɣìxàndɨ]	

The stress facts thus point unequivocally to the conclusion that geminates are not moraic in Gosiute.

In addition to the stress facts cited above, there is typological evidence to consider Gosiute geminates as non-moraic. In the forms in (19), a geminate voiceless stop follows a long vowel in the first syllable. If geminates were moraic, that would imply a trimoraic syllable (two for the long vowel, one for the coda), which is typologically unusual.

(19) Geminates and long vowels

[tɨːppai]	'whip'
[aːttoɣo]	'potato bug'
[waːppi]	'cedar tree'
[tuːkk^{w}asu]	'soldier'

Both the stress data and typological considerations argue against a representation of gemination involving an empty mora, and I therefore conclude that in Gosiute geminates are non-moraic. This satisfies Selkirk's (1990) test to distinguish moraic geminates from two-root geminates; I assume the latter representation for geminates in Gosiute.

4. The analysis of Gemination

Having motivated a representation for Gemination as a root node, I turn now to an account of the distribution of the phonetic reflexes of Gemination. Gemination is audible before stops and nasals, but is silent elsewhere. In this section I account for this distribution.

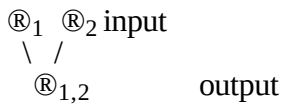
4.1. The expression of Gemination

Here I account for the gemination of stops and nasals following a morpheme with a Geminating final feature. If geminates are treated as a sequence of two root nodes in Gosiute, then anything other than a one-to-one mapping between input and output root nodes will be suboptimal. The constraint ROOT-UNIFORMITY is then crucial in preventing such an input-output pairing. It is defined in (21).

(21) ROOT-UNIFORMITY (UNIF): 'No root node of the output has multiple correspondents in the input.'

This constraint is violated when a root node in the output has multiple correspondent root nodes in the input; that is, when two underlying segments coalesce into a single surface segment, a situation depicted in (22).

(22) *ROOT-UNIFORMITY



Such a configuration cannot be the outcome of Gemination in Gosiute.

Another constraint which is crucial for the correct outcome of Gemination is MAXROOT. This constraint acts to prevent the deletion of a root node from the input. It is defined in (23).

(23) MAXROOT (MAX): 'Every root node of the input has a corresponding root node in the output.'

The constraint MAX marks input-output pairings such as (24) as ill-formed:

(24) *MAX

®$_1$ ®$_2$ input
|
®$_1$ output

In chapter 2 I motivated the constraint PLONS, which demands that consonantal place features be licensed by association to an onset. In the analysis of Gemination PLONS insures that the root node which is the Geminating final feature share place of articulation features with a following stop or nasal. The activity of these three constraints is demonstrated in the tableau in (25).

(25) Gemination

	/tɨpa"$_1$-p$_2$ai/	PLONS	MAX	UNIF
a. ☞	tɨβap$_1$p$_2$ai			
b.	tɨβap$_{1,2}$ai			*!
c.	tɨβap$_2$ai		*!	
d.	tɨβat$_1$p$_2$ai	*!		

In this tableau, any violation of any of the three constraints PLONS, MAX, or UNIFORMITY renders a candidate suboptimal, leaving only the candidate which satisfies all three of them (25a). In (25d), the Geminating final feature receives a Coronal place of articulation; this violates PLONS since the following consonant is Labial; the Coronal feature is not licensed in this position. Candidate (25c) violates MAX since the root node indexed "1" has no correspondent in the output. Candidate (25b) violates UNIF since a single root node in the output is indexed as a correspondent to two root nodes in the input. Candidate (25a) satisfies all of the requirements of the constraints presented since the Labial feature is licensed on the coda consonant by its association with the following onset; furthermore, each input root node has exactly one correspondent in the output, satisfying both MAX and UNIF.

4.2. The surface absence of Gemination

There are no other phonetic reflexes of Gemination. In particular, Gemination is silent in the following environments: phrase-finally, pre-vocalically, and before continuants. I will account for each of these environments in turn.

4.2.1. Phrase-final Gemination

The absence of gemination in phrase-final position involves nothing more than the ranking of constraints already established in section 4.1. If PLONS is ranked above MAX, the correct results ensue (26).

(26) PLONS » MAX

	/tɨpa"/	PLONS	MAX
a. ☞	tɨβa		*
b.	tɨβat	*!	

In the tableau in (26), candidate (26b) fails PLONS since the final consonant, [t], has place features not associated to an onset; these features are thus not licensed. This violation is more egregious than the MAX violation which ensues if the final feature is deleted altogether, so candidate (26a) is judged by the constraint hierarchy to be optimal.

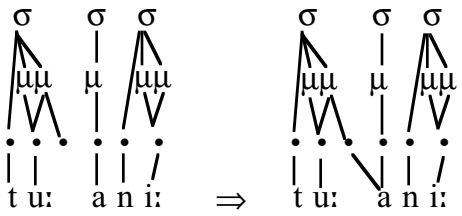
4.2.2. Prevocalic Gemination

In section 3 I argued that Gemination should be represented as a root node. Vocalic features as well as consonantal features may be linked to a root node, so in principle there is nothing to prevent a Geminating final feature from lengthening a following vowel. In (27), a potential vowel-lengthening situation arises when the morpheme tuː" 'black', which ends in a

Geminating final feature, is immediately followed by the vowel-initial morpheme aniː 'ant'.

(27) Faulty realization of Gemination

/tuː"+aniː/ *[tuːaːniː] 'black ant'



This structure is anomalous since elsewhere long vowels are bimoraic, while in (27) the derived long vowel is monomoraic. Since it is this association of a vowel with the root node representing Gemination which is faulty, I propose the constraint in (28) to prohibit this configuration.

(28) DEPASSOC(V) (DEP-A(V)): An output association to [–cons] has a correspondent in the input.

This constraint prohibits the insertion of an association line from a segment specified [-consonantal] to an empty root node, precisely the operation shown in unattested (27).

A different sort of problem emerges if the Geminating final feature is assigned consonantal features rather than vocalic features, say, by inserting the feature [+constricted glottis] ([+cg]) to produce a glottal stop. The preservation of [+consonantal] is not at issue since the surface glottal stop is specified [+cg]. By mapping the Geminating feature to a surface glottal stop, the constraint DEP-A(V) is satisfied, as is MAX. Additionally, all of the candidates vacuously satisfy PLONS since vowels and glottal stop don't carry consonantal place of articulation features (29).

(29) false prediction

	/tuː"$_1$-a$_2$niː/	DEP-A(V)	PLONS	MAX
a. (☞)	.tuː.a$_2$.niː.			*!
b. ✘	.tuː.ʔ$_1$a$_2$.niː.			
c.	.tuː.aː$_{1,2}$.niː.	*!		

In the tableau in (28) candidate (28b) is erroneously judged the winner, since it satisfies all of the constraints introduced thus far. It bears the feature [+consonantal], glottal stop has no place of articulation features and thus satisfies PLONS vacuously, and its root node is the output correspondent of the input Geminating final feature. However, Gosiute does not have a glottal stop in this position.

It should be noted that candidate (29b) shows a mismatch between syllable and morpheme boundaries. That is, the glottal stop corresponding with the Geminating final feature is morphologically affiliated with the material to its left, but at the same time, it forms the onset of the syllable to its right. This state of affairs is generally not permitted in Gosiute; this is due to the constraint in (30), based on the Alignment Schema of McCarthy and Prince (1993).

(30) ALIGN (Morph, R; σ, R) (ALIGN-R): 'For every morpheme there is a syllable such that the right edge of the morpheme and the right edge of the syllable coincide.'

This constraint is violated every time a syllable crosses a morpheme boundary. Adding this constraint to those already established yields the desired results and eliminates candidate (29b) from the competition. This is shown in the tableau in (31). (In this tableau PLONS has been suppressed since none of the candidates violates it.)

(31) $\left\{\begin{matrix}\text{DEP-A(V)}\\ \text{ALIGN-R}\end{matrix}\right\}$ » MAX

	/tuː"$_1$-a$_2$niː/	DEP-A(V)	ALIGN-R	MAX
a. ☞	.tuː.a$_2$.niː.			*
b.	.tuː.ʔ$_1$a$_2$.niː.		*!	
c.	.tuː.aː$_{1,2}$.niː.	*!		

Now because of the mismatch between syllable and morpheme boundaries, candidate (31b) tu:ʔani: is rejected in favor of (31a). This is the desired outcome.

4.2.3. Precontinuant Geminate deletion

Gemination also has no phonetic effect on a fricative. To account for this fact, I propose the constraint in (32).

(32) *FF: 'Avoid geminate fricatives.'

This constraint is based on the effort-based approach to lenition found in Kirchner (1998). Reporting on a software simulation of a bio-mechanical model of effort relations in speech sounds, Kirchner found that considerably more effort is expended in the production of a geminate fricative than in a singleton. Adding this constraint to the group of constraints at the top of the Gemination hierarchy will account for the absence of geminate fricatives in Gosiute (33).

(33) No Geminate fricatives

	/tu:"$_1$-s$_2$aiya/	*FF	DEP-A(V)	PLONS	ALIGN-R	UNIF	MAX
a.	tu:s$_1$s$_2$aiya	*!					
b. ☞	tu:s$_{1,2}$aiya					*	
c. ☞	tu:s$_2$aiya						*

In the tableau in (33), three candidates are considered. Of these three, the first, (33a), violates the constraint *FF because of the geminate fricative. Candidates (33b) and (33c) each violate a single constraint; (33b) violates UNIF since the output [s] is indexed to two segments in the input, while candidate (33c) has no output correspondent for the Geminating final feature, and thus violates MAX. At this point, there is no ranking argument for deciding which of these two constraints would decide the competition; in chapter 5 I will argue that MAX must outrank UNIF (see chapter 5, section 4.1).

4.3. Summary

In this section I have provided an account of the expression and deletion of the Geminating final feature. The final ranking of constraints introduced here is given in (34).

(34) Gemination: Final constraint ranking

$$\left\{ \left\{ \begin{array}{c} \textsc{Unif} \\ *FF \\ \textsc{Dep-A(V)} \\ \textsc{Align-R} \\ \textsc{PlOns} \end{array} \right\} \gg \textsc{Max} \right\}$$

This ranking accounts correctly for the patterns of realization of Gemination. The general strategy for Gosiute is to delete the Geminating final feature when conditions for its expression haven't been met; this is encoded in the constraint hierarchy by the low ranking of the constraint MAX.

5. Conclusion

In this chapter I have introduced the final features and discussed their distributional properties. I have demonstrated that Gemination in particular is best treated as a root node, and that geminates in Gosiute should be represented as a sequence of two root nodes linked to the same featural content (Selkirk 1990). This conclusion was the result of an examination of the stress system of Gosiute, which is mora-counting but which doesn't count coda consonants. Gemination is thus best considered to be a full segment, one which is provided with a root node. In this chapter I also accounted for the distributional properties of Gemination; Gemination is phonetically realized before stops and nasals but is silent phrase-finally and before vowels and continuants. The role of the representation of Gemination is crucial to this account.