Theoretical Aspects of Kashaya Phonology and Morphology

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Theoretical Aspects of Kashaya Phonology and Morphology

By

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Theoretical Aspects of Kashaya Phonology and Morphology

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Table of Contents

Acknowledgments ................................................................. vi

Chapter 1: Introduction .......................................................... 1
  1.1. Theoretical Assumptions ................................................. 4
  1.2. Background and Previous Work ....................................... 6
  1.3. Notation and Abbreviations ......................................... 7

Chapter 2: Segmental Representations ...................................... 12
  2.1. Segment Inventory ..................................................... 12
  2.2. Underlying Representations .......................................... 16
      2.2.1. Feature Geometry ............................................... 16
      2.2.2. Consonant Underspecification: Place Features .............. 19
      2.2.3. Consonant Underspecification: Manner Features .......... 26
      2.2.4. Vowel Underspecification ..................................... 34
  2.3. Glottalized and Aspirated Sonorants ............................... 38
      2.3.1. General Considerations ........................................ 38
      2.3.2. Phonological Evidence ........................................ 46
      2.3.3. Voiced Stops .................................................... 50
  2.4. The Status of Glides .................................................. 58

Chapter 3: Segmental Processes ............................................. 69
  3.1. Rules Targeting Laryngeal Features ................................. 69
      3.1.1. Glottal Merger .................................................. 70
      3.1.2. Onset Simplification .......................................... 78
      3.1.3. Desonorization ................................................ 80
      3.1.4. Glottal Transfer ................................................. 83
      3.1.5. Aspirate Dissimilation ....................................... 85
      3.1.6. Cluster Deaspiration ......................................... 88
      3.1.7. Coda Aspiration ............................................... 89
  3.2. Place Node Delinking ................................................ 91
      3.2.1. Coronal Debuccalization .................................... 92
      3.2.2. Uvular Debuccalization ..................................... 98
      3.2.3. Debuccalization of Word-Final Stops ....................... 99
3.3. Vowel-Consonant Interactions ................................................. 103
  3.3.1. The Epenthetic Vowel .............................................. 103
  3.3.2. Uvular Assimilation ................................................. 106
  3.3.3. [+back] Insertion .................................................. 112
  3.3.4. [+round] Insertion ................................................ 113
  3.3.5. Uvular Raising .................................................... 115
  3.3.6. /e/ Raising ....................................................... 119
3.4. Vowel Harmony ................................................................... 123
  3.4.1. Translaryngeal Harmony ........................................... 123
  3.4.2. Height Harmony ..................................................... 128
3.5. Other Rules ....................................................................... 133
  3.5.1. Sonorization .......................................................... 134
  3.5.2. Palatalization ......................................................... 138
  3.5.3. Gemination ........................................................... 142
3.6. Summary ........................................................................... 145

Chapter 4: Constraint-Triggered Rules ........................................ 147
  4.1. Review of Rules .......................................................... 147
  4.2. Background ................................................................ 150
    4.2.1. Previous Approaches ........................................... 150
    4.2.2. Assumptions ....................................................... 152
  4.3. Application to the Kashaya Data ................................... 156
    4.3.1. Place Delinking ................................................... 156
    4.3.2. Laryngeal Delinking ............................................ 158
    4.3.3. Sonorization ....................................................... 160
    4.3.4. Addition of Laryngeal Features ............................... 161
  4.4. Conclusion .................................................................. 162

Chapter 5: Metrical Phonology ................................................ 166
  5.1. Basic Prosody ................................................................ 166
  5.2. Persistence ................................................................. 170
    5.2.1. Extrametricality of Initial Syllabes ......................... 170
    5.2.2. Persistence to the Postlexical Component ............... 174
    5.2.3. Theoretical Considerations ................................. 177
  5.3. The Special Status of Long Vowels ............................... 180
    5.3.1. Foot Flipping and Stress Shift ............................... 180
    5.3.2. Stress Shift Alone ............................................... 183
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4</td>
<td>Summary</td>
<td>186</td>
</tr>
<tr>
<td>5.5</td>
<td>Analysis</td>
<td>187</td>
</tr>
<tr>
<td>5.5.1</td>
<td>Level Ordering</td>
<td>187</td>
</tr>
<tr>
<td>5.5.2</td>
<td>Creation of an Anti-lamb</td>
<td>190</td>
</tr>
<tr>
<td>5.5.3</td>
<td>Stress Shift as Extrametricality</td>
<td>192</td>
</tr>
<tr>
<td>5.5.4</td>
<td>Foot Flipping as a Rule</td>
<td>195</td>
</tr>
<tr>
<td>5.5.5</td>
<td>Stress Shift, Literally?</td>
<td>204</td>
</tr>
<tr>
<td>5.6</td>
<td>Cumulativity and Peripherality</td>
<td>207</td>
</tr>
<tr>
<td>5.7</td>
<td>Further Issues</td>
<td>216</td>
</tr>
<tr>
<td>5.7.1</td>
<td>Presuffixal Lengthening</td>
<td>216</td>
</tr>
<tr>
<td>5.7.2</td>
<td>'Blocking' of Syllable Extrametricality</td>
<td>223</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Mora and Syllable Structure</td>
<td>227</td>
</tr>
<tr>
<td>6.1</td>
<td>Basic Prosodic Structure</td>
<td>227</td>
</tr>
<tr>
<td>6.1.1</td>
<td>Morification</td>
<td>228</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Syllabification</td>
<td>230</td>
</tr>
<tr>
<td>6.1.3</td>
<td>Exceptional Superheavy Syllables</td>
<td>232</td>
</tr>
<tr>
<td>6.2</td>
<td>Closed-Syllable Shortening</td>
<td>235</td>
</tr>
<tr>
<td>6.3</td>
<td>Final-Consonant Extrapersodicity</td>
<td>240</td>
</tr>
<tr>
<td>6.3.1</td>
<td>Epenthesis</td>
<td>243</td>
</tr>
<tr>
<td>6.3.2</td>
<td>Distribution of Superheavy Syllables</td>
<td>248</td>
</tr>
<tr>
<td>6.3.3</td>
<td>Shortening in Word-Final CVVC</td>
<td>253</td>
</tr>
<tr>
<td>6.3.4</td>
<td>Sensitivity to Extrapersodicity</td>
<td>256</td>
</tr>
<tr>
<td>6.3.5</td>
<td>Resyllabification</td>
<td>260</td>
</tr>
<tr>
<td>6.4</td>
<td>Laryngeal Increments</td>
<td>262</td>
</tr>
<tr>
<td>6.4.1</td>
<td>The Phenomenon</td>
<td>262</td>
</tr>
<tr>
<td>6.4.2</td>
<td>Representations</td>
<td>269</td>
</tr>
<tr>
<td>6.4.3</td>
<td>Implications</td>
<td>272</td>
</tr>
<tr>
<td>6.5</td>
<td>The Decrement</td>
<td>282</td>
</tr>
<tr>
<td>6.5.1</td>
<td>Examples</td>
<td>282</td>
</tr>
<tr>
<td>6.5.2</td>
<td>The Form of the Rule</td>
<td>285</td>
</tr>
<tr>
<td>6.5.3</td>
<td>Blocking of the Decrement</td>
<td>287</td>
</tr>
<tr>
<td>6.6</td>
<td>Elision</td>
<td>290</td>
</tr>
<tr>
<td>6.7</td>
<td>Glide Deletion</td>
<td>294</td>
</tr>
<tr>
<td>6.8</td>
<td>Morphological Shortening</td>
<td>301</td>
</tr>
<tr>
<td>Chapter 7: Organization of the Phonology and Morphology</td>
<td>305</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>7.1. Traditional Position Classes</td>
<td>305</td>
<td></td>
</tr>
<tr>
<td>7.2. An Analysis in Terms of Levels</td>
<td>307</td>
<td></td>
</tr>
<tr>
<td>7.2.1. Prefixes</td>
<td>307</td>
<td></td>
</tr>
<tr>
<td>7.2.2. The Inner Group Suffixes</td>
<td>309</td>
<td></td>
</tr>
<tr>
<td>7.2.3. The Middle Group Suffixes</td>
<td>315</td>
<td></td>
</tr>
<tr>
<td>7.2.4. The Outer Group Suffixes</td>
<td>322</td>
<td></td>
</tr>
<tr>
<td>7.3. Level Ordering</td>
<td>328</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 8: Morphological Details</th>
<th>331</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1. Templatic Morphology</td>
<td>331</td>
</tr>
<tr>
<td>8.2. Infixedan</td>
<td>336</td>
</tr>
<tr>
<td>8.3. Reduplication</td>
<td>341</td>
</tr>
<tr>
<td>8.3.1. CV Reduplication</td>
<td>341</td>
</tr>
<tr>
<td>8.3.2. Stem Reduplication</td>
<td>348</td>
</tr>
<tr>
<td>8.4. Aphesis</td>
<td>354</td>
</tr>
<tr>
<td>8.5. Compounding</td>
<td>356</td>
</tr>
<tr>
<td>8.6. The Kinship System</td>
<td>361</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 9: Conclusions</th>
<th>369</th>
</tr>
</thead>
<tbody>
<tr>
<td>References</td>
<td>372</td>
</tr>
<tr>
<td>Appendix: List of Verb Suffixes</td>
<td>387</td>
</tr>
</tbody>
</table>
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vi
Chapter 1
Introduction

Broadly speaking, there are two major approaches to the study of linguistics. The first, the DATA-ORIENTED approach, involves the collection and analysis of data from various languages. The second, the THEORY-ORIENTED approach, involves the formalization of the results of data analysis in terms of a precisely elaborated model which attempts to express common linguistic processes in simple terms, and uncommon processes in more complicated terms. Ideally, processes which are unattested in any language should be impossible to express in the theory.

Obviously, we cannot apply theory to data unless those data have first been collected and given an analysis according to basic linguistic principles which are accepted by most or all linguists. On the other hand, the collection and analysis of data from a single language is not enough to understand how language in general works; in fact, it is not even enough to understand how that single language really works. In order to get a clear picture of language in general, we need to compare the facts of many languages; and only in this wider context can we see how the facts of an individual language fit in the broader picture. The theory also serves to determine the most promising areas for further collection of data. Any linguist with a modicum of experience develops an intuitive sense for what sorts of processes are ‘natural’ in language, and this intuition can often provide a reasonable notion of how a particular language fits in the general scheme. But intuition is not adequate for the science of linguistics; we must make our intuitions clear and explicit by expressing them in formal terms, give data from many languages to support our model, and test the predictions that follow from the model by applying it to the analysis of other languages. The vague
intuitive sense of what is a ‘normal’ process finds more precise expression in the ease and naturalness of representing the process in the formal model.

In line with these two basic approaches to linguistic research, there are (among others) two quite different ways of going about the writing of a dissertation. One possibility is to describe a language which is relatively or completely unknown to the linguistic community, collecting and analyzing the data that the language offers. Such efforts are essential to increasing our knowledge of what kind of variation is possible in human language, but do not immediately contribute to our understanding of how the language fits in a larger context. Another possibility is to discuss a particular theoretical problem, giving evidence from a wide range of languages to support a specific solution to the problem. This sort of synthesis is also essential to draw conclusions from the large amount of data scattered in various sources, but complex aspects of the individual languages must often be overlooked. Between these two extremes, however, there is a third possibility: a detailed analysis of a single language, based on formal theoretical models but extensive enough to give fair treatment to all the complexities of the language and how they interact with one another. This type of in-depth analysis provides an opportunity to thoroughly test the adequacy of the theory, as well as to shed light on how the language fits into the larger cross-linguistic context. The present dissertation falls into this category, since it has been my goal to apply the tools of modern phonological and morphological theory to the data of Kashaya.

Kashaya (or Southwestern Pomo) is a member of the Pomoan family of languages of northern California. Of the seven languages in this family, Kashaya is spoken today by the greatest number of people (perhaps two or three dozen); the other Pomoan languages are extinct or have only a handful of speakers. Kashaya has also been thoroughly described in the work of Robert Oswalt (§1.2). Oswalt’s analysis, however, is not couched in the model of modern generative grammar; this means that the complex phonological and morphological patterns found in Kashaya have not been used to test the predictions made.
by current theories. There are two complementary reasons to remedy this situation. First, every language that is analyzed using the tools provided by a theory serves as a means of evaluating the adequacy of that theory; and since Kashaya offers many interesting patterns, it is a potential source of important data bearing on the proper composition of the theory. Second, since Kashaya has been analyzed largely on its own terms, it is difficult to see how it fits in the larger picture of how languages work beyond an intuitive sense. Specifically, there are ideas and tools developed through the study of other languages (formalized in the theory) which can help explain why some things work the way they do in Kashaya, and lead to simpler analyses of the language-internal patterns. Because Oswalt has done the essential fundamental analysis of the data, a new analysis in generative terms has a firm foundation to build on.

What exactly do modern phonology and morphology have to offer? An important change in the approach to phonology since the original generative formulation (Chomsky and Halle 1968; hereafter SPE) has been the development of separate theories for different areas of phonology. In SPE an effort was made to express rules for all types of phonological processes in the same segment-based terms. This includes such things as stress and syllable structure, which are inherently of broader scope than the segment. More recently, separate theories of the syllable and metrical structure have been proposed which are more successful in accounting for the unique properties of these subparts of the grammar. With the advent of autosegmental phonology and feature geometry, even phenomena which appeared to involve single segments have been profitably reanalyzed. The nature of morphological rules, and their interaction with the rules of phonology and syntax, have also received increasing attention. I argue in the following chapters that the theories which have been developed in the past ten or twenty years provide valuable tools for understanding Kashaya in its own right, in addition to its typological relation to other languages of the world. To take one example, in chapter 5 I give an analysis of stress placement in Kashaya using the tools of metrical phonology which, I believe, succeeds in
bringing relative order to a very complicated set of data. At the same time, however, certain changes are necessary in the theory, especially with regard to extrametricality, in order to give an adequate treatment of the Kashaya facts. A similar case can be made for the other issues treated here. Crucially, they must all be organized into a coherent whole, where each aspect of the analysis fits with the others. In short, Kashaya gives us an excellent opportunity to test many claims of modern phonological and morphological theory, and to explore how the theory can contribute to an understanding of the grammar of an individual language.

In the remainder of this chapter I outline the basic assumptions which inform the analysis (§1.1); the sources of the data on which the analysis is founded (§1.2); and the notations and abbreviations used throughout (§1.3).

1.1. Theoretical Assumptions

As suggested in the previous section, I base my analysis on the formal models of modern generative phonology and morphology. Although many of these issues are discussed where relevant in the body of the dissertation, I lay out here in very broad strokes the assumptions that I make. As formulated below they are intended primarily as context useful to the reader, rather than as theoretical claims. References to the literature in this section are given only when the issue at hand is not discussed in greater depth later on.

My most fundamental assumption is a commonplace of modern linguistics: languages do not vary in unpredictable ways, but rather show often striking similarities which suggest universal properties of all natural languages. The goal of formal phonological theory is to capture these properties in a rigorous and testable fashion. The purpose of this dissertation is to put some of the generalizations of the theory to an empirical test based on data from one language studied in depth.

I couch my analysis in the general framework of Lexical Phonology (Kiparsky 1982,
1985, K.P. Mohanan 1982, 1986, and many others). The lexicon is divided into distinct levels (five in Kashaya), each of which includes particular morphological rules. Phonological rules are typically associated with more than one level; the levels in which a particular phonological rule is active are, at a minimum, part of a contiguous block of levels (the Stratum Domain Hypothesis: K.P. Mohanan 1982), and at least in the most common case, apply from level 1 to some later level, and all that needs to be said about the rule is when it ceases to be active (the Strong Domain Hypothesis: Kiparsky 1984). In Kashaya, phonological rules apply cyclically after each morphological operation in all levels but the last level of the lexicon, level 5, which is noncyclic: there all the morphology precedes all the phonology. After a word completes its lexical derivation, it enters the postlexical component and is placed in a phrase by the syntax. At this point other rules can apply, or a rule active in the lexical component can have another chance to apply. In general, lexical rules are structure-preserving, i.e. they do not create nondistinctive structure; postlexical rules, on the other hand, can lead to allophonic variation. I assume, however, that Structure Preservation is not a monolithic property; rather, it is expressed by constraints on lexical representations which can turn off before or after the transition to the postlexical component; that is, however, the default point for the constraints to turn off.

Following the claims of autosegmental phonology (e.g. Goldsmith 1976), I assume that phonological features are represented on separate tiers. For a segment to bear a feature, that feature must be linked to the Root node which defines the segment. The deletion of a feature is formalized as delinking, followed by erasure of the unlinked feature if it cannot link elsewhere. Features are organized according to articulatory categories into a hierarchy (a ‘feature geometry’) which determines how features can function as a group. Assimilation of one segment to another involves the spreading of some feature, or a node dominating multiple features, between the segments. The features themselves are radically underspecified: that is, the unmarked value of a feature is not present in underlying representations and because it is absent it cannot spread, block spreading, or even be
referred to in a rule. It is inserted by default at some later point, typically at the end of the lexicon.

Segments are linked directly to prosodic structure, which consists of moras, syllables, feet, and higher word- and phrase-level categories. There is no intermediate skeleton (X or CV) between the Root node dominating all features and the mora, which is the constituent to which all segments must link. Moras and syllables play an important role in many of the rules formulated here; the main role of feet is in the system of stress placement. Prosodic constituents can be marked as invisible (extrametrical) when at the edge of the domain, in which case they are ignored by (certain) phonological rules. In Kashaya I argue for the invisibility of initial syllables, initial feet, and final consonants.

1.2. Background and Previous Work

I began my research on Kashaya as part of a field methods class directed by Leanne Hinton at Berkeley in the 1989-90 school year, and continued working on the language after that time. Our consultant was Milton ‘Bun’ Lucas, and he continued as my primary consultant in my subsequent work on the dissertation. Toward the end of my research I also worked with Otis Parrish.

This dissertation owes an incalculable debt to the work of Robert Oswalt; without his decades-long dedication to Kashaya and the other Pomoan languages the data on which most of my analysis is based would not exist. In addition, while my approach and emphasis differ in many respects from that in Oswalt’s dissertation (1961), that work sets out all the major descriptive issues which arise in the analysis of Kashaya phonology and morphology. It is the source of the basic morphological analysis that I assume throughout, though my representations reflect my different framework. Another source of many forms is a Kashaya wordlist (Oswalt 1975); this consists primarily of nouns, plus other parts of speech such as adjectives and adverbs. No verbs are included. Although no dictionary of
Kashaya is available, Oswalt gave me and other members of the Kashaya field methods class copies of the first two letters (b and c) of his dictionary in preparation, which I cite as Oswalt (1990). While this source constitutes the best potential source of data about particular words, the fact that only two (out of thirty) initial phonemes in the native vocabulary are represented limits its usefulness.

Other sources have occasionally provided additional data; for example, the collection of Kashaya texts in Oswalt (1964a) provides a wealth of material little exploited here, and information on borrowings is given in Oswalt (1958, 1964b, 1971, 1988b). Additional works by Oswalt are cited in the bibliography. McLendon (1973) and Oswalt (1964b, 1976) provide historical and comparative perspective, though with differing conclusions on some points. Data collected by earlier researchers have not been used here; references are given in Oswalt (1961).

1.3. Notation and Abbreviations

The vast majority of linguistic forms cited in this dissertation come from four sources. Many morphologically complex words are from Oswalt (1961), in which case the form or its gloss is followed by the page number in square brackets; for example, [123] is to be interpreted as Oswalt (1961:123). Similar types of examples given in the manuscript dictionary (Oswalt 1990) are cited as [D]; the pages are unnumbered but organized alphabetically by root. A number of uninflected nouns and other words are taken from Oswalt (1975). These words are given no citation; again, the page number is unnecessary since they are arranged alphabetically (by gloss) in the source. In citations of data, other works by Oswalt are given in a format such as [Os64b], to be interpreted as Oswalt (1964b); most of those references are short papers and often no page number is included here. Data from other sources are cited with a full reference, e.g. McLendon (1973:89). Finally, data from my notes are cited (largely for my own reference) with two numbers,
again in square brackets: the notebook (1-3) separated from the page number with a period; for example, [2.123] for notebook 2, page 123. Forms from notebooks 1 and 2 reflect the speech of Bun Lucas; those from notebook 3 were elicited from Otis Parrish.

In addition to these bibliographic citations, the following notational practices are used. A hyphen shows that a form is a stem which requires one or more affixes to complete its morphology. All verb roots require at least one suffix and are thus followed by a hyphen (mo- ‘run’), while some roots require a prefix as well and are also preceded by a hyphen (-yec- ‘press’). At times, verbs are cited in incomplete form, to avoid further changes due to additional suffixes which may obscure the point at hand; these incomplete verbs are followed by a hyphen. Slashes represent underlying forms, e.g. /tápla/; square brackets indicate that some rule has applied, e.g. [tápla], but may not represent the final surface form.

It is impossible to provide a full derivation for every form cited here, with representations after every morphological and phonological rule; in general I give no more than one or two intermediate stages. Great care has been taken, however, to ensure that each stage shown is internally consistent. That is, if the application of one phonological rule is evident, then the effect of every earlier rule is also shown. Particularly relevant here are rules relating to metrical and syllable structure. For example, stress placement is postlexical, and I do not show stress on any incomplete stems, since they cannot exit the lexicon as such. Conversely, the special status of laryngeal increments is lost in level 2 of the lexicon, so any later stages will not show them as anything but simple glottal segments; and since the survival of a word-initial increment depends on the preceding word, it is preserved in the representation of all incomplete lexical stems, but removed from complete words which are assumed to be uttered in isolation.

Even when morphologically complete, stress is indicated only on those words long enough to undergo the normal rule of Foot Construction; shorter words which would
receive final stress by the default End Rule are unmarked (see chapter 5). Stress on a word-final closed syllable is marked, although in certain contexts that syllable may become open and the stress would fall on the next syllable: the assumption is made that the word is spoken in isolation. Classes of segments are occasionally abbreviated as follows when cited in the text:

(1)  
\begin{align*}
\text{C} & \quad \text{consonant} \\
\text{V} & \quad \text{vowel} \\
\text{G} & \quad \text{glide} \\
\text{R} & \quad \text{resonant (a sonorant consonant)} \\
\text{H} & \quad \text{glottal consonant: /h/ or /R/}
\end{align*}

For example, VHV indicates an intervocalic glottal. Prosodic categories are given these labels:

(2)  
\begin{align*}
\text{f} & \quad \text{foot} \\
\text{w} & \quad \text{phonological word} \\
\sigma & \quad \text{syllable} \\
\mu & \quad \text{mora}
\end{align*}

The following abbreviations, most of which are quite standard, are used primarily in rules and feature geometry diagrams:

(3)  
\begin{align*}
\text{RC} & \quad \text{consonantal Root node ([+cons])} \\
\text{RV} & \quad \text{vocalic Root node ([−cons])} \\
\text{RO} & \quad \text{obstruent Root node ([+cons, −son])} \\
\text{RS} & \quad \text{sonorant Root node ([+cons, +son])}
\end{align*}

(4)  
\begin{align*}
\text{Pl} & \quad \text{Place node} \\
\text{Cor} & \quad \text{Coronal node} \\
\text{Dors} & \quad \text{Dorsal node} \\
\text{Lab} & \quad \text{Labial node} \\
\text{Lar} & \quad \text{Laryngeal node}
\end{align*}

---

1 This is to be distinguished from Oswalt's practice of not indicating regular stress on ANY final syllable, due to the overlap with the intonation contour.
(5)  [gl]  glottalization, equivalent to [+constricted glottis] 
[asp]  aspiration, equivalent to [+spread glottis] 
[son]  [sonorant]  
[cons]  [consonantal]  
[nas]  [nasal]  
[cont]  [continuant]  
[lat]  [lateral]  
[dist]  [distributed]  
[rd]  [round]  
[hi]  [high]  
[bk]  [back]  

(6)  
1           ‘is linked to’ (a statement about a representation)  
+           ‘is not linked to’ (a statement about a representation)  
:           ‘link’ (an operation on a representation)  
*           ‘delink’ (an operation on a representation)  

Simple labels are sometimes given for verb suffixes whose meaning is not easily expressed 
by an English gloss:

(7)  Resp  -em  RESPONSIVE: the speaker is responding to a question or 
statement by the addressee  
NFV  -e*  NONFINAL VERB: a main verb (with one of a set of certain 
other suffixes present) which is not final in the sentence  
Subj  -em(u)  SUBJECTIVE: a noun functioning as ‘subject’ of the verb  
Obj  -el  OBJECTIVE: a noun functioning as ‘object’ of the verb  

For discussion of all the suffixes and their allomorphy, see §7.2. A complete list of verb 
suffixes in the language is included in the Appendix.

The dissertation is organized according to general areas of the theory. In chapter 2 we 
examine the basic issues of what the underlying segments are and how they should be 
represented. Chapter 3 gives the wide range of processes applying at the segmental level. 
Chapter 4 considers a reanalysis of some of these segmental processes in terms of 
constraints on well-formed representations. Chapter 5 treats the complicated nature of 
stress in Kashaya, along with the related issue of extrametricality. Chapter 6 discusses the 
lower levels of the prosodic hierarchy, i.e. the mora and the syllable. Chapter 7 lays out 
the overall organization of the phonology and morphology, and discusses the types of
allomorphy present. Chapter 8 gives details on several morphological processes and subsystems. Finally, chapter 9 suggests implications of the analyses for the theory.
Chapter 2
Segmental Representations

This chapter addresses the basic issue of how the segments of Kashaya should be represented, with particular attention to the underspecification and hierarchical representation of features. In §2.1 the traditional segment inventory is contrasted with the one that I assume. §2.2 proposes how these segments should be represented, in terms of feature geometry and feature underspecification. §2.3 argues for the single-segment status of the glottalized and aspirated sonorants, and motivates the derivation of surface voiced stops from underlying glottalized nasals. Finally, §2.4 provides evidence for treating glides as consonants, rather than as nonsyllabic vowels.

2.1. Segment Inventory

A basic way in which my analysis differs from that given in Oswalt (1961) lies in the assumptions about what constitutes a segment, and therefore what segments can be thought of as underlying. In the traditional analysis of Kashaya, the large number of consonants derives in part from the fact that glottalization and aspiration are distinctive features of all voiceless stops, which occur at six places of articulation. I propose that there are even more phonemic segments, specifically that glottalization and aspiration are distinctive features for sonorants as well as obstruents. There are numerous advantages to this analysis, both with respect to the underlying inventory, and in explaining distributional and phonological characteristics of the segments.

It is uncontroversial that Kashaya stops are found at six supralaryngeal places of articulation, and all contrast in aspiration and glottalization; sonorants are found at far fewer
places. Oswalt (1961:18) gives the following as the complete inventory of consonant phonemes:

(1) **TRADITIONAL INVENTORY**

<table>
<thead>
<tr>
<th>GLOTTALICS</th>
<th>labial</th>
<th>dental</th>
<th>alveolar</th>
<th>palatal</th>
<th>velar</th>
<th>uvular</th>
<th>laryngeal</th>
</tr>
</thead>
<tbody>
<tr>
<td>glottalized stops</td>
<td>'email'</td>
<td>'i'</td>
<td>'t'</td>
<td>'c'</td>
<td>'k'</td>
<td>'q'</td>
<td>'ʔ'</td>
</tr>
<tr>
<td>glottalized spirant</td>
<td></td>
<td>'s'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voiced stops</td>
<td>'b'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>'d'</td>
</tr>
<tr>
<td>SONORANTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nasals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>'m'</td>
</tr>
<tr>
<td>liquid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>semivowels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>'w'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NON-GLOTTALICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>plain stops</td>
</tr>
<tr>
<td>aspirated stops</td>
</tr>
<tr>
<td>spirants</td>
</tr>
</tbody>
</table>

The segments /i/ and /r/ exist only in borrowed words, and are placed in parentheses here to indicate their marginal status. The voiced alveolar stop, most precisely [d], is written simply as d, since there is no contrast with a voiced dental stop; the same is true of the alveolar fricatives and sonorants.¹ The symbol c represents an alveopalatal affricate [ç], which patterns phonologically like a stop; see §2.2 for further discussion.

I argue for a revised interpretation of the consonants, where glottalization and aspiration are distinctive for sonorants as well as obstruents. (There is no change claimed here for the fricative series.) In addition, voiced stops are treated as derived from glottalized nasals and therefore omitted from the following chart:

---

¹ Although the International Phonetic Alphabet treats alveolar consonants as unmarked and uses the diacritic [.] to mark dentals, I follow the standard practice for Kashaya and other Native American languages by marking the alveolars with [.].
### PROPOSED INVENTORY

<table>
<thead>
<tr>
<th>stops:</th>
<th>labial</th>
<th>dental</th>
<th>alveolar</th>
<th>palatal</th>
<th>velar</th>
<th>uvular</th>
<th>glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>plain</td>
<td>p</td>
<td>t</td>
<td>t</td>
<td>c</td>
<td>k</td>
<td>q</td>
<td>?</td>
</tr>
<tr>
<td>asp</td>
<td>pʰ</td>
<td>tʰ</td>
<td>tʰ</td>
<td>cʰ</td>
<td>kʰ</td>
<td>qʰ</td>
<td></td>
</tr>
<tr>
<td>glott</td>
<td>p̂</td>
<td>t̂</td>
<td>t̂</td>
<td>ć</td>
<td>k̂</td>
<td>q̂</td>
<td></td>
</tr>
<tr>
<td>fricatives:</td>
<td>plain</td>
<td></td>
<td></td>
<td>s</td>
<td>s</td>
<td>h</td>
<td></td>
</tr>
<tr>
<td>glott</td>
<td></td>
<td></td>
<td></td>
<td>ŝ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nasals:</td>
<td>plain</td>
<td>m</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asp</td>
<td>mʰ</td>
<td>nʰ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>glott</td>
<td>m̂</td>
<td>n̂</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>approximants:</td>
<td>plain</td>
<td>w</td>
<td>l</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asp</td>
<td>wʰ</td>
<td>lʰ</td>
<td>yʰ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>glott</td>
<td>ŵ</td>
<td>l̂</td>
<td>ŷ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The borrowed segments /l/ and /r/ are excluded from this inventory because they figure only marginally in phonological processes, and I formulate the rules and representations below without attempting to account for their place and manner features. See below for further discussion.

Oswalt includes in his transcriptions sequences where a sonorant is followed by /h/ or /r/, such as /nh/ and /nr/. I give evidence in §2.3 that these sequences should be treated as single segments, for example /nʰ/ and /nʳ/, where in effect the same features are present but they occupy a single segmental slot. In addition to the phonemes in (1), Oswalt posits two special consonant morphophonemes.² The first is /lʃ`/ /lʃ/, realized as /h/ before certain consonants and zero elsewhere; I analyze it as an aspiration feature rather than a separate consonant (§2.3, §3.1). The second, /q`q`, behaves like /q/ except that it conditions assimilation of a following vowel to [o]. I treat it as /qʰ/, which has a special status and is not shown in (2); see §3.3.2.

I will not attempt to show here that all of the consonants in (2) are phonemically distinctive, since examples of the various consonants are given in Oswalt (1961:23ff). See

---

² Oswalt’s analysis is given in a framework influenced by stratificational grammar (cf. Lamb 1966). There are three major levels of representation: morphophonemic, phonemic, and phonetic. The relationship between the morphophonemic and phonemic levels is unique (i.e. predictable in one direction), while that between the phonemic and phonetic levels is biunique (i.e. predictable in both directions).
§2.3.1 for a demonstration that the glottalized and aspirated sonorants contrast with each other and with the plain sonorants.

My interpretation of the vowel system does not differ from Oswald (1961) insofar as Kashaya has a five-vowel system on the surface:

(3) i u e o a

That all five vowels are underlyingly contrastive is clear from the following set of words:

(4) hiʁi ‘large feather’
    heʔe ‘hair’
    haʔa ‘horn, antler’
    hoʔo ‘tooth’
    huʔu ‘whereabouts (visible)’

Length is also contrastive:

(5) ?ihya ‘wind’  ?ihya’ ‘bone’
    dono ‘mountain’  dono’ ‘uphill’ [130]
    mace- ‘hold with foot’ [D] mace- ‘protect’ [D]
    -mîl- ‘blaze’ [D] -mîl- ‘turn in circle’ [D]

Oswald posits the vowel morphophonemes ll, α, ə, i, v, e, ə, ü ll which change according to the preceding (·) or following (’’) environment. This type of alternation is typically handled in modern phonology by general rules rather than special representations for the alternating segments, so my set of underlying vowel segments is smaller. I argue in §3.3.5, however, that it is necessary to distinguish the underspecified vowels /i, a/ from the same vowels prespecified as [+high] or [-round], and in this respect I preserve Oswald’s morphophonemes ll, ə ll.
2.2. Underlying Representations

In this section I give the underlying forms that the segments listed above take. After discussing the model of feature geometry that I assume (§2.2.1), I make explicit the underlying features used for consonants, and the cooccurrence restrictions and rules which generate the correct set of consonants, both with regard to place features (§2.2.2) and manner features (§2.2.3). The same is then done for the vowels (§2.2.4).

2.2.1. Feature Geometry

I assume a theory of FEATURE GEOMETRY which organizes features hierarchically according to their behavior in phonological rules (Mohanan 1983, Clements 1985a, Sagey 1986, Steriade 1987a, McCarthy 1988). The basic arrangement is in articulatory terms, with features dominated by NODES that represent natural classes. A phonological rule which targets more than one feature is permitted to manipulate only a single node that dominates those features, thereby giving formal expression to the notion of natural class. I largely adopt the geometry given by McCarthy (1988), which is reproduced below in a modified form with only those features relevant to the segments of Kashaya:

(6)

```
     son
    /   cons
   /     \ [lat]
Laryngeal /     [nas]
   \   \ [cont]
      [gl] [asp] [voice]
       Place
         Labial     Coronal     Dorsal
          /     \    /     \     /     \  
        [round] [dist] [high] [back]
```
In the original proposals by Mohanan (1983) and Clements (1985a), the Root node serves simply as a structural element that dominates all features, among them the general class features [consonantal] and [sonorant]. In McCarthy’s model, based on Sagey (1986) and Schein and Steriade (1986), [cons] and [son] in fact constitute the Root node. Following Selkirk (1988), I use the abbreviation RV for a Root node containing the value [-cons], and RC for one containing [+cons] — that is, for vowels and consonants respectively. (The status of glides in Kashaya is discussed in §2.4.) I also use RS for a sonorant consonant, and RO for an obstruent.

The geometry shown in (6) differs from that given by McCarthy in three ways. First, the feature [lateral] is positioned under the Root node rather than under Coronal. This follows the proposals of Avery and Rice (1991) and Shaw (1991), and makes possible the underspecification of Coronal for all alveolar consonants, including /l/. Second, his tentative suggestion of a Pharyngeal class node is not included, since it seems to play no role in Kashaya phonology. Third, I adopt Lombardi’s (1991) proposal that the binary laryngeal features [+constricted glottis] and [±spread glottis] be replaced by the privative features [gl] and [asp], which correspond to the positive values of the old features but are never present in negative form. Accepting also Mester and Itô’s (1989) treatment of [voice] as privative, this means that all laryngeal features are privative. Assuming that the Laryngeal node is present only when a subordinate feature requires it, the node is absent for ‘plain’ consonants: that is, voiced sonorants and unaspirated, unglottalized obstruents.

Because /h/ and /ʔ/ involve only glottal activity, they do not have a Place node and are represented as shown:

---

3 For Kashaya, this argument is not particularly relevant since, as I claim in §2.2.2, [lat] is not distinctive and is inserted by rule. The feature [lat] is not manipulated by any rules in the language.
In other words, \( /h/ \) consists simply of the feature \([asp]\), and \( /\ell/ \) is simply \([gl]\). I treat the glottals as obstruents. These are precisely the features that are used to mark aspiration and glottalization, respectively; for example, \( /p^h/ \) differs from \( /p/ \) only in the presence of \([asp]\) under the Laryngeal node. Recall that [-voice] does not occur; when no laryngeal features are present, as for \( /p/ \), the Laryngeal node is omitted from the representation. An aspirated stop, then, is represented as a plain stop with the equivalent of an \( /h/ \) as part of its features. Similarly, an ejective is represented as a plain stop plus a \( /\ell/ \), i.e. the feature \([gl]\):

\[
\begin{array}{ccc}
(8) & /p/ & /p^h/ & /p^\ell/ \\
RO & RO & RO & RO \\
Place & / \ \ \ \ \ \ \ \ \ \ Place & / \ \ \ \ \ \ \ \ \ \ Place & / \ \ \ \ \ \ \ \ \ \ Place \\
Lab & [asp] & Lab & [gl] & Lab \\
\end{array}
\]

The difference between the aspirated or glottalized sonorants that I propose in (2), and their plain versions, is precisely the same: the presence or absence of one of these laryngeal features. In this respect it is quite literally true that \( /m^h/ \) is nothing more than a single-segment version of \( /m/ \) plus \( /h/ \), and \( /m^\ell/ \) is simply \( /m/ \) plus \( /\ell/ \).

\[
(9) & /m/ & /m^h/ & /m^\ell/ \\
RS & RS & RS & RS \\
Lab & [asp] & Lab & [gl] & Lab \\
\]

Evidence for these representations is given in §2.3.
2.2.2. Consonant Underspecification: Place Features

We can now lay out the features used to distinguish the various places of articulation in the consonants; for the moment I ignore the manner features. The column in (2) labeled 'palatal' actually contains two phonetic types of consonants: the alveopalatal /c, cʰ, ɾ, ɾ/ and the true palatals /ɫ, ɬ, ʃ̊/. There is considerable evidence, however, that these (alveo)palatal are not distinguished for place of articulation in the phonology of Kashaya. It is often assumed that dentals, alveolars, alveopalatal, and palatal are coronal (Keating 1991), though there is some variation in the treatment of true palatal. For example, Chomsky and Halle (1968) analyze palatal as [-cor], the same as the velars. This departs from the earlier classification by Jakobson, Fant, and Halle (1952), where the feature [-grave] is the equivalent of [+cor] for consonants, with the single exception of palatal: they are [-grave] and group with the alveopalatal.

Keating (1988a) bridges this gap by arguing that palatal should be represented as both coronal and dorsal; a similar proposal is made by Lahiri and Evers (1991). In Kashaya there is overwhelming evidence that the (alveo)palatal group with the coronals (§3.2.1), but there is also some indication that the (alveo)palatal have dorsal features in the phonology (§3.3.6). At the same time, there is no reason to believe that /c/ and /ɬ/ are phonologically distinct in place. I consider the difference between alveopalatal /c/ and palatal /ɬ/ a matter of varying phonetic implementation for obstruents and sonorants which has no effect on the phonology, and henceforth I refer to them as a group as palatal. See §3.5.1 for a rule where /c/ becomes [ɬ], a change handled most easily if they are at the same phonological place of articulation. Further, I treat the alveopalatal affricates [c, cʰ, ɾ] as palatal stops which are realized phonetically as affricates; this follows recent work such as Steriade (1989). There is no evidence in Kashaya that the palatal are affricates for phonological purposes, or that they ever bear a feature [+cont] in the phonology; they
always pattern with stops, not fricatives (see especially §3.3.1 and §3.2). This would seem to contradict the proposals of Hualde (1988) and Lombardi (1990) that affricates are both [-cont] and [+cont] in the phonology, but these features are not ordered until the phonetic component. A possible compromise is that [+cont] is added to affricates at some late level in certain languages, including Kashaya, so that they behave like stops in all or part of the phonology (as predicted by Steriade 1989).

I propose the following fully specified features for representing the place distinctions in the consonants of the language:

<table>
<thead>
<tr>
<th>(10) PLACE</th>
<th>EXAMPLES</th>
<th>FULLY SPECIFIED REPRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>bilabial</td>
<td>p m</td>
<td>Labial</td>
</tr>
<tr>
<td>labiovelar</td>
<td>w</td>
<td>Labial, Dorsal [+high]</td>
</tr>
<tr>
<td>lamino-dental</td>
<td>t</td>
<td>Coronal [+dist]</td>
</tr>
<tr>
<td>apico-alveolar</td>
<td>ʈ s n ɭ</td>
<td>Coronal [-dist]</td>
</tr>
<tr>
<td>(alveo)palatal</td>
<td>ɕ ɭ y</td>
<td>Coronal [+dist], Dorsal [+high]</td>
</tr>
<tr>
<td>velar</td>
<td>ɖ</td>
<td>Dorsal [+high]</td>
</tr>
<tr>
<td>uvular</td>
<td>ʡ</td>
<td>Dorsal [-high]</td>
</tr>
<tr>
<td>rounded uvular</td>
<td>ɿ</td>
<td>Dorsal [-high], Labial</td>
</tr>
</tbody>
</table>

I assume the theory of Radical Underspecification (Kiparsky 1982, Archangeli 1984a, Pulleyblank 1986, Archangeli and Pulleyblank 1986, Archangeli 1988a), whereby all features which are predictable are excluded from underlying representations. If we eliminate all features in (10) which can be predicted by rule, we are left with the following minimal features:

<table>
<thead>
<tr>
<th>(11) PLACE</th>
<th>EXAMPLES</th>
<th>FULLY SPECIFIED REPRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>bilabial, labiovelar</td>
<td>p m w</td>
<td>Labial</td>
</tr>
<tr>
<td>lamino-dental</td>
<td>t</td>
<td>Coronal [+dist]</td>
</tr>
<tr>
<td>apico-alveolar</td>
<td>ʈ s n ɭ</td>
<td>Coronal [+dist], Dorsal</td>
</tr>
<tr>
<td>(alveo)palatal</td>
<td>ɕ ɭ y</td>
<td>Dorsal</td>
</tr>
<tr>
<td>velar</td>
<td>ɖ</td>
<td>Dorsal [-high]</td>
</tr>
<tr>
<td>uvular</td>
<td>ʡ</td>
<td>Dorsal [-high], Labial</td>
</tr>
<tr>
<td>rounded uvular</td>
<td>ɿ</td>
<td></td>
</tr>
</tbody>
</table>
As Paradis and Prunet (1991b) note, [+ant] is the unmarked feature for coronal consonants. While this particular feature is not necessary in Kashaya phonology, it covers the alveolar place. Since this is also the most frequent type of segment in the inventory of Kashaya, it is fitting that they should be maximally underspecified. This claim is relatively vacuous here, however, since we see evidence that default features are filled in immediately: a process of Coronal De-buccalization applies equally to all coronal consonants, indicating that the Coronal node is present to trigger the rule (§3.2.1). In this case, the main substance of the claim of Coronal underspecification is that no other place of articulation can be underspecified in the phonology; for example, it predicts that velars will not show behavior suggesting the absence of a Dorsal node. Implications for the formulation of cooccurrence restrictions are given in §2.2.3. All supralaryngeal consonants, including the alveolars, are opaque to a morpheme structure condition of Translaryngeal Harmony (§3.4.1), suggesting the presence of a Place node in the underlying representation. I assume that all supralaryngeal consonants have a Place node underlyingly — only the glottals /h, ḷ/ lack one.

The default place features are supplied by the following redundancy rules for those segments which are [+cons]:

\[
\begin{align*}
\text{Place} & \rightarrow \text{Coronal} \\
\text{Coronal} & \rightarrow [-\text{dist}] \\
\text{Dorsal} & \rightarrow [+\text{high}] \\
\text{Labial, [+son, +cont]} & \rightarrow \text{Dorsal}
\end{align*}
\]

The rules in (12a,b) generate the default alveolar place of articulation. Velars and palatals undergo (c), while (d) reflects the fact that of the labials only the glides have a labiovelar articulation.

The remainder of this section is devoted to a formal working-out of the principles which determine the permitted feature cooccurrences in Kashaya, included here for the sake of completeness. It is likely to be of limited interest to some readers, who may wish to
skip ahead to §2.2.3.

The underspecified representations in (11) include just three nodes (Labial, Coronal, Dorsal) and two features ([+dist], [-high]). The distinctions between all places of articulation in the language must be constructed from these basic elements. For each feature or node which is available underlyingly, there is a binary choice, namely presence versus absence of the element. Since there are five features and nodes which can combine with each other, the total number of logically possible combinations is $2^5$ or 32. I give here all of these combinations, with an account of those which must be prevented from occurring in Kashaya:

\[
\begin{array}{cccccc}
\text{(13)} & \text{LABIAL} & \text{CORONAL} & \text{[+DIST]} & \text{DORSAL} & \text{[-HIGH]} & \text{STATUS} \\
1. & 0 & 0 & 0 & 0 & 0 & \text{= alveolar} \\
2. & 0 & 0 & 0 & 0 & [-high] & * by feature geometry \\
3. & 0 & 0 & 0 & \text{Dorsal} & 0 & \text{= velar} \\
4. & 0 & 0 & 0 & \text{Dorsal} & [-high] & \text{= uvular} \\
5. & 0 & 0 & [+dist] & 0 & 0 & * by feature geometry \\
6. & 0 & 0 & [+dist] & 0 & [-high] & * by feature geometry \\
7. & 0 & 0 & [+dist] & \text{Dorsal} & 0 & * by feature geometry \\
8. & 0 & 0 & [+dist] & \text{Dorsal} & [-high] & * by feature geometry \\
9. & 0 & \text{Coronal} & 0 & 0 & 0 & ? alveolar \\
10. & 0 & \text{Coronal} & 0 & 0 & [-high] & * by feature geometry \\
11. & 0 & \text{Coronal} & 0 & \text{Dorsal} & 0 & ? palatal \\
12. & 0 & \text{Coronal} & 0 & \text{Dorsal} & [-high] & * by rule (15) \\
13. & 0 & \text{Coronal} & [+dist] & 0 & 0 & \text{= dental} \\
14. & 0 & \text{Coronal} & [+dist] & 0 & [-high] & * by feature geometry \\
15. & 0 & \text{Coronal} & [+dist] & \text{Dorsal} & 0 & \text{= palatal} \\
16. & 0 & \text{Coronal} & [+dist] & \text{Dorsal} & [-high] & * by rule (15) \\
17. & \text{Labial} & 0 & 0 & 0 & 0 & \text{= bilabial} \\
18. & \text{Labial} & 0 & 0 & 0 & [-high] & * by feature geometry \\
19. & \text{Labial} & 0 & 0 & \text{Dorsal} & 0 & * by rule (16) \\
20. & \text{Labial} & 0 & 0 & \text{Dorsal} & [-high] & \text{= rounded uvular} \\
21. & \text{Labial} & 0 & [+dist] & 0 & 0 & * by feature geometry \\
22. & \text{Labial} & 0 & [+dist] & 0 & [-high] & * by feature geometry \\
23. & \text{Labial} & 0 & [+dist] & \text{Dorsal} & 0 & * by feature geometry \\
24. & \text{Labial} & 0 & [+dist] & \text{Dorsal} & [-high] & * by feature geometry \\
25. & \text{Labial} & \text{Coronal} & 0 & 0 & 0 & * by rule (17) \\
26. & \text{Labial} & \text{Coronal} & 0 & 0 & [-high] & * by feature geometry \\
27. & \text{Labial} & \text{Coronal} & 0 & \text{Dorsal} & 0 & * by rule (17)
\end{array}
\]
Many of the ill-formed combinations are easy to explain: a feature such as [+dist] or [-high] cannot be present in the representation unless the articulator node which dominates it (i.e. Coronal or Dorsal) is also present. This follows from the hierarchical nature of the feature organization in (6), so that fourteen of the logically possible combinations in (13) are in fact not possible given the interrelationships of the features and nodes.

The rest of the ill-formed combinations can be accounted for by explicit cooccurrence restrictions. Following Myers (1991b), I take Structure Preservation to be a set of PERSISTENT RULES which apply whenever their structural description is met, in order to correct ill-formed feature cooccurrences. For example, to express the fact that the feature [-nas] is not present in underlying representations in a language, we have two options. We can appeal to a static filter or constraint as in (14a), or a rule removing the feature as in (14b):

(14) a. * [-nas]
    b. Root
       +
       [-nas]

The constraint in (a) simply blocks the creation of the ill-formed structure. The persistent rule in (b), on the other hand, permits the structure to be created but immediately corrects it — its ‘persistence’ ensures that there is no intermediate stage during which some other rule could make reference to the ill-formed representation. Myers (1991a) argues that the persistent rule approach in (b) is superior because there are cases where it is necessary for an ill-formed structure to be created and then corrected (obviously, in such instances the rule creating the ill-formed representation is not the simple converse of the persistent rule which corrects it).
Three persistent rules are required to account for the remaining illicit structures in (13). First, Coronal and Dorsal are permitted to cooccur only in the case of palatals, where the Dorsal node cannot be marked [-high]. A simple rule deleting that feature eliminates the potential 'alveo-uvular' segments:

(15) \[
\begin{array}{c}
\text{Place} \\
\text{Cor} \quad \text{Dors} \\
\text{[-high]}
\end{array}
\]

Similarly, the representation in #19 must be ruled out for underlying representations. While the labiovelar glides eventually acquire a Dorsal node in addition to their underlying Labial, this is a predictable result of their other features ([+son] plus [+cont] or [-nas]). Underlyingly, labiovelars are not permitted:

(16) \[
\begin{array}{c}
\text{Place} \\
\text{Lab} \quad \text{Dors}
\end{array}
\]

This rule probably turns off at the beginning of the lexical derivation, since there is evidence that the labiovelar glides bear the Dorsal node for the purposes of a lexical phonological rule (§3.3.6).

The remaining ill-formed combinations also involve two nodes, namely Labial and Coronal. While unitary segments such as /t/ are attested, for example, in Nupe (Hyman 1970, Sagey 1986), they are illicit in Kashaya, as expressed by the following rule:

(17) \[
\begin{array}{c}
\text{Place} \\
\text{Lab} \quad \text{Cor}
\end{array}
\]

We have now accounted for the clearly ill-formed structures in (13). There remain, however, two which are questionable. The first is #9, which is like the underspecified alveolar in #1 except that it includes a Coronal node. The existence of this representation predicts a difference between alveolars depending on whether there is an underlying
Coronal node, but there is no evidence for such a distinction. One of the representations should be ruled out: either no alveolar has an underlying Coronal node, or all do. As mentioned above, there is no point in the derivation where alveolars are necessarily underspecified for Coronal, and it is clear from the phenomenon of Coronal Debuccalization that alveolars have that node at a relatively early stage (level 3). Before deciding between these options, we can consider the second questionable representation — namely #11, which is like the palatal in #15 except that it lacks the specification [+dist]. This problem could be dealt with by proposing an additional redundancy rule inserting [+dist] on Coronal when Dorsal is also present, but again we have no motivation for two different underlying representations of palatal segments. What #9 and #11 have in common is the presence of a Coronal node without any feature under it, and I suggest that we can eliminate both representations by a persistent rule deleting Coronal in this situation.\(^4\)

\[
\begin{array}{c}
\text{Place} \\
+ \\
\text{Cor} \\
+
\end{array}
\]

This rule ensures that Coronal is present in underlying representations only when it is necessary as the node dominating [+dist]. This rule turns off by level 3, however, so that the redundancy rule inserting Coronal is permitted to apply.

An alternative analysis is to claim that #9 and #11 are actually the correct representations, and #1 and #15 must be ruled out. The completely underspecified Place node in #1 could be ruled out by requiring some articulator node to be present under every

\(^4\) I use the symbol + to mean 'is not linked to'; this static statement contrasts with the operation 'delink', represented as +. While reference to the absence of a node or feature weakens the predictions of a privative theory of specification — referring to the absence of Coronal, for example, is similar to referring to the presence of a nonexistent [-cor] feature — it does not completely vitiate the theory: for example, the prediction that spreading or dissimilation of [-cor] is impossible still holds. In other words, we maintain a binarity which incorporates asymmetric values (cf. Stanley 1967). I am not aware of an alternative to the use of + in these cases. Note that the widely accepted process of Stray Erasure (Steriade 1982) makes reference to a similar notion, since it deletes elements which are not linked to higher structure. Similarly, Pulleyblank (1986) refers to floating tones, as well as unlinked tone-bearing units.
instance of Place. It is less clear how to eliminate #15, since a Coronal dominating [+dist]
is well-formed in other circumstances, such as the dental in #13. Appeal to [anterior] mightaccomplish the task, but my analysis does not require this feature at all. In addition, ruling
out #1 goes against the considerable evidence for the cross-linguistic underspecification of
Coronal (Paradis and Prunet 1991a). Since the rule in (18) accounts for both #9 and #11,
and is consistent with the special status of Coronal, I maintain the first analysis proposed.

2.2.3. Consonant Underspecification: Manner Features

Here I use the term ‘manner features’ loosely to refer to all those which are not dominated
by Place, i.e. the Laryngeal features [gl], [asp], and [voiced], along with those immediately
dominated by the Root node: [cont], [nas], and [lat]. Like the place features, the manner
features are also radically underspecified. Two of these features — [voiced] and [lat] —
are not present at all in underlying representations. There is little evidence that [lat] is
relevant to the phonology of Kashaya; its primary use would be to distinguish the coronal
sonorants /r/ and /l/, and since I ignore the borrowed segments /r/ and /l/ in the discussion
of productive phonology I assume that /r/ and /l/ need not be distinguished in a systematic
way.\(^5\) Therefore [lat] is not present underlingly: it is predictable for sonorants based on
their place of articulation. Similarly, [voiced] is not an underlying feature of Kashaya: it is
predictable based on the value of [son]. See §3.1.3 for a detailed discussion of the voiced
stops. For [cont] and [nas], only the positive values are given underlingly. Further,
[cont] is distinctive only for obstruents; for sonorants it depends on the values of [nas] and
[lat], so sonorants do not bear this feature underlingly.

We must still deal with the major class features [sonorant] and [consonantal]. It is not
clear to me that either one of these should be underspecified. Clements (1988) and

\(^5\) Obviously, /r/ must carry some marking, such as [-lat], which differentiates it from /l/; but given its
marginal status, that marking is irrelevant to the phonological analysis, and might as well be an arbitrary
diacritic ensuring that it ultimately becomes [-lat]. In §6.7 I suggest [-lat] as an awkward means of referring
to glides, but that is a postlexical rule and the default features are filled in by that point.
Christdas (1988) assume that these features are always fully specified, while Waksler (1988) argues based on the behavior of glides in Lenakel that a segment can be underlyingly [-cons], [+cons], or unspecified. Certainly the presence of both [+cons] and [-cons] is implicit in my use of the contrast between consonantal and vocalic Root nodes, RC and RV. In addition, the question of whether vowels or consonants are more ‘marked’ segments hardly seems meaningful, since both are present in all languages of the world. I assume that both values of [cons] are present underlyingly.

The status of [son] is perhaps more ambiguous. For example, within the class of consonants, it is not unreasonable to argue that obstruents are the prototypical type — the most consonantal. From this perspective, one might choose to give [+son] underlyingly and supply [-son] by default. This is consistent with the fact that we need only [+son] in expressing the redundancy rules in (19). However, we also need [-son] for various regular phonological rules, as well as the persistent rule below in (32). The special status of both [cons] and [son] as part of the Root node suggests that they might have different properties from other features with respect to underspecification. I assume, therefore, that [son] is fully specified underlyingly.

Although according to the SPE tradition the glottal segments /h, ʔ/ are ‘glides’, i.e. they carry the major class features [-cons, +son], I reject this analysis for Kashaya. First of all, not even /w, y/ are ‘glides’ as defined by these features: I argue in §2.4 that they are true consonants rather than nonsyllabic vowels. Second, the glottals behave in every respect like normal consonants, and there is no reason to suspect that they are [-cons]. Finally, the process of Debuclalization (§3.2) establishes a strong connection between stops and /h, ʔ/: the latter appear to differ from stops only insofar as they lack a Place node. In fact, it is simplest to treat the glottals as obstruents, i.e. [+cons, -son]. This is the assumption that I make here, although it would be conceivable to write a rule changing a placeless consonant to [+son].

6 Stevens and Keyser (1989) assume, based on phonetic criteria, that the glottals are [-sonorant] but
The consonant redundancy rules are as follows:

(19)  [0nas] → [-nas]  
      [+son] → [+lat] / Cor, [-nas]  
      [0lat] → [-lat]  
      [+nas] → [-cont]  
      [+lat] → [-cont]  
      [+son] → [+cont]  
      [0cont] → [-cont]  
      [+son] → [voiced]

It is only at this point that voiced sonorants acquire a Laryngeal node, and since [gl], [asp], and [voiced] are privative, plain obstruents never seem to need one. The intervening Laryngeal node is automatically created, since it is a necessary part of the PATH to the existing Root node (cf. the principle of ‘node generation’ from Archangeli and Pulleyblank 1986). It is likely that [nas] is also privative (cf. Cohn 1990, Steriade 1991b), but for present purposes I treat it as equipollent.

Once again I devote the rest of this section to the formal expression of feature cooccurrences. Two questions of this sort remain: how place and manner features combine, and how the different manner features combine with each other. This information can be seen in the chart in (2). For the most part, the Laryngeal features [gl] and [asp] combine freely with all places and manners, with the exception of the fricatives: no fricative can be aspirated, and /$/ cannot be glottalized. The expression of these facts requires two persistent rules. The first ensures that [asp] cannot be associated to a fricative:

(20)  RO
     \  
      Lar [+cont]  
     /  
      [asp]
Since (20) applies to all fricatives, it subsumes */s*/ and now we need only rule out */s*/. In fact, however, the next rule can be expressed more simply if it deletes a Laryngeal node from */s*/ regardless of the feature it dominates:

\[(21) \quad \text{RO} \]
\[\begin{array}{c}
\text{Lar} \\
[-5pt]
\text{Pl} \\
\text{[+cont]} \\
\text{Dors}
\end{array} \]

Since the palatal fricative is the only one which contains a Dorsal node, it is unnecessary to include a Coronal node as well. Both (20) and (21) eliminate */s*/, but this is a consequence of their being expressed as simply as possible: the redundancy is in their effect, not in their formulation. All other cooccurrences of [gl] and [asp] with places and manners are instantiated in the language. See §3.1 for evidence that all plain fricatives receive the feature [asp] during the derivation (after (21) turns off).

Since we need the redundancy rule in (19) which inserts [voiced], there must be a rule which prevents this feature from being present underlingly. That is, there is a persistent rule deleting [voiced] in all contexts:

\[(22) \quad \text{[voiced]} \]

This rule governs only underlying representations, and turns off as soon as the derivation begins. After that point, the redundancy rule provides the [voiced] which occurs on the voiced stops derived from underlying glottalized nasals (§3.1.3).

We turn now to the other manner features, those dominated by the Root node. Again, [lat] is not present underlingly; if the feature is inserted by a phonological rule as given in (19), we require a persistent rule to prevent the insertion of [lat] in underlying representations:

\[(23) \quad \text{RC} \]
\[\begin{array}{c}
\text{[lat]}
\end{array} \]
Since [flat], unlike [voiced], does not figure in any lexical processes, the rule in (23) can remain in effect until the end of that component.

Similarly, I have suggested that [+cont] is present underlingly only for obstruents. The following persistent rule prevents its combination with sonorants:

\[
\begin{align*}
\text{(24)} & \quad \text{RS} \\
& \quad \neq \\
& \quad [+\text{cont}]
\end{align*}
\]

Naturally, this rule turns off in time for the redundancy rules in (19) to apply, perhaps at the end of the lexical component.

The interaction of manner features with various places of articulation requires a number of rules. Continuing with [+cont], we must prevent the creation of fricatives at places other than alveolar and palatal. (I make no attempt to account for /f/.) Three persistent rules are necessary here. The first covers labials:

\[
\begin{align*}
\text{(25)} & \quad \text{RC} \\
& \quad /\text{x} \\
& \quad \text{Place} \quad [+\text{cont}] \\
& \quad \text{Lab}
\end{align*}
\]

While the labiovelar glides are eventually marked [+cont], as sonorants they do not carry this redundant specification underlingly (which (24) already ensures). The second rule applies to dentals:

\[
\begin{align*}
\text{(26)} & \quad \text{RC} \\
& \quad /\text{x} \\
& \quad \text{Place} \quad [+\text{cont}] \\
& \quad \text{Cor} \quad \text{Dors}
\end{align*}
\]

It is not possible in (26) to refer to a [+dist] coronal, since that includes palatais, and a palatal fricative does exist; instead, the presence of a Coronal node and the absence of a Dorsal node must be referred to. Since the alveolars have no Coronal node underlingly, nothing prevents the creation of an alveolar fricative; this fact also makes it unnecessary to

30
include [+dist] in (26). The final persistent rule relative to fricatives refers to the opposite configuration, a Dorsal node without a Coronal node:

\[(27) \quad \text{RC} \]
\[
\begin{array}{c}
/ \hat{x} \\
\text{Place} & [+\text{cont}] \\
\hat{f} \backslash \\
\text{Cor} & \text{Dors}
\end{array}
\]

This rule targets velars and uvulars. None of these fricative rules, (25) to (27), is necessary beyond the beginning of the derivation. In fact, (26) must turn off before the redundancy rule inserts Coronal on alveolars; otherwise /s/ will become a stop.

It is a somewhat simpler matter to restrict the distribution of [+nas], since it occurs only with labial and alveolar place specifications. First, it is not found with underlying Coronal:

\[(28) \quad \text{RC} \]
\[
\begin{array}{c}
/ \hat{x} \\
\text{Place} & [+\text{nas}] \\
\hat{f} \backslash \\
\text{Cor}
\end{array}
\]

This covers dentals and palatals; the alveolar nasal is permitted because there is no Coronal node underlyingly to trigger (28). Again, the rule must turn off before Coronal is inserted by redundancy rule. The [+nas] feature also fails to cooccur with Dorsal:

\[(29) \quad \text{RC} \]
\[
\begin{array}{c}
/ \hat{x} \\
\text{Place} & [+\text{nas}] \\
\hat{f} \backslash \\
\text{Dors}
\end{array}
\]

This accounts for velars and uvulars (and redundantly palatals).

There are two persistent rules which govern the cooccurrence of [son] with various place features. Note that under the preceding analysis, the only underlying distinction between a stop such as /l/ or /c/ and an approximant at the same place of articulation (in this case /l/ or /y/) is the value of [son]. This means that restrictions on the presence of approximants in the segment inventory must be expressed in terms of [son]. For example,
the fact that there is no approximant corresponding to dental /l/ can be stated as a rule
forbidding [+son] with a dental place representation:

(30)  \[
\begin{array}{c}
\text{RC} \\
[+\text{son}] \rightarrow [-\text{son}] \\
\text{Place} \\
/ \checkmark \\
\text{Cor} \quad \text{Dors}
\end{array}
\]

The lack of linking to a Dorsal node is necessary to exclude palatal sonorants from the rule.

Similarly, there are no velar or uvular sonorants in Kashaya. This fact can be captured by another persistent rule targeting a Dorsal consonant:

(31)  \[
\begin{array}{c}
\text{RC} \\
[+\text{son}] \rightarrow [-\text{son}] \\
\text{Place} \\
\checkmark \\
\text{Cor} \quad \text{Dors}
\end{array}
\]

Again, the lack of application to palatals necessitates the explicit reference to Coronal here.

Finally, we should address the question of how [+son] interacts with the manner features. The rule in (24) already prevents [+son] from cooccurring with [+cont] underlyingly. A further restriction is that [+nas] segments are necessarily [+son] as well. There are two ways to express this fact: we can insert [+son] on a [+nas] segment, or we can delete [+nas] from a [-son] segment. We see evidence in §3.1.3 for the latter approach, which I adopt here:

(32)  \[
\begin{array}{c}
\text{RO} \\
+ \\
[+\text{nas}]
\end{array}
\]

The existence of this rule permits us to collapse somewhat the treatment of [+nas] and [+son] cooccurrence restrictions. Specifically, the two rules in (28) and (29), which prevent dental/palatal and velar/uvular nasals respectively, overlap in their effect with (30) and (31), which prevent dental and velar/uvular sonorants. The difference is that while
palatal nasals are impossible, other palatal sonorants still exist. This makes a complete collapse impossible; but we can replace both (28) and (29) with a single rule targeting palatal nasals:

\[
\begin{align*}
\text{RC} & \quad / \overset{3}{\alpha} \\
\text{Place} & \quad [+\text{nas}] \\
\text{Cor} & \quad \backslash \text{Dors}
\end{align*}
\]

This arrangement is not only more economical overall, it also addresses the facts more directly: it is not simply the case that back NASALS are impossible (as (29) wrongly implies), but rather that all back SONORANTS are impossible (as expressed by (31)).

For Kashaya, it appears that the rule in (32) is correct. But a more general issue arises: are there other languages where the alternative implementation is justified, i.e. where a [+nas] segment retains its nasality and is marked [+son] instead? A potential case is the nasalization of a stop next to a nasal vowel, e.g. /bā/ → [mā], if this is to be treated as a persistent rule. The question is made more complicated by the unclear status of underspecification of [son]. It should be the case, for example, that a rule such as (32) is possible only in a language where [-son] is actually specified at the appropriate point in the derivation, and if languages can vary in this parameter we might expect different outcomes for an apparent [-son, +nas] segment should it arise in a derivation. This is an empirical question which must await future research.
2.2.4. Vowel Underspecification

We turn now to the vowels. Three features can be used to distinguish the five segments, as shown in the following fully specified representations:

(34) \[
\begin{array}{cccc}
  & i & e & a & o & u \\
  [\text{high}] & + & - & - & - & + \\
  [\text{round}] & - & - & - & + & + \\
  [\text{back}] & - & - & + & + & + \\
\end{array}
\]

The two features [high] and [round] serve to distinguish all vowels except the pair /a/ and /e/, which are both [-high, -round]. A third feature is necessary, which could be either [back] or [low]. Without any strong reason, I choose to use [back]. Three rules are relevant for this third feature: Uvular Assimilation (§3.3.2), [+back] Insertion (§3.3.3), and /e/ Raising (§3.3.6)

In Radical Underspecification, the default vowel has no place features. Other vowels are specified for those features which differ from the defaults, and even those are omitted when predictable from other features. Assuming that /i/ is the default vowel in Kashaya — see §3.3.1 for evidence — we arrive at the following set of underlying features:

(35) \[
\begin{array}{cccc}
  & i & e & a & o & u \\
  [\text{high}] & - & - & - & - & - \\
  [\text{round}] & - & - & + & + & + \\
  [\text{back}] & - & - & + & + & + \\
\end{array}
\]

The default features are filled in by the following redundancy rules, with a Labial or Dorsal path created where necessary:

(36) \[
\begin{array}{ll}
  [\text{+round}] & \rightarrow \quad [\text{+back}] \\
  [\text{-back}] & \rightarrow \quad [\text{-back}] \\
  [\text{+high}] & \rightarrow \quad [\text{+high}] \\
  [\text{-round}] & \rightarrow \quad [\text{-round}] \\
\end{array}
\]

34
Thus, /e/ differs from /i/ only in being [-high], so that is its only underlying feature. /a/ differs in two ways: it is [-high] and [+back]; but since it is also [-round] we do not need both of the features underlyingly: a vowel which is [+back] and [-round] in this system is necessarily [-high], since /u/ does not exist. Therefore we need only say that /a/ is [+back]; the redundancy rule in (36) provides [-round], and [-high] is predictable on this basis:

(37)  [+back, -round] → [-high]

A similar situation holds for /o/ and /u/; they are [+back] and [+round], but since all round vowels are back in Kashaya (e.g. there is no /ø/), we need only say that they are [+round] and derive [+back] by rule:

(38)  [+round] → [+back]

Of course, /o/ must also be [-high] to distinguish it from /u/.

I argue in §3.3.5 that certain tokens of /i/ are underlyingly specified as [+high]. This position is consistent with Hualde (1991), who argues for a difference between the unmarked vowel (inserted by Epenthesis, but with features) and the unspecified vowel (which behaves as though it has no features); similarly, Archangeli and Pulleyblank (in preparation) accept the prespecification of default features in particular morphemes. Essentially, in Kashaya some /i/’s which occur initially in suffixes are exceptional in behaving as though the vowel is [+high], and this exceptionality is marked by the underlying presence of that feature. In underlying representations, these vowels are notated /i/ (since they correspond to Oswalt’s morphophoneme indicated with the same symbol). Similarly, the vowel /a/ which appears in the Evidential suffixes has two special properties: it triggers the loss of rounding on a preceding uvular (§3.3.2) and deletes word-finally (§6.3.2). I treat it as underlyingly [-round], and represent it /ã/.

In a system with rules governing cooccurrences of underlyingly marked features, does
the presence of a default feature destroy the analysis? For example, if [+high] is permitted underlyingly, can it combine with [+back] and then undergo default [-round] insertion to create the ill-formed vowel /tu/? I assume that the prespecification of default features is constrained by the redundancy rules, so that [+high] can only combine with a set of underlying features that would become [+high] by default. Since a vowel which is [+back] underlyingly surfaces as [-high] (specifically, /a/) by normal rules, [+high] cannot be combined with [+back] even as an exceptional prespecification.

The representations that I have proposed for the high vowels /i, u/ do not correspond to those given earlier for the glides /y, w/. This is possible because I treat glides as consonants, not nonsyllabic vowels. See §2.4 for detailed discussion.

The difference between a simple Labial node and one dominating [+round] is not relevant in Kashaya, and in some theories the Labial node itself replaces [+round] as a feature (e.g. Selkirk 1991). For present purposes I retain the potentially redundant [round] feature for vowels, but without intending it as a serious claim. In the rule of Uvular Assimilation discussed in §3.3.2, the spreading of the Place node from /qʰ/, which I have treated as simply Labial, results in a round vowel [o], which is [+round]. If the role of [+round] is taken seriously, we need a rule to the effect that Labial → [+round] on vowels. I ignore the difference here, and assume that the presence of a Labial node is enough to generate a round vowel.

Again, the rest of this section deals with the formal implementation of feature cooccurrence. If the three underlying features [-high], [+back], and [+round] were permitted to combine freely, the grammar would generate $2^3$ or 8 vowels:
(39) \[\begin{array}{c|c|c|c}
0 & 0 & 0 & /i/ \\
0 & 0 & [+round] & /u/ \\
0 & [+back] & 0 & /a/ \\
0 & [+back] & [+round] & /u/ (redundant) \\
[-high] & 0 & 0 & /e/ \\
[-high] & 0 & [+round] & /o/ \\
[-high] & [+back] & 0 & /a/ (redundant) \\
[-high] & [+back] & [+round] & /o/ (redundant) \\
\end{array} \]

All of these feature combinations are consistent with the fully specified vowels given in (34), but we are faced with multiple representations for the same vowels. Specifically, there are two realizations for each of the back vowels. This is due to redundancies in the system: for example, we can predict that [+round] vowels are also [+back]. Such facts should not be given underlyingly — they are to be treated as redundancy rules, as shown in (36). The overspecified representations of /o, u/ can be eliminated by the following persistent rule:

(40) \[
\begin{array}{c|c|c|c}
RV & Place & & \\
\hline & / & \backslash & \\
Lab & Dors & & \\
\hline & + & & \\
[+rd] & [+bk] & & \\
\end{array}
\]

Naturally, this rule turns off before the redundancy rules in (36) need to apply. Similarly, we know that a [+back] vowel which is unspecified for [+round] must be [-high], so those two features should not cooccur underlyingly in this context:

(41) \[
\begin{array}{c|c|c|c|c}
RV & Place & & Dors & \\
\hline & / & \backslash & \& & \\
& [+bk] & [-hi] & & \\
\end{array}
\]
Notice that in (41) there is no reference to [-round], or to the lack of [+round]. Such a reference is impossible given the underspecification employed and a prohibition on indirectly creating ternary features by reference to the absence of a binary one. But due to the existence of (40), this is no problem: that rule removes [+back] on vowels which are [+round], so the only vowel which retains [+back] after (40) applies is necessarily unspecified for [+round]. This analysis requires, of course, that (40) be ordered before (41). It appears that persistent rules, while unordered relative to normal phonological rules, must at least sometimes be ordered relative to each other. The same type of ordering is to be expected in cases where more than one persistent rule could in principle apply to a representation: one must be ordered before the other to resolve the conflict. Although Myers (1991a) does not discuss this issue, it is consistent with his treatment. By contrast, the redundancy rule in (37) can have direct reference to the feature [-round], since it occurs after the other redundancy rule which fills in that value.

2.3. Glottalized and Aspirated Sonorants

As mentioned above, the major difference between my segmental inventory (2) and that proposed by Oswalt (1) lies in my treatment of his sequences of sonorant plus glottal as a single segment. The representations this entails were laid out in §2.2.1; here I give more detailed evidence for my position. The basic facts and typological aspects are discussed in §2.3.1; in §2.3.2 we turn to phonological evidence internal to Kashaya; and §2.3.3 is devoted to the glottalized nasals, which surface in the onset as voiced stops.

2.3.1. General Considerations

On the surface, what I term 'complex' sonorants — i.e. those with a Laryngeal node dominating [gl] or [asp] — are found only in coda position. I argue in §2.3.3 for underlying glottalized nasals which occur in onset position, but are realized as voiced stops.
there. All other complex sonorants occur only in coda position. The following examples are intended to show that the presence of laryngeal features on a sonorant is not predictable based on the environment; in each case plain (a), glottalized (b), and aspirated (c) variants of each sonorant are given. First, consider the nasals in (42) and (43) (syllable breaks are shown with a space):

<table>
<thead>
<tr>
<th>Number</th>
<th>Morpheme</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>42a</td>
<td>yom ta</td>
<td>‘prophet, dreamer’</td>
</tr>
<tr>
<td></td>
<td>mám ko lo</td>
<td>‘ground squirrel’</td>
</tr>
<tr>
<td></td>
<td>kon hóm t'u' nu</td>
<td>‘mountain lizard’</td>
</tr>
<tr>
<td></td>
<td>k'óm k'o lo</td>
<td>‘river eel’</td>
</tr>
<tr>
<td>42b</td>
<td>p'a rán so</td>
<td>‘type of greens’</td>
</tr>
<tr>
<td></td>
<td>q'áñ su du</td>
<td>‘strawberries’</td>
</tr>
<tr>
<td></td>
<td>ší nán te</td>
<td>‘top’</td>
</tr>
<tr>
<td></td>
<td>p'i jëm je</td>
<td>‘symphysis’</td>
</tr>
<tr>
<td></td>
<td>do lóm</td>
<td>‘wildcat’</td>
</tr>
<tr>
<td>42c</td>
<td>cámr ci?</td>
<td>‘shrink’ [39]</td>
</tr>
<tr>
<td></td>
<td>yém't te</td>
<td>‘gill net’</td>
</tr>
<tr>
<td></td>
<td>simr má</td>
<td>‘fifteen’</td>
</tr>
<tr>
<td></td>
<td>ñoh cómr ya</td>
<td>‘hip’</td>
</tr>
<tr>
<td></td>
<td>kamr se</td>
<td>‘stakes (in gambling)’</td>
</tr>
<tr>
<td>43a</td>
<td>dič wa cín nam</td>
<td>‘I heard them talking’ [243]</td>
</tr>
<tr>
<td></td>
<td>nán ča</td>
<td>‘sixteen’</td>
</tr>
<tr>
<td></td>
<td>q'a bán hay</td>
<td>‘driftwood pile’</td>
</tr>
<tr>
<td></td>
<td>ší mún</td>
<td>‘living’</td>
</tr>
<tr>
<td>43b</td>
<td>mo már ci'ń na</td>
<td>‘he wasn’t thinking of running in’ [253]</td>
</tr>
<tr>
<td></td>
<td>cañ wán miy</td>
<td>‘I saw it fly here and there long ago’ [104]</td>
</tr>
<tr>
<td></td>
<td>mah sáñńą</td>
<td>‘must have taken it away’ [104]</td>
</tr>
<tr>
<td></td>
<td>řih mëni cať</td>
<td>‘singer’</td>
</tr>
<tr>
<td></td>
<td>wa'ń</td>
<td>‘is walking’ [2.105]</td>
</tr>
<tr>
<td>43c</td>
<td>ma tánr na</td>
<td>‘perch’ [39]</td>
</tr>
<tr>
<td></td>
<td>lanr ča</td>
<td>‘six’</td>
</tr>
<tr>
<td></td>
<td>lanr k'o</td>
<td>‘seven’</td>
</tr>
<tr>
<td></td>
<td>mo? sónr ciw</td>
<td>‘dent with a thrown object’ [75]</td>
</tr>
</tbody>
</table>

---

7 The morpheme structure condition is enforced by the rule of Onset Simplification (§3.1.2), which makes it impossible for a complex sonorant to surface in onset position. In nonalternating forms, the language learner has no reason to posit an underlying complex sonorant in an onset.
Notice especially that there is no necessary connection between the laryngeal features of the sonorant and those of the following consonant, so that it is not possible simply to say that, for example, a sonorant is aspirated before an aspirated consonant and at no other time.\footnote{The partial geminates /\textipa{m̩n}/ and /\textipa{n̩n}/ are pronounced [n\textipa{n}] and [n\textipa{n}] respectively; that is, with glottalization or voicelessness in the middle of the articulation, without an intermediate oral release.}  

The same is true of the lateral:

(44) a. kēl mu li  \hspace{1em} ‘peer around!’ [2.105]  
\hspace{1em} kēl keľ’ \hspace{1em} ‘peer repeatedly’ [2.105]  
\hspace{1em} t’a wfl \hspace{1em} ‘left (side)’

b. wól’ wo \hspace{1em} ‘badger’

\hspace{1em} q’al’ ša \hspace{1em} ‘weasel’

c. ṣīh sūľ’ la \hspace{1em} ‘brown towhee’

\hspace{1em} hi’ bāl’ mul’ \hspace{1em} ‘turn around’ [75]

\hspace{1em} mu’ sūľ’ mo \hspace{1em} ‘hollow log’

\hspace{1em} da pōl’ maw \hspace{1em} ‘squeeze liquid out’ [75]

The glides have the same pattern (see §6.7 for relevant discussion about the surface distribution of plain glides):

(45) a. cáy nīk’ \hspace{1em} ‘teapot’

\hspace{1em} kēy key \hspace{1em} ‘nod head’ [2.26]

\hspace{1em} ṭah r’fy \hspace{1em} ‘big (pl)’

\hspace{1em} way \hspace{1em} interjection [321]

b. máy ma \hspace{1em} ‘separate, apart’

\hspace{1em} tū y tu \hspace{1em} ‘sugar’

\hspace{1em} wāy c’īn \hspace{1em} ‘repeatedly’

\hspace{1em} háy ko \hspace{1em} ‘wigglers (mosquito larvae)’

\hspace{1em} kō’ tāy \hspace{1em} ‘mosquito’

c. q’āy’ c’į \hspace{1em} ‘pelican’

\hspace{1em} háy’ c’ā \hspace{1em} ‘dry brush’

\hspace{1em} háy’ ụa \hspace{1em} ‘redbud’

\hspace{1em} li p’ūy’ ya \hspace{1em} ‘marrow’

\hspace{1em} way’ \hspace{1em} ‘just walked out’ [25, 2.106]
(46) a. pêw lo  ‘town’
lîw ra  ‘pound’
yôw  ‘all right’
ʔâ náw  ‘be cooked’ [106]

b. ñaవ  ‘tight’ [142]
śfrw ñi  ‘chick’
maʔ jáw duʔ  ‘step on’ [39]

c. ca hâw³ ku  ‘one boil’ [39]
muʔ ñâw³ mi  ‘really cooked’ [107]
yow³ ce du  ‘ “All right,” he said’ [108]

The borrowed segment /ɾ/ does not have underlying glottalized or aspirated variants, supporting the claim that laryngeal features on sonorants are phonemic and not (in all cases) derived. The segment [w³], illustrated in (46c), has been found only in derived contexts; some of the other examples of complex sonorants given here are also derived. In fact, it appears that all of the complex sonorants in Kashaya are historically derived from the merger of a plain sonorant with an adjacent glottal. This process is still active in the language, and is discussed in §3.1.1. Defects in distribution are likely due to this historical origin. For example, word-final glottalized sonorants are common because of the Absolutive suffix -ʔ (§3.1.1). On the other hand, word-final aspirated sonorants are virtually nonexistent, since there has apparently never been a suffix *-h which could have generated them. The one case of a word-final aspirated sonorant above, namely [y³], is derived by Coda Aspiration (§3.1.7), Debuccalization (§3.2), and Glottal Merger (§3.1.1).

The question remains of whether it is appropriate to analyze the complex sonorants as single segments as I have done, rather than as the clusters (sonorant plus glottal) which Oswalt assumes. First, consider the phonetic plausibility. Consider the phonetic representation [nn], a regular voiced nasal followed by a voiceless nasal, where halfway through the articulation of the nasal, voicing ceases. This situation is consistent with a phonological analysis as /nh/, since /h/ is typically realized as the voiceless counterpart of the adjacent segment. Similarly, /nʔ/ is pronounced as [nʔ], a nasal with normal voicing.
at the beginning and creaky voice toward the end, sometimes followed by a glottal stop. This in turn is consistent with /nʔ/, since a glottal stop often causes creaky voice, especially when noninitial. At the same time, however, both of these phonetic realizations are perfectly consistent with a phonologically complex nasal, since the features of oral closure and velic opening are maintained throughout; an additional feature of glottalization or aspiration would account for the fact that creaky voice or voicelessness takes over partway through the segment. In addition, the segments which I represent as, for example, /iː/ and /nː/, have (to my ear) the same duration as plain /n/ in coda position — which we might not expect if the complex sonorants are actually clusters. The point of this discussion is to show that the phonetic facts cannot determine the choice between these analyses; rather, we must use phonological evidence to determine the best phonological representation.

Glottalized sonorants are found in a number of Native American languages (e.g. Sapir 1938), and in syllable-final position (where, as mentioned above, the Kashaya segments are found) they are typically realized as a sonorant with creaky voice and a glottal stop toward the end of the segment. For example, in Kutenai (Lawrence Morgan, personal communication):

(47) /kaʔ\iː/ → [kanʔʔ] ‘shoe, moccasin’

Data such as this show that similar phonetic sequences in Kashaya can plausibly be related to single phonological units.

More specific typological and areal support for this analysis comes from other California languages. Jacobsen (1976:215) suggests that in Yana, a Hokan language related to the Pomoan family, the sequences /bʔ/ and /dʔ/ derive historically ‘from nasals m or n plus θ, and further that their common syllable-final location implies that they may come from earlier glottalized nasal unitary phonemes (besides which there may have been also a glottalized l).’ Hinton (1988) gives a synchronic analysis of Yana phonemes, developed by Ken Whistler, which includes glottalized versions of /m, n, l, w, y/. The resemblance
to what I have proposed for Kashaya is striking, and it would be interesting to explore whether this similarity sheds any light on the historical phonology of northern Hokan. In addition, Kingston (1985:352) discusses data from Yokuts (a Penutian language) where glottalized sonorants do not occur in word-initial position, and reduce to plain sonorants when following another consonant, concluding that 'glottalization shows a strong preference for syllable codas.' This is exactly where it is found in Kashaya: in addition to (70) below which creates voiced stops, see (59) for a rule which removes the laryngeal features from a sonorant which comes to be in onset position.

The term 'aspirated sonorant' is more surprising, considering that the phonetic realization is a partly devoiced sonorant. Phonologically, however, this seems to be precisely the correct notion. A relevant illustration is presented by Shaterian (1976, 1983) in his analysis of the Yuman language Yavapai, where an /h/ combines with a following sonorant to produce a voiceless sonorant:

\[(48) \quad /hla/ \rightarrow [lə] \quad \text{‘moon’}\]
\[/ʔohnaːl/ \rightarrow [ʔənəːl] \quad \text{‘gourd’}\]
\[/tah+m+i/ \rightarrow [təni] \quad \text{‘throw (away from speaker)’}\]

In addition to these examples with /h/ plus a sonorant, there are sporadic examples of /h/ plus a stop becoming an aspirated stop; for example, /ʔ+hta/ \rightarrow [ʔtəʔa] ‘reed, cane’.

Shaterian treats this as simple metathesis, but it is more faithful to the phonetic realization to analyze the outcome as a single segment, an aspirated stop. The closely related language Havasupai has similar examples of both types (Hinton 1984); there are variant pronunciations of a number of words where /h/ and a following voiceless stop can be separated by an epenthetic vowel or combined into an aspirated stop:

\[(49) \quad /hҚąyк/ \rightarrow [hʔқąyк] \text{ or } [kɛąyк] \quad \text{‘be different’}\]
\[/hחכֳw/ \rightarrow [hʔחכֳw] \text{ or } [cɛąw] \quad \text{‘material, cloth’}\]
The forms with epenthesis are most common in slow speech among older speakers. A parallel alternation occurs for /h/ followed by a sonorant; in this case the result of combining the sounds is a voiceless sonorant:

\[(50) \quad /\text{máñ}/ \rightarrow [\text{hámáñ}] \text{ or } [\text{máñ}] \quad \text{‘boy’}\]
\[/\text{láñ}/ \rightarrow [\text{háñ}] \text{ or } [\text{láñ}] \quad \text{‘moon, month’}\]

These patterns show a clear correlation between (phonetic) aspiration in obstruents and devoicing in sonorants, which can be unified by a phonological feature of aspiration.

Similarly, Clements (1985a) argues that in Klamath the phonetically voiceless lateral [l] should be treated with the aspiration feature [+spread glottis] rather than [-voice]. He also equates the relationship between [l] and [h] with that between [l'] and [ʔ]; in other words, the Laryngeal node that represents the purely glottal segments is what marks the voicelessness (aspiration) or glottalization of the sonorant — just what I have suggested for Kashaya. In a more general context, Mester and Itô (1989) argue on the basis of data from a number of languages that voicing is a privative feature that exists only in the form [+voice], so that it is impossible to use [-voice] to mark a contrast between plain and voiceless sonorants (giving language-particular evidence from Burmese). Instead, voicelessness in sonorants is the equivalent of aspiration in obstruents: both are marked by [+sgl]. This position is supported by Cho (1991) with further data. Not only is there good cross-linguistic precedent for treating ‘voiceless’ sonorants in Kashaya as phonologically aspirated, but the theoretical arguments adduced by Mester and Itô suggest that this is the only possible analysis.

One objection that might be raised to the proposal in (2) is that it constitutes an unacceptable complication of the consonant inventory. After all, the addition of ten glottalized and aspirated sonorants is hardly offset by the elimination of two voiced stops. This argument only carries force, however, if the most important measure of complexity is counting phonemes, a strategy which appears to be wrong in light of advances made in
modern phonology.

At an earlier stage of phonological theory, phonemes were regarded as indivisible units. Even when it was recognized that acoustic or articulatory features could be used to describe natural classes of phonemes, the phonemes were often still seen as unitary 'bundles' of features (Bloomfield 1933). With the advent of generative phonology (e.g. Chomsky and Halle 1968), features came into their own and replaced the phoneme as the basic underlying unit. For example, phonological rules manipulate features rather than phonemes, so that natural classes are directly expressed by the features present in the rules. The segmental inventory of a language can thus be analyzed not as a list of segments, but as a list of features and principles determining how the features can cooccur to form segments, as I have done in §2.2. In this view, phonemes are secondary or epiphenomenal, and the important issue is what features are present and how they interact (e.g. Archangeli 1988, Archangeli and Pulleyblank in preparation). Asymmetries in the inventory take their toll on the cooccurrence restrictions that determine how features can combine to form segments: for example, if /ʔ/ or /qʰ/ were missing from Kashaya a special statement would be necessary in the grammar to prevent the features marking uvular place from combining with the features marking glottalization or aspiration. Since all voiceless stops occur also as ejectives and aspirates, however, no such statement is necessary.

Seen from this perspective, the proposed inventory in (2) can actually be thought of as a simplification of that in (1). The glottalized and aspirated sonorants are merely the result of allowing the glottalization and aspiration features — already necessary for the stops — to cooccur with the sonorant features, which are themselves already needed for the plain sonorants. Further, the elimination of /b/ and /d/ from the underlying inventory means that voicing is no longer required as a distinctive feature; although there are other segments that are phonetically voiced, in all cases this is predictable in accordance with the universal default pattern: sonorants are voiced, and obstruents are voiceless. The voiced stops are discussed more fully in §2.3.3 and §3.1.3.
2.3.2. Phonological Evidence

Having explained my proposal and given general arguments for its plausibility, I turn now to specific language-internal reasons for pursuing such an analysis in Kashaya. A number of the issues discussed here are treated in more depth in chapters 3 and 6, and for present purposes only a brief description is necessary.

There are two pervasive patterns in Kashaya that are better accounted for if we assume these single-segment representations of complex sonorants. First, monosyllabic verbal roots have the shape (H)CV(·)(C), where H is a laryngeal increment (§6.4). The relevant fact here is that there is normally no more than a single consonant at the end of the root.

Typical examples are given here:

(51) mo-        ‘run’ [70]
    -§a-        ‘break’ [72]
    -bRAY-      ‘touch’ [106]
    -kis-       ‘scratch’ [70]
    -ʔsat-      ‘slam’ [177]
    -hmuʔl-     ‘do incompletely’ [148]

There are some roots, however, that in Oswalt’s transcription end in two consonants:

(52) -ʔkolh-    ‘spill’ [172]
    -ʔpanh-     ‘open’ [170]
    -ʔbalh-     ‘turn’ [75]
    -ʔsonh-     ‘dent’ [75]
    -ʔcalh-     ‘be skeletal’ [162]
    -ʔcenh-     ‘have an impediment, build a shelter’ [D]
    -ʔpolh-     ‘cause liquid to flow out’ [75]
    -ʔcelh-     ‘carry on the back with a strap’ [D]

The root-final /h/ does not always surface (depending on the following segment; see §3.1.2, §3.1.6), but it is found only after the coronal sonorants /l/ and /n/. If the final sequence is treated as a single segment — /ňN/ or /n/ — then the generalization that roots end in a maximum of one consonant is preserved, and we also explain why the apparent /ň/
occurs only after plain sonorants.

A more compelling argument comes from syllable structure. Most of the time we can describe Kashaya syllables in a simple way: one C in the onset, a V in the nucleus, and an optional C or V in the coda; this yields the possible syllables CV, CVC, and CVV. This is a well-attested type of syllable structure cross-linguistically, and can form part of a natural analysis of Kashaya (§6.1). Exceptions to this pattern are found when a sonorant is apparently followed by /h/ or /ʔ/:

(53)  lanhk’o  ‘seven’
      wól’wo  ‘badger’
      q’áyhc’i  ‘pelican’
      monʔ*  ‘is running’ [40]

These forms cause problems for the otherwise straightforward syllable structure, which itself explains alternations in vowel length and epenthesis (see below). If the sonorant and glottal are a single segment, however, they fit perfectly in the same syllable pattern:

(54)  lan’k’o  ‘seven’
      wól’ wo  ‘badger’
      q’áy’c’i  ‘pelican’
      mo’n  ‘is running’

This analysis explains why in Oswalt’s transcriptions of native vocabulary there are no three-consonant clusters where the first two segments are not a sonorant and a glottal: a word of the form *lanhk’o is impossible since that really would have three consonants in a row, and could never fit the syllable structure. The same is true of word-final clusters after a long vowel: no form such as *mo’n could exist. It would be possible to add a statement to the grammar such that only /ʔ/ and /h/ (i.e. placeless consonants) are permitted as the second of two consonants in a CC coda cluster, but this is a needless complication when we have the option of treating the sonorant and the glottal as a single segment. For an account of irregular syllable structure in loanwords, see §6.1.3.

Aside from allowing a simple expression of permissible underlying forms in the native
vocabulary, this clear statement of syllable structure is essential to understanding a wide range of processes which respond to the limited size of the syllable. For example, an unsyllabifiable consonant can be saved by Epenthesis (§6.3.1): a vowel (whose quality is determined by the preceding consonant) is inserted and the consonant becomes the onset to the syllable headed by the epenthetic vowel:

(55)  kel-m-w → kēl maw ‘peer down at’ [158]
masahc-w → ma sāh čjw ‘be damp-dry (pl)’ [172]
mo-hṭ-w → môh tįw ‘run (pl)’ [2.106]

A similar change is Closed-Syllable Shortening, whereby a CVVC syllable becomes CVC. These phenomena and others are discussed in chapter 6; they share the need for a restrictive syllable structure which the representations in (53) violate but which those in (54) do not.

A minor point of advantage for the single-segment analysis is found in the expression of the rule of Aspirate Dissimilation (§3.1.5). When a word-initial aspirated stop is followed by a consonant with the [asp] feature, the initial stop loses this feature and becomes a plain stop:

(56)  cʰi-cʰa-w → cicʰaw ‘grasp with handled instrument’ [74]
pʰi-holʔ → pihол ‘look for unseen object with stick’ [2.54]
pʰu-heʰa-w → puheʰaw ‘blow over’ [145]

The simplest and most restricted way of expressing this rule is by referring to the first consonant that follows the word-initial consonant, essentially C⁴VC⁸ → CVC⁸. There is a root -mʰmi- ‘do in detail, do perfectly’ which also triggers Aspirate Dissimilation:

(57)  pʰi-mʰmi-w → pimʰmɨw ‘see perfectly’ [42]

If the first consonant of the root is represented as an aspirated nasal, the rule of Aspirate Dissimilation as expressed above will apply straightforwardly. If we assume a representation such as -mʰmi-, however, the first consonant of the root is a plain /m/ and we would not expect the rule to apply; Aspirate Dissimilation would have to be formulated
in a more complicated way to account for this situation. By admitting /m/, we are able to keep the rule in a simple form where this root behaves in a way parallel to all others.\footnote{This root is the only one I am aware of which begins in a nonincremental cluster, but it would be an even greater exception to the pattern if it were -m\textsuperscript{mi}-, with three initial consonants. If it is -m\textsuperscript{mi}-, as I suggest, then the essence of the violation is that the laryngeal increment (H) shares the place features of the following consonant. Bun Lucas has a simplified root -\textsuperscript{H}mi- (\textsuperscript{H}CV), which fits the canonical pattern. See also §6.4.3.}

If a glottalized sonorant at the end of a word resyllabifies as the onset, it loses its glottalization:

(58) \begin{align*}
\text{ma' e' mu} & \quad \rightarrow \quad \text{ma n' e' mu} & \text{‘it’s her’} & \text{[2.49]} \\
\text{dolo'm e' mu} & \quad \rightarrow \quad \text{dolo lo m' e' mu} & \text{‘it’s a wildcat’} & \text{[2.50]}
\end{align*}

This can be accounted for by a simple rule of Onset Simplification which deletes the glottal feature from a sonorant in onset position (§3.1.2). Schematically, where R stands for a sonorant consonant:

(59) \text{R’} \rightarrow \text{R} / [c\ _]

This rule is well motivated by the general constraint in Kashaya against glottalized sonorants in onsets, attested in other languages as well (Kingston 1985). Under a cluster analysis, where for example ‘wildcat’ is dolom\textsuperscript{2}, the rule would have to be something like the following:

(60) \text{?} \rightarrow \emptyset / \text{R} \ _ \ V

Such a deletion has no apparent motivation, unlike one which refers to onset position as in (59). It must also be formulated in such a way that it will not apply to word-initial glottal stops which follow a word ending in a sonorant. There are two examples of the sequence /n\textsuperscript{2}/ across a word boundary in the following sentence which are unaffected by Onset Simplification (from Oswalt 1964a:36):

(61) \begin{align*}
\text{men'sili p\textsuperscript{h}ɪ\textsuperscript{ta}n pah\textsuperscript{h}ɪ\textsuperscript{ya}ni\textsuperscript{m} min \text{?ul p\textsuperscript{h}ɪ\textsuperscript{ya}ni\textsuperscript{m} pli\textsuperscript{h}ɪ\textsuperscript{ya}ni\textsuperscript{m} mu\textsuperscript{h}ɪ\textsuperscript{q}i\textsuperscript{m} qawi dāhala\textsuperscript{la}l i} \\
\text{‘Then, suddenly, it looked like there was a little water there where he was digging.’}
\end{align*}
To prevent application of rule (60) it must be further complicated by including a word boundary after the glottal stop, which makes it even more unnatural. Since my analysis treats these cases as true clusters of /n/ plus /l/, they are unaffected by rule (59).

2.3.3. Voiced Stops

Up to this point I have argued in general terms for aspirated and glottalized sonorants in Kashaya. This analysis makes possible another modification in the segment inventory, namely the elimination of voiced stops as underlying phonemes. I suggest that the voiced stops are derived from the glottalized nasals, which I have already argued to exist underlyingly as single segments. I now turn to evidence in favor of deriving surface [b] and [d] from phonemic /b/ and /d/. To the extent that the arguments for this derivation are persuasive, they also constitute arguments in favor of including in the inventory glottalized (and aspirated) sonorants in general.

We already need a rule which relates the phones [d] and [n], since they alternate in the same morphemes. For example, using ‘D’ to stand for the alternating segment:

(62) caD-ì   →  ca ñù   ‘look!’ [2.6]
caD-pì   →  cán pì   ‘if he sees’ [104]

(63) du-hluD-ìbic-?   →  duh lu ñì bic?   ‘start to pick off’ [104]
du-hluD-ba   →  duh luñì ba   ‘having picked it off’ [104]

(64) ma-hsaD-in   →  mah sa ñùn   ‘while taking it away’ [104]
ma-hsaD-qà   →  mah sàñìqì   ‘must have taken it away’ [104]

The two segments are in complementary distribution: [d] occurs only in onset position, [n] only in coda position. In Oswalt’s analysis, essentially /d/ becomes [n?] in the coda:

(65) /cadpì/   →  [càn?pì]
Instead of treating [d] as underlying, I take /n/ as the basic form and change it to a voiced stop in onset position:

(66)  /cən/  →  [cad̪]

This can be accomplished by a rule of Desonorization with the following effect (§3.1.3):

(67)  n → d / [σ —

In other words, the nasal loses its nasality and glottalization when it occurs at the beginning of a syllable. This rule is by itself not more complicated, nor simpler, than Oswalt’s description.

The complementary distribution of [b] and [m] is parallel, with the voiced stop found only in onsets and the glottalized nasal only in codas (see also (42)):

(68)  bar bán  ‘father’s father’  
     be’ li  ‘here’  
     bî? da  ‘stream’  
     si bô  ‘three’  
     q’a? be  ‘rock’

(69)  ?o hóm’  ‘nettle’  
     k’u núm  ‘Bishop pine’  
     héin gó lo  ‘thimbleberry’  
     bar’ sím’si  ‘chipmunk’

Although the morphology does not provide an occasion for the phones to alternate (such as at the end of a root or in a consonant-final suffix), we can derive [b] from /m/ by generalizing the rule in (67), i.e. not specifying a place of articulation (expressed here informally):

(70)  N’ → C / [σ —

That is, a glottalized nasal becomes a nonnasal, nonglottalized consonant in an onset; the voicing of the resulting stop is derived from the fact that nasals are voiced by default
(§3.1.3). This rule then expresses the relationship of complementary distribution without complicating (indeed, by simplifying to more general terms) the rule in (67) that we already need.

Two objections might be raised to this analysis. First, there are at least two words with geminate [d]'s which could be thought to contradict the rule:

(71) ḫešéddu
    hikaddedu
    ‘feathered dancing skirt’
    ‘main, chief’

In conventional approaches to the structure of geminates (e.g. Schein and Steriade 1986, Hayes 1986a), a geminate such as /ň/ should not undergo a rule which targets only one half of it — in this case just the /ň/ which is in onset position. If the geminate is underlyingly /dː/, this problem is avoided since no rule applies. One response is that these geminates are not found in native Kashaya vocabulary and do not figure at all in the productive phonology of the language (for example, ḫešéddu is borrowed from Southern Pomo (McLendon 1973:47)). A more satisfying solution, however, does not rely on exceptionality, but on a different theory of geminates. Inkelas and Cho (1991) argue that geminate integrity is the result of the fact that geminates are represented underlyingly with prespecified mora or feature structure, and this prespecification exempts them from certain structure-building rules. On this view, nothing prevents a rule such as (70) from applying to a geminate: the features fit the structural description because they are linked to an onset, and the change to a voiced stop is automatically carried out over the entire geminate due to the fact that all the features are shared. As a result the forms in (71) present no difficulty.

Another complication is the rare Independent Intensive suffix -ń; it surfaces as [d] when final and following /n/:

(72) coʰtoci-ń    →    coʰtōtīń    ‘he is about to leave’ [260]
    coʰtoci-ńi-ń-e    →    coʰtōtīńi-ńede    ‘he is not about to leave (NIV)’ [260]
    coʰtoci-ńi-ń    →    coʰtōtīńind    ‘he is not about to leave’ [260]¹⁰

¹⁰ Oswalt’s transcription does not show any Glottal Transfer (§3.1.4) in this form, and I could not
This is a problem for any analysis, however, whether the [d] is underlying or not, since the [d] appears to be in the coda and violates the simple descriptive generalization about its distribution. Oswalt assumes a special rule regarding the realization of the phoneme when it is final and following /n/. We could adopt the same solution here, but as discussed in §4.3.2 is it possible to use the same rule of Desonorization for the forms in (72), by adding to the grammar a constraint against the word-final cluster [ni].

Finally, as Robert Oswalt (personal communication) points out, treating the allophone which appears in codas (i.e. the glottalized nasal) as underlying is unlike the pattern for other consonants (specifically, the stops) in Kashaya, where many underlying distinctions are lost in codas (see chapter 3). There is a crucial difference between these cases, however: the rules which operate on consonants in coda position (often reducing them to [h] or [ʔ]) eliminate phonemic DISTINCTIONS. The rule in (70) does not eliminate distinctions in onset position; rather, it changes the phonetic REALIZATION of the glottalized nasals. Since no other phonemes become voiced stops (in any position), no distinction is lost. In this respect, there is no inconsistency, and we preserve the generalization that distinctions are lost in codas rather than onsets (cf. Cho 1990). It is true, however, that the complex sonorants of all types occur as such only in coda position, and in this they differ from other consonants, some of which surface unchanged only in onset position. This, I believe, reflects a cross-linguistic tendency for complex sonorants to be restricted to codas. At any rate, the deglottalization illustrated in (58) is a clear example of the loss of contrast in onset position, which either account must accept.

We now continue with the arguments in favor of the present analysis. Ignoring the voiced stops, voicing is not distinctive in Kashaya: obstruents are voiceless, sonorants are voiced. Glottalization, on the other hand, is distinctive for all stops — and, I have argued, for sonorants as well. Treating [b] and [d] as derived from /b/ and /d/ fits much better with
elicit it myself.
the rest of the inventory. If the voiced stops are underlying, we must include [voiced] as a distinctive feature, even though it is needed for only two segments in the entire language — voicing in other segments is completely predictable from the value of [sonorant]. We already have a clear need for the feature [gl] since all of the oral stops occur in glottalized and nonglottalized versions. Recall the modern view that features, and not phonemes, are the basic units of phonology. This means that a simpler inventory is one which minimizes the number of underlying FEATURES rather than the number of underlying SEGMENTS. By using this same feature to distinguish the glottalized nasals (which become voiced stops by rule in onset position) we eliminate a redundant feature from the underlying inventory.

Voiceless stops occur at six places of articulation. We could reasonably expect that, if voicing is distinctive in Kashaya, voiced stops should also occur at most or all of these same places. In fact, of course, voiced stops are found only at the labial and alveolar places of articulation. Why should this be the case? I suggest it is no coincidence that this is precisely where the plain nasals /m, n/ are found. In describing the inventory of Kashaya, we already need to say that the feature [+nasal] is found only at the labial and alveolar places (§2.2.3). By allowing the feature [gl] to cooccur with these nasals, we understand immediately why /m, n/ and their allophones [b, d] exist to the exclusion of other potential voiced stops. There is no dental [q] simply because there is no /q/ from which to derive it — and this glottalized nasal does not exist because the plain nasal /q/ is absent. If the underlying segments are /b/ and /q/, we have no explanation for why we do not find /q, j, g, G/ as well.\footnote{The absence of voiced stops further back in the mouth could potentially be explained in aerodynamic terms: the smaller oral cavity during closure makes voicing more difficult (e.g. Catford 1977). This might account for the lack of uvular /g/, but it becomes less convincing when forced to explain the absence of /g/ and /q/, not to mention /q/ which is further forward in the mouth then the alveolar stop which does exist.}

An underlying feature of glottalization has positive benefits, beyond avoiding the disadvantages of underlying [+voice]. Many morphemes contain a laryngeal increment which may or may not surface depending on the environment, represented informally as a
segment preceded by /ʰ/ or /ʔ/. As illustrated in §6.4.1, glottalized stops are preceded only by /ʔ/ and aspirated stops only by /ʰ/; in other words, the increment must agree with the features of the Laryngeal node of the following consonant:

(73) \[ \begin{array}{ll}
-h_p^b-o^- & \text{‘overflow’ [137]} \\
-h_t^i- & \text{‘do to pieces’ [137]}
\end{array} \]

(74) \[ \begin{array}{ll}
-t_p^b-an^- & \text{‘shut’ [170]}
-t_aq^- & \text{‘smear, rub’ [138]}
\end{array} \]

It is quite interesting to note that both [b] and [d] take /ʔ/ rather than /ʰ/ as an increment:

(75) \[ \begin{array}{ll}
-t_b^a- & \text{‘crack open’ [151]}
-t_di^- & \text{‘pick up, carry’ [80]}
\end{array} \]

This is explained if, as I have proposed, the underlying segments are actually /tm/ and /n/, since the [gl] feature will be realized as /ʔ/. The constraint is satisfied in the underlying representation; when rule (70) later applies to change the nasal to a voiced stop, the increment /ʔ/ is unaffected. Oswalt (1961) captures these similarities by proposing a cover term ‘glottalic’ for ejective and voiced stops. My use of the feature [gl] provides a formal means of accounting for the pattern.\footnote{Imitative words offer further suggestive evidence that voiced stops are underlyingly glottalized: compare the verb roots ɨbɨ- ‘be clicking’ and ɨbő- ‘make popping sound’ with the interjections ɨp’ ‘click’ [D] and ɨp’ ‘pop’ [2.59].}

As mentioned above, consonants in Kashaya often undergo changes when followed by another consonant. For example, there is a dissimilatory process whereby all place features are lost on a coronal consonant which is followed by another coronal (§3.2.1). This means that the first consonant will reduce to /h/ or /ʔ/ depending on its laryngeal features. Once again the glottalized nasals pattern like ejectives:

(76) \[ \begin{array}{ll}
\text{cač-ti} & \rightarrow \text{cáʔti} \quad \text{‘in order to see (pl)’ [105]}
\text{cań-ti} & \rightarrow \text{cáʔtí} \quad \text{‘in order to see (sg)’ [104]}
\text{moñon-ti} & \rightarrow \text{moñonti} \quad \text{‘in order to hit’}
\end{array} \]

\footnote{Imitative words offer further suggestive evidence that voiced stops are underlyingly glottalized: compare the verb roots ɨbɨ- ‘be clicking’ and ɨbő- ‘make popping sound’ with the interjections ɨp’ ‘click’ [D] and ɨp’ ‘pop’ [2.59].}
Both /č/ and /ń/ become [ʔ]. If /d/ is underlying, we require a special statement saying that it reduces to [ʔ] in this environment; but if glottalized nasals are underlying, the result follows automatically.

Another change is found when a consonant precedes what on the surface is a voiced stop; in this environment it becomes glottalized:

\[(77)\]

\[
\begin{align*}
\text{yoqoc-ba} & \rightarrow \text{yoqocba} & \text{‘after keeping’ [99]} \\
\text{dahyut-ba} & \rightarrow \text{dahyutba} & \text{‘after rubbing’ [2.12]} \\
\text{p’anem-ba} & \rightarrow \text{p’anemba} & \text{‘after punching’ [2.50]} \\
\text{duhtay-do} & \rightarrow \text{duhtaydo} & \text{‘they say he touched’ [2.62]}
\end{align*}
\]

This change is rather surprising, since we would normally expect a voiced stop to spread its voicing to an adjacent segment, e.g. *yoqójba. But if, as I have suggested, the voiced stops are really glottalized nasals underlyingly, this process is much easier to understand: the nasal transfers its glottalization to the preceding segment:

\[(78)\]

\[
\begin{align*}
\text{yoqoc-mi} & \rightarrow \text{yoqoc?ba} & \rightarrow \text{yoqocba} \\
\text{nahyut-mi} & \rightarrow \text{nahyut?ba} & \rightarrow \text{dahyutba} \\
\text{p’anem-mi} & \rightarrow \text{p’anem?ba} & \rightarrow \text{p’anemba} \\
\text{nuhtay-no} & \rightarrow \text{nuhtay?do} & \rightarrow \text{duhtaydo}
\end{align*}
\]

By assuming glottalization in the underlying representation, we can express this rule in an entirely straightforward fashion (§3.1.4).

Another advantage of this analysis is with the Plural Agent morpheme, which changes tokens of /ń/ into [č]. First, the ‘Palatalization’ rule can be expressed more simply if this is the change, rather than /d/ → [č]. Second, the facts about which segments in a verb actually undergo the rule support the position that /ń/ is underlying, and that Palatalization targets only /ń/, not [d]. See §3.5.2 for further discussion.

I have argued here that the voiced stops [b, d] derive from underlying glottalized nasals, which carry the features [+nas, gl]. An alternative which still includes [gl] in the underlying representation is to assume that the segments are actually implosive /b, d/, bearing the features [voiced, gl] instead, with [+nas] inserted on [voiced] segments at the
end of the lexicon. Lexically, the loss of [gl] in onset position leaves only [voiced], and results in a voiced stop. Postlexically, the loss of [gl] leaves both [voiced] and [+nas], resulting in a (voiced) nasal. This analysis has the advantage of exploiting the same Onset Simplification rule in both components of the phonology and tries to derive the difference in a principled way from the presence or absence of the redundant feature [+nas], but creates major problems. First, it requires [voiced] to be present in underlying representations, which is otherwise unnecessary: it seems more reasonable to say that [voiced] is a side effect of [+nas] (the universal default rule) rather than that [+nas] is a side effect of [voiced] (although cf. Piggott, to appear). The restriction of nasal segments to the labial and alveolar positions is very common cross-linguistically, but we have no strong case for why voiced segments should be restricted to these places (and to be absent at the dental and other places).

Second, this analysis relies on [voiced] to make a distinction between sonorants which are actually all voiced on the surface and differ really in [nas]. The formal implementation of this dubious distinction is also problematic: if surface [m, n] are [voiced] rather than [nas], we ought to assume that the other nasals /m, n, m³, n³/ are also marked in this way, and that [nas] is inserted on [voiced] segments by rule. Of course, to prevent the other sonorants from becoming nasals as well there must be some difference from the eventual nasals; one possibility is that the redundancy rules are ordered as follows:

\[
\begin{align*}
(79) \quad [\text{voiced}, +\text{son}] & \rightarrow [+\text{nas}] \\
[+\text{son}] & \rightarrow [\text{voiced}] \\
[0\text{nas}] & \rightarrow [-\text{nas}]
\end{align*}
\]

This is an underhanded way of encoding [+nas] by [voiced]. An alternative is to use other features which restrict the assignment of [+nas], such as [cont] and [lat] and place features. There is, however, no independent evidence that sonorants bear these manner features distinctively. Further, this analysis offers no easy account of why /n³/ becomes [n] lexically in the onset (§3.1.2), even though [+nas] should not yet be present in the
representation. Most important, there must be a way of preventing [+nas] from being assigned to eventual [b, d]: the only obvious way of doing this is by assigning [-son] to voiced segments in onset position. But this is precisely the effect of the rule I have suggested is responsible for Desonorization, rendering unclear any advantage that the implosive-based analysis may have over the glottalized nasals.

A final note: My arguments in this section for analyzing voiced stops as allophones of glottalized nasals are relevant only to Kashaya, and I make no claims about the synchronic description of other Pomoan languages, nor any other language that might have a similar inventory to Kashaya. In other languages, even if the ultimate origin of voiced stops is the same, the surface voiced stops may have taken on a life of their own and been reanalyzed as the underlying form; but by the same token, in such languages I would not expect the wide range of evidence we find in Kashaya suggesting an underlying glottalization feature. Of course, in many languages nasals and voiced stops show various phonological relations and alternations which are unrelated to glottalization, and my analysis has nothing to say about that. Implications of this analysis for the reconstruction of Proto-Pomo stops are discussed in Buckley (1990).

2.4. The Status of Glides

In many languages, alternations between glides and vowels provide evidence that these two classes of segments are identical except for their syllabicity: for example, that the glides [y, w] are simply the high vowels /i, u/ linked to nonnuclear positions in the syllable structure (cf. Clements and Keyser 1983, Kaye and Lowenstamm 1984, Levin 1985, Guerssel 1986). Since this positive evidence suggests that glides and vowels differ only in this minimal way, the most constrained cross-linguistic theory of phonology should treat all glides as nonsyllabic vowels, even in languages where no such alternations exist (cf. Hunt 1991). Evidence from other languages, however, points in a different direction: namely,
that glides and vowels must be distinct in more than their syllabicitly. The typical solution is to treat glides as [+cons] and vowels as [-cons] (Hyman 1985, Hayes 1989b, Waksler 1990). Whether other features are underlyingly different, e.g. those dominated by Place, is a separate matter, but if glides and vowels differ only in their syllabicitly, their melodic features must of course be the same.

There are many reasons to believe that in Kashaya, glides are distinct from vowels in their featural composition — not only that glides are [+cons] while vowels are [-cons], but also that they differ in their Place specification. In this section I lay out the numerous arguments, some more compelling than others, in favor of this distinction. Once it is unnecessary to maintain identical representations for vowels and glides, we are free to base the underlying featural representations of each class on their individual behaviors, as suggested in §2.2.

Most basically, Kashaya lacks the glide-vowel alternations which would directly motivate treating glides as vowels. In addition, there is a clear need for the representations of / sû, uũ/ to be distinct from /îy, ûw/, both for phonetic and phonological reasons. The two types of strings are pronounced differently: the glide involves greater tension and a closer articulation. They are also treated differently by the lexical and postlexical phonology, as discussed below. The Obligatory Contour Principle (Leben 1973, Goldsmith 1976, McCarthy 1986, Yip 1988) prohibits sequences of identical melodic elements, so we cannot appeal to representations such as /ii/ or /uu/. The featural content of the glides and vowels must be distinct in order to represent this contrast. Note that there are morpheme-internal cases of all four strings, within a single syllable. Since Glide Deletion (§6.7)

---

13 I know of one potential example of glide-vowel alternation, but it appears to be lexically frozen. Oswald (1990) considers ʰcalu- ‘arrive’ to be an irregular compound of ʰcal ‘to a house’ and ʰ- ‘go’. This verb is used instead of ʰ- when no Directional suffix is present, but since there is no necessary meaning of ‘house’ in the stem ʰcalu-, it must be treated as a lexicalized form, and the apparent alternation between [u] and [w] is diachronic at best.

14 The encoding of syllabicitly on a separate CV tier (e.g. Clements and Keyser 1983) could replace [cons], but I reject that theory. A skeletal X tier which does not include information about syllabicitly (e.g. Levin 1985) must appeal to underlying syllable structure in the same way as the moraic theory.
normally applies to all preconsonantal glides, these strings are phonetically distinct only at
the end of a word:

(80)  a. ṭahʃʃy  ‘big (pl)’
yuhʃʃy  ‘black oak acorn’
ʔahʃʃy  ‘hard, firm, difficult’
puhʃʃy  ‘purple olive shell’
yahwʃʃy  ‘thank you’
ʃalʃy  ‘just sifted’ [3.1]
b. marʃr  ‘blind’
ʔiniʃ  ‘beware (interjection)’
hikiʃ  ‘crab’
paʃiʃ  ‘poison’

(81)  a. bahcúw  ‘jump’ [3.1]
duʔkúw  ‘finish working’ [76]
dasúw  ‘scratch with the hand’ [3.1]
cʔʔbúw  ‘weave’ [25]
tumhúw  ‘buy’ [3.1]
tumúw  ‘be tired’ [3.1]
ʔkúlúw  ‘cough’ [3.1]
-ʃuw  Mandatory
b. hiʃuʃ  ‘arrow’
ʔimúʃ  ‘chiton (Chinese slipper)’
musuʃ  ‘log’
qʔayuʃ  ‘cormorant’
haduʃ  ‘different’
nanuʃ  ‘lame, crippled’
puʃuʃ  ‘edge’
muʔuʃ  ‘knot (in wood)’
ʔasúʃ  ‘riffle (in a stream)’
lipuʃ  ‘shin’
ʔihyuʃ  ‘snow, ice’
libuʃ  ‘whistle’

All of these examples are monomorphemic except for those which bear page citations; the
latter are verbs suffixed with the Absolutive -w or Visual Evidential -yʃ. A clear example
of the different phonological behavior of these sequences can be seen before the clitic =ʔe’
which serves as a copula:

(82)  ṭahșiy=ʔe’ mu  →  ṭah si ye’ mu  ‘that’s hard’ [3.3]
pași=ʔe’ mu  →  pa și’ ʔe’ mu  ‘that’s poison’ [3.10]
While the glide merges with the glottal stop (§3.1.1) and loses the glottalization in onset position (§3.1.2), the long vowel is unaffected.

As discussed in §6.3.2, there are superheavy final syllables of the shape CVVC.\^15 These arise in verbs when the /ɑ/ of an Evidential suffix is deleted word-finally. Below we see examples with true consonants in (83a), and parallel cases with glides in (b):

(83) a. ńa-li-t-ā → dalirt\^a  ‘is waving his hand’ [40]
    ce-mac-ā → cemæc\^a  ‘is open in from here’ [40]
    ŋu-ki-t-ā → dukí\^m  ‘is streaked’ [40]
    ſu-hwe-n-ā → ſuhwe-n  ‘is shaking’ [40]
    b. ńa-w-wā → daw  ‘is pleasing’ [40]
    mo-mac-yā → momáy  ‘just ran in’ [40]

Final glides in superheavy syllables are also possible when the preceding vowel corresponds to the glide, giving us syllables for example of the shape [i'y]:

(84) ſi-ki-yā → dukí\^r  ‘just scratched it’ [3.1]
    ńa-li-š-ya → dalí\^r  ‘just bent them’ [3.1]

If a glide is a consonant, we can have the simple representation in (85a); but if it is identical to a vowel, the OCP requires the type of representation in (b):

(85) a. \(\begin{array}{c}
\sigma \\
\underline{\mu} \underline{\mu} \\
\underline{\mu} \underline{\mu} \underline{\mu} \\
\underline{k i y}
\end{array}\) b. \(\begin{array}{c}
\sigma \\
\underline{\mu} \underline{\mu} \\
\underline{\mu} \underline{\mu} \underline{\mu} \\
\underline{k i y}
\end{array}\)

The double linking in (b), where a single feature is linked to a single mora by two different association lines, should probably not be permitted in phonological theory, and is at any rate difficult to interpret. Some version of the Twin Sisters Convention (Clements and Keyser 1983) could ensure against such representations.

\^15 This syllable structure also occurs in nonderived environments (typically borrowed words): sentáw ‘cent’ (Sp. centavo), kaféy ‘coffee’ (Sp. café), camáy ‘hello’ (Alutiiq), réy ‘king’ (Sp. rey), liwra ‘pound’ (Sp. libra), ḥāy ‘what do you want? (interjection)’. In these cases, however, I assume exceptional underlying mora structure (§6.1.3).
As pointed out in Hayes (1989b), any language which permits syllables of the shape [yi] or [wu] presents a challenge for moraic theory. As the following list shows, Kashaya has a significant number of [yi] syllables, though only one that I found of [wu]:

(86) wiyi 'Oregon oak'; 'top (toy)'
    ɨyi 'acorns collected by woodpeckers'
    wa'yi 'early, first'
    =yihe 'imitation, pretended'
    mayiʔ 'inopportune'
    ɨyi 'scrub jay'
    -(ɨ)yi Multiplicative
    koʔyi 'patterned'
    mi-yi- 'count'
    yihóʔl 'beans' (Sp. frijol)
    kayʔma 'chicken' (Sp. gallina)
    máʔyìš 'corn' (Sp. maíz)

(87) wúrtu 'burro' (Sp.)

If the OCP prevents the representation /iɪ/ where the first /i/ serves as onset and the second as the syllable head, the only way to distinguish between [i] and [yi] is by including syllabification information in the underlying representation. Hayes (1989b) rejects this option as too powerful and concludes that the feature [cons] must be used to distinguish the glide from the vowel, permitting the representation /yi/. For English this is necessary since there is a distinction between syllables beginning [i] and those beginning [yi] (e.g. 'east' versus 'yeast'). In Kashaya, on the other hand, there is a phonological requirement that every syllable have an onset, so that in effect there is no need to distinguish [i] from [yi]: it would be possible to write a rule such that a syllable beginning with /i/ or /u/ is pronounced as [yi] or [wu] respectively. Such a rule could be expressed unproblematically in a theory where the onset links directly to the syllable node, as in (88a). But I argue in chapter 6 for a theory of the syllable in which onsets link directly to moras, and this framework we would require a double linking of the same feature matrix to the same mora as in (b):
The structure in (88b) raises a similar problem to (85b). Even if we accept the possibility of the representation in (88a), we require an additional rule to generate it, one which rather oddly seems to suggest that syllables like [yi] are unmarked, despite their impossibility in many languages.

Another basic representational issue concerns sequences such as the verb root buwi- 'string beads'. Assuming glide-vowel equivalence and the OCP, this root must be represented segmentally as /bui/. At the same time, the stem -hkʰy- 'burn up' must include the same /ui/ sequence. The realization of /ui/ in the two cases, of course, is different, and to ensure the correct outcome for buwi- two aspects must be given underlyingly: that /i/ is the head of a syllable, and that the onset of this syllable is the same as the head of the preceding syllable. This can be accomplished by including moraic structure in the underlying representation (syllable structure is unnecessary for this purpose), but it is still unfortunate that normally predictable prosody must be prespecified. Under the opposite assumption, however, that glides and vowels are distinct in their features, the OCP does not prevent an underlying sequence /buwi/, and both mora and syllable structure can be generated by rule. See Waksler (1990) for similar discussion of representational issues.

The Absolutive suffix -w behaves differently from the Imperative suffix -i; only the latter undergoes Elision (§6.6), as do other vowels:

(89)  
\[
\begin{array}{llll}
\text{a.} & \text{i} \text{₃a} \text{cu-w} & \rightarrow & \text{bahcúw} & \text{‘to jump’ [3.1]} \\
& \text{i} \text{₃a} \text{cu-i} & \rightarrow & \text{bahcu} & \text{‘jump!’ [D]} \\
\text{b.} & \text{ca} \text{hci-w} & \rightarrow & \text{cahciw} & \text{‘to sit down’ [3.1]} \\
& \text{ca} \text{hci-i} & \rightarrow & \text{cahci} & \text{‘sit down!’ [3.1]} \\
\text{c.} & \text{nu} \text{₃a} \text{ka-w} & \rightarrow & \text{du₃káw} & \text{‘to crack apart’ [73]} \\
& \text{nu} \text{₃a} \text{ka-i} & \rightarrow & \text{du₃ka} & \text{‘crack it apart!’ [3.2]} \\
\end{array}
\]

63
If the Absolutive were actually -u we would expect the same Elision there. The two suffixes belong to the same position class and cannot be distinguished according to the level of the lexicon in which they are added, so they must be phonologically different. Since Elision applies only to [-cons] segments, treating -w as [+cons] explains the failure of the rule to apply to that suffix.

It is necessary to distinguish CV from CG at the end of a stem, since a glide-final stem fails to undergo the rules to which a vowel-final stem is subject. For example, when two vowels come together across a morpheme boundary they undergo Root Elision, whereby the features of the second vowel are lost and the first vowel lengthens:

(90)  \( \text{m}u\text{wi}-\text{\textipa{ic}}-? \) \( \rightarrow \) \( \text{buw} \text{\textipa{iri}?} \) ‘start to string beads’ [3.2]
\( c^\text{\textipa{ul}i-}\text{-ala-w} \) \( \rightarrow c^\text{\textipa{ul}i}\text{\textipa{law}} \) ‘be at lowest ebb (of tide)’ [3.2]

The glide at the end of \( \text{i}\text{\textipa{ahy}}-\) ‘pour (pl)’ is unaffected by the rule, showing that it is not *\( \text{i}\text{\textipa{ahi}}-\):

(91)  \( \text{i}\text{\textipa{ahy}}-\text{\textipa{ic}}-? \) \( \rightarrow \) \( \text{i}\text{\textipa{ahyib}i}? \) ‘pour out (pl)’ [2.52]
\( \text{i}\text{\textipa{ahy}}-\text{-ala-w} \) \( \rightarrow \) \( \text{i}\text{\textipa{ahygal}aw} \) ‘pour down (pl)’ [2.52]

In addition, the stem \( \text{i}\text{\textipa{ahy}}-\) counts as monosyllabic and fails to undergo Syllable Extrametricality (§5.2.1), as evidenced by the initial stress in (91); this is the same result as for a stem such as \( \text{k}\text{\textipa{ehl}}-\) ‘peer (pl)’:

(92)  \( \text{k}\text{\textipa{ehl}}-\text{\textipa{ic}}-? \) \( \rightarrow \) \( \text{k}\text{\textipa{ehlib}i}? \) ‘peer up (pl)’ [3.2]
\( \text{k}\text{\textipa{ehl}}-\text{-ala-w} \) \( \rightarrow \) \( \text{k}\text{\textipa{ehl}al}aw \) ‘peer down (pl)’ [3.2]

The forms in (90), by contrast, are disyllabic and do undergo Syllable Extrametricality, as shown by the final stress.

The evidence for /y/ suggests that it is a Coronal (and also Dorsal), the same place of articulation as /c/; for example, both trigger Coronal Debuccalization (§3.2.1). The evidence for /i/ suggests that it is underspecified, since it is the default realization of an epenthetic vowel (§3.3.1). If [y] and [i] are the same underlyingly, we are not free to give

64
these differing representations; but if one is a glide and the other is a vowel, these alternations can be treated as necessary.

In addition to these phonological criteria, there is evidence from the morphology that glides are not vowels. In selecting the appropriate allomorph of the Absolutive, root-final /y/ is treated as a consonant. Roughly speaking, this suffix takes the form -w when it follows a vowel, and -ʔ when it follows a consonant (§7.2.4):

(93) a. mo-alaw → mo'law ‘run down’ [265]
     pʰi⁻hi⁻w → pihtiw ‘chip with an axe’ [174]
     maʰcu⁻w → bahcuw ‘jump’ [3.1]

b. mi-laqaʔam⁻ʔ → bilaq'aʔiŋ ‘feed’ [171]
   čiʰwin⁻ʔ → čihwiŋ ‘get red hot’ [171]
   na-hal⁻ʔ → dahál’ ‘dig (a hole)’ [171]

After /y/, the postconsonantal allomorph -ʔ is chosen (/w/ is rare in this position):

(94)  nu⁻hay⁻ʔ → duhataʔ ‘touch’ [170]
      mu⁻hku⁻uy⁻ʔ → muhk'atuy̞ ‘burn up’ [170]

Similarly, the Durative and Plural Act treat glides as consonants, or fail to group them with the true vowels. A common allomorph of the Durative after a consonant is -an⁻i:

(95)  mo-ma ri⁻i → moma'du ‘keep running across’ [213]
      nu⁻hlu⁻ri⁻i → duhludádu ‘keep picking’ [213]
      qašo'q⁻ri⁻i → qašoq'qdu ‘be getting well’ [213]

After a vowel, the Durative has two allomorphs: -ciŋ when the vowel is in the first syllable (modulo Syllable Extrametricality), and -meŋ elsewhe:

(96) a. nuwu-ciŋ⁻i → buwič'du ‘keep stringing’ [212]
     šu-jo⁻ciŋ⁻i → šojoci'du ‘keep peeling’ [212]

b. mo⁻hqa-meŋ⁻i → mohqlamédu ‘drive’ [212]
     kulu⁻ku⁻meŋ⁻i → kūlū'kulumedu ‘keep coughing’ [213]

Notice that after a glide, the postconsonantal allomorph -an⁻i is chosen:
(97)  iet-ay-an-i → ietaya’du  ‘keep standing against’ [213, 3.2]
pihmo-y-an-i → pihmoya’du  ‘keep smiling’ [3.2]
mul-hkuy-an-i → mulkuy’ay’du  ‘be burning up’ [3.2]
qa-hcaw-an-i → qahcaw’a’du  ‘eat foods together’ [D]

The explanation for this allomorphy is completely straightforward if /y/ is a consonant rather than a vowel.

The Plural Act suffix provides less direct confirmation. A common allomorph is -t, which is suffixed to a final vowel (a) and infixed before a final consonant (b); when that consonant in coronal, the /t/ debuccalizes to [h] as in (c). The Decrement (§6.5) also applies to remove a laryngeal increment in the root:

(98)  a.  si-ša-t- → sišat-  ‘leach (pl)’ [169]
      řa-hčʰa-t- → dachat-  ‘knock over (pl)’ [168]
      pʰi-hmi-t- → pimit-  ‘see in detail (pl)’ [2.55]
  b.  pʰa-nejli-m-w → pʰanɛ’qaw  ‘punch (pl)’ [170]
      pʰi-pa’lq-w → pʰiy’qaw  ‘recognize (pl)’ [170]
  c.  maḥsalṭ-c-w → masáḥciw  ‘be damp-dry (pl)’ [172]
      šu-ṭalṭ-t-w → šuṭáḥtiw  ‘twist (pl)’ [172]

The best test for the status of /y/, of course, is whether -t is infixed or suffixed. Unfortunately, this test is not easy to apply. In at least one partly idiosyncratic Plural Act form, however, there is evidence of an infixed /t/ which has debuccalized to [h]: the singular ŋac- ‘pour’ has the Plural Act root ŋak-. It would appear that the basic form of the root is ŋay-, with suffixation of the Semelfactive -c in the singular and infixation of -t- in the plural.16 This constitutes weak evidence for the treatment of /y/ as a consonant, which could be strengthened if there are other verbs ending in /y/ which show an infixed [h] in the Plural Act.

Another type of evidence comes from a different Plural Act allomorph, namely -ta. Roughly speaking, this form is suffixed to stems ending in coronals (a) and infixed in

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16 The expected application of Glide Deletion (§6.7) in the singular, changing ŋayc/ to [ャ̄c], appears to have been lexicalized as a true long vowel rather than a vowel-glide sequence in its effect on postlexical stress (§5.3).
stems ending in other consonants (b). The Decrement also applies:

(99)  
a. ʔa₃-qoʔol-ta-w → dacoʔol-taw  ‘fail to do (pl)’ [170]
      ni₃-lan-ta-w   → diʔantaw  ‘bruise by dropping (pl)’ [170]
    b. ʔi₃niyaltaqʔ → ʔi₃niyāʔtaʔ  ‘get dwarfed (pl)’ [171]
         mii₃laq₄altamʔ → bilaq₄tarm  ‘feed (pl)’ [171]

It is important to note that -ʔa is never used with vowel-final roots. But the slight variant
-ʔa is frequently used after /y/:

(100) ʔu₃-huayʔa-w → duʔaʔtaw  ‘touch (pl)’ [170]
      mu₃-huuyʔa-w → muʔaʔtaw  ‘burn up (pl)’ [170]

The fact that it is suffixed, rather than infixed, before this coronal glide is consistent with
the identification of -ʔa with the more generally used -ta, and is again weak evidence that
/y/ is grouped with the consonants rather than the vowels.

All of this evidence points to the fact that glides in Kashaya are consonants rather than
nonsyllabic vowels. At the same time, however, one process in the language does reflect
an affinity between vowels and glides, namely Glide Deletion (§6.7). By this rule a vowel-
 glide rime becomes a long vowel, provided the glide is not phrase-final and bears no
laryngeal features:

(101) ʔu₃-huay-ti → duʔaʔtii  ‘about to touch’ [2.12]
      ʔu₃-huay-q₃ → duʔaʔtq₃  ‘must have touched’ [2.112]
       muʔa-w min → muʔaʔ min  ‘as if cooked’ [107]
      ʔanaʔʔaʔahsiy → ʔanaʔʔaʔahsiy  ‘very hard’ [107]
       huʔuy q₄aʔbe → huʔuʔq₄aʔbe  ‘eyeball’

If glides were [-cons] it would be a simple matter to single them out from other postvocalic
segments for the purposes of this rule; on the other hand, if they are [-cons] we would
expect them to undergo Elision, as illustrated above. There are certain glides which
idosyncratically fail to undergo Glide Deletion. As a postlexical rule, it ought to be
impossible to mark them diacritically as lexical exceptions to the rule. If well-behaved
glides were actually nonsyllabic vowels, we could mark the exceptions as [+cons], similar
to the treatment of nonalternating glides by Hyman (1985) and Waksler (1990). By assuming that all glides are consonants, however, we are forced to adopt another solution, but fortunately one exists: prelinking of the VG sequence to a single mora. See §6.7 for further discussion.
Chapter 3

Segmental Processes

Having discussed the representations of the sounds of Kashaya, we turn now to the rules which affect these sounds at the level of features and segments. This chapter is organized according to the effect of the rules. The considerable number of rules targeting the features dominated by the Laryngeal node are discussed in §3.1. Next, in §3.2 we turn to several rules which delink the Place node under various conditions. In both of these sections the rules refer only to consonantal features; by contrast, §3.3 deals with rules which crucially refer to both consonants and vowels, showing how their features interact. §3.4 describes two rules of vowel harmony across consonants, and §3.5 presents a small residue of rules which do not fit into the preceding categories. Finally, §3.6 gives a summary of all the rules discussed in the chapter, their place in the overall phonology, and what orderings are necessary among them.

The reader may notice that certain rules presented here share significant content with other rules, whether in their effect (such as debuccalization) or their triggering environment (such as a complex sonorant in onset position). These similarities can be captured in an appropriate formal model of rules, but I defer until chapter 4 a discussion of how this might be accomplished.

3.1. Rules Targeting Laryngeal Features

The laryngeal features [ASP] and [GL] are involved in many processes in Kashaya. Some rules target both of these features — Glottal Merger (§3.1.1) and Onset Simplification (§3.1.2) — while others target just [ASP]: Aspirate Dissimilation (§3.1.5), Cluster
Deaspiration (§3.1.6), and Coda Aspiration (§3.1.7). The complex derivation of the voiced stops begins with Desonorization (§3.1.3), which targets nasal [gl] segments; as a result, the side effect of Glottal Transfer (§3.1.4) affects only [gl]. It is also in the aftermath of Desonorization that the underlyingly nondistinctive feature [voiced] becomes relevant.

3.1.1. Glottal Merger

When a consonant with no laryngeal features is followed by a simple glottal /ʔ/, /h/, the two merge to form a single segment — a glottalized or aspirated consonant, depending on which glottal is present. I term this Glottal Merger. First, consider forms with a glottal stop; this can be illustrated with the Future suffix -ʔk'e and the Assertive clitic =ʔ. After a vowel, no change occurs:

(1)  qa-ne-ʔk'e  →  qanɛʔk'e  ‘will bite’ [263]
     ʔn-ʔk'e     →  ʔk'k'e   ‘will stay’ [263]
     na-ʔta-ʔk'e  →  daʔtɛʔk'e  ‘will find’ [264]

(2)  hayu=ʔ  →  hayuʔ  ‘it’s a dog’ [82]

After a stop, the glottal stop combines with it to form an ejective:¹

(3)  qa-c-ma-muc-ʔk'e  →  qačmamúč'k'e  ‘will race’ [263]
     ʔna-h-yut-ʔk'e  →  dahuńk'k'e   ‘will rub’ [2.107]
     šuwac-ʔk'e     →  šuwałč'k'e  ‘will dry’ [2.92]

(4)  a.  qaḥmat=ʔ  →  qaḥmat  ‘he’s angry’ [2.51]
     šeʔet=ʔ     →  šeʔɛt    ‘it’s a basket’ [2.108]
     mahsit=ʔ    →  mahsit   ‘it’s embers’ [2.108]

   b.  siq'ot=ʔ  →  siq'ọt  ‘it’s acorn grounds’ [2.49]
     q'aboʔ=ʔ   →  q'aboʔ   ‘it’s a garter snake’ [2.51]
     sulemat=ʔ  →  sulɛmáți  ‘it’s a rope’ [2.108]

¹ The word soh 'yet' takes a special form ending in /k'/ before the Assertive: soh=ʔɛ· mu → soko'ɛ·mu [2.60]. I am not aware of any general evidence for a rule changing final /k'/ to [h], so this appears to be a case of irregular stem allomorphy.
c. watacʔ → watác ‘it’s a frog’ [82]
    maʔcæʔ → maʔcáč ‘it’s them’ [2.49]
    qanemæʔ → qanemáć ‘it’s a relative’ [2.50]

d. mihyʊʔ → mihyúq ‘it’s a woodrat’ [3.2]
    mic’aqʔ → mic’aq ‘it’s sweat’ [3.2]

In the same way, it combines with a preceding sonorant to make a complex sonorant:

(5) íunuw-ʔk’e → íunúwʔk’e ‘would get tired’ [274]
    pʰakum-ʔk’e → pʰakumʔk’e ‘will kill’ [263, 3.9]
    šu-ʰweʔn-ʔk’e → šuhweʔnʔk’e ‘will shake’ [3.3]
    šá-hal-ʔk’e → daháʔlʔk’e ‘will dig’ [3.3]
    šu-ʰray-ʔk’e → duhtáʔyʔk’e ‘will touch’ [3.3]
    resáʔ-ʔk’e → resáʔk’e ‘will pray’ [3.3]

(6) cahawʔ → caháw ‘it’s a boil’ [2.108]
    čiškánʔ → čiškán ‘it’s pretty’ [82]
    þololʔ → þolol ‘it’s a chicken hawk’ [2.28]
    balayʔ → baláy ‘it’s blood’ [82]

Fricatives fail to undergo Glottal Merger; that is, plain /s/, š/ and glottalized /š/ all surface unchanged:

(7) nu-kis-ʔk’e → dukîsk’e ‘will scratch’ [2.107]
    cubuš-ʔk’e → cubúšk’e ‘will sprout’ [3.3]
    ra-ʰqos-ʔk’e → dahqošk’e ‘will knead’ [2.107]²

(8) q’aʔdusʔ → q’aʔdús ‘it’s a raccoon’ [84]
    mosʔ → móš ‘it’s sour’ [2.108]
    biyešʔ → biyeš ‘it’s a louse’ [82]

How are we to account for the special behavior of fricatives? In the case of /š/, the nonexistence of /š/ can explain why Merger fails. But since /š/ is a well-formed segment in the language, Structure Preservation cannot prevent Merger in the case of /š/. I suggest that the explanation is related to the absence of distinctively aspirated fricatives in the language.

Following an analysis of Slave by Rice (1988), I propose a rule inserting [asp] on BOTH plain fricatives: since this feature represents a spread glottis, its presence expresses the fact

² Oswald (1961) gives a meaning of ‘spill’ for this verb.
that significant airflow through the glottis is necessary to create enough pressure in the oral cavity to articulate a fricative:

(9)  \textit{Fricative Aspiration}

\[-\text{son}, +\text{cont}] \rightarrow [\text{asp}]

The presence of [asp] then blocks Merger with [gl]. There is marginal evidence from Aspirate Dissimilation supporting the presence of this feature on ‘plain’ fricatives (§3.1.5).

Similar examples are found with the Absolutive suffix, which takes the form -ʔ after most consonants. It behaves as expected after sonorants (where it merges) and fricatives (where it is lost):

(10) \begin{align*}
\text{mo-\text{-}ʔ} & \rightarrow \text{mó\text{-}n} & \text{‘run across’ [265]} \\
\text{̄n\text{-}la\text{-}q\text{-}ʔa\text{-}m\text{-}ʔ} & \rightarrow \text{blink\text{-}ʔa\text{-}n} & \text{‘feed’ [171]} \\
\text{čǐ\text{-}h\text{-}w\text{-}in\text{-}ʔ} & \rightarrow \text{či\text{-}h\text{-}w\text{-}in\text{-}ʔ} & \text{‘get red hot’ [171]} \\
\text{̄ni\text{-}ʔa\text{-}n\text{-}ʔ} & \rightarrow \text{ði\text{-}ʔan\text{-}ʔ} & \text{‘bruise by dropping’ [170]} \\
\text{mo\text{-}mul\text{-}ʔ} & \rightarrow \text{mom\text{-}ʔ\text{-}n\text{-}ʔ} & \text{‘run around’ [188]} \\
\text{̄n\text{-}a\text{-}h\text{-}ai\text{-}ʔ} & \rightarrow \text{ðah\text{-}a\text{-}i\text{-}ʔ} & \text{‘dig (a hole)’ [171]} \\
\text{nu\text{-}h\text{-}t\text{-}a\text{-}y\text{-}ʔ} & \rightarrow \text{du\text{-}h\text{-}tá\text{-}y\text{-}ʔ} & \text{‘touch’ [170]} \\
\text{mu\text{-}h\text{-}k\text{-}q\text{-}w\text{-}ʔ} & \rightarrow \text{mu\text{-}h\text{-}k\text{-}w\text{-}ʔ\text{-}n\text{-}ʔ} & \text{‘burn up’ [170]}
\end{align*}

(11) \begin{align*}
\text{nu\text{-}k\text{-}i\text{-}ʔ\text{-}ʔ} & \rightarrow \text{dk\text{-}ʔs} & \text{‘scratch’ [2.107]} \\
\text{cu\text{-}nu\text{-}ʔ\text{-}ʔ} & \rightarrow \text{cub\text{-}ʔs} & \text{‘sprout’ [265]} \\
\text{̄n\text{-}a\text{-}h\text{-}q\text{-}q\text{-}s\text{-}ʔ} & \rightarrow \text{ðah\text{-}q\text{-}q\text{-}s\text{-}ʔ} & \text{‘knead’ [2.107]}
\end{align*}

The [gl] feature simply links to the preceding consonant where possible. The behavior of the Absolutive with stops involves an additional complication and is discussed in §3.2.3.

It is not possible to illustrate Glottal Merger involving a suffix with /h/ because there is only one such suffix — the Causative -ʔqa — and its status is complicated (§7.2.3). We can, however, see Merger with /h/ when that segment is at the beginning of a word. This results from an initial laryngeal increment, which at the postlexical level is a simple segment, unsyllabified but licensed by a mora (§6.4.3). Both glottals are attested here:

(12) \begin{align*}
\text{ba\text{-}l\text{-}l\text{-}ʔow} & \rightarrow \text{bal\text{-}á\text{-}y\text{-}t\text{-}ow\text{-}ʔ} & \text{‘suck blood’ [106]}
\end{align*}
(13) yow ḥceu → yów⁴ ce du "All right," he said' [108]
    huʔuy hu → huʔuy⁵ ku 'one eye' [39]
    dasew hca → da séw⁴ ca 'wash room' [D]

This shows that Glottal Merger is active postlexically, but it is important to note that it does
not apply freely across a word boundary when the glottal is an onset:

(14) čiškan ṝiw → *čiškaniw 'be pretty' [2.107]
    ṭk⁵e ĭleyač ṝiw → *ṭk⁵e ĭleyačiw 'there's my father-in-law' [3.17]

The form čiškaniw is actually acceptable in rapid speech, but differs from the other
examples where Merger is obligatory. I assume it to be the result of a different (allegro)
rule applying across word boundaries, and only when the first consonant is a sonorant.

When a consonant precedes a glottal (a placeless consonant), the glottal is delinked.

Since this sets in motion the effect of Glottal Merger, I retain that name for the rule:

(15) \[ \text{Glottal Merger} \]

\[ \begin{array}{c}
\mu \\
RC
\end{array} \quad \begin{array}{c}
\mu \\
RC
\end{array} \quad \begin{array}{c}
\hat{+} \\
\text{Place}
\end{array} \]

The mora dominated by the spreading consonant is lost by Segmental Licensing (see §3.2).

The stray Laryngeal node from the glottal links to the preceding consonant when that
consonant has no Laryngeal node of its own:

(16) \[ \begin{array}{c}
\mu \\
\text{RC}
\end{array} \quad \begin{array}{c}
\text{Lar}
\end{array} \quad \begin{array}{c}
\text{Place}
\end{array} \]

This is essentially the same operation as that discussed in §3.1.4. If a vowel follows, the
(merged) consonant undergoes resyllabification to satisfy the need for an onset in every

\[ ^3 \text{The output of Merger, [i], would lose its glottalization by Onset Simplification (§3.1.2).} \]

73
syllable (§6.3.5).

Alternative formulations of Glottal Merger have been rejected here to account for several facts. For example, why not simply spread the Place node of the first consonant to the following glottal?

(17) \[ \mu \quad \mu \]
    \[ \text{RC} \quad \text{RC} \]
    \[ \text{Place} \quad \text{Lar} \]

The reason is that a consonant which has underlying laryngeal features causes the loss of the following glottal. This point requires some background.

In Oswalt's (1961) analysis, the Assertive is a defective verb which can take certain verb suffixes; the whole complex is then cliticized on the preceding word. An especially common example of this is the Nonfinal Verb suffix -e; which together with the Assertive often functions as a copula (given here with the pronoun \( mu \)). Other typical suffixes found with the Assertive are the Evidentials, such as Hearsay -ño and Circumstantial -qā. In addition, there are clitics such as =ʔnati 'even though' which begin with a glottal stop and exhibit the same sort of behavior as the suffixed Assertive, but since the rest of the clitic does not correspond to a verb suffix there is no reason to treat the element as including the Assertive:

(18)  
      \[ \text{hayu}=ʔ-\text{e'} \text{ mu} \rightarrow \text{hayuʔe'} \text{ mu} \quad \text{‘that's a dog’} \ [82] \]
      \[ \text{ʔoʔdi}=ʔ-\text{e'} \text{ mu} \rightarrow \text{ʔoʔdiʔe'} \text{ mu} \quad \text{‘he's good’} \ [283] \]

(19)  
      \[ \text{beʔli}=ʔ-\text{ño} \rightarrow \text{beʔliʔdo} \quad \text{‘they say it was here’} \ [2.29] \]
      \[ \text{hayu}=ʔ-\text{ño} \rightarrow \text{hayúʔdo} \quad \text{‘they say it’s a dog’} \ [2.108] \]
      \[ \text{hayu}=ʔ-\text{qā} \rightarrow \text{hayúʔqā} \quad \text{‘it must be a dog’} \ [82] \]
      \[ \text{hayu}=ʔnati \rightarrow \text{hayúʔnati} \quad \text{‘even though a dog’} \ [82] \]

A preceding consonant undergoes the expected Glottal Merger, but not until the sequence of three consonants is resolved by insertion of an epenthetic [i] after the glottal stop (§6.3.1):
(20) waṭać=ʔ-e’-mu → waṭaćé mu ‘that’s a frog’ [82]
marcac=ʔ-e’-mu → mařaćé mu ‘that’s them’ [2,42]
šeřet=ʔ-e’-mu → šeřeté mu ‘that’s a basket’ [3.3]

(21) waṭać=ʔ-qä → waṭaći̞iq → waṭaćįqʰ ‘it must be a frog’ [82]
waṭać=ʔ-hatı → waṭaći̞iniatı → waṭaći̞iniatı ‘even though a frog’ [82]
marcac=ʔ-ńo → marcacįdo → marcacįdo ‘I heard it’s them’ [242]
šoqot=ʔ-še → šoqotįšē → šoqotįšē ‘I wonder if it’s a mouse’ [249]

After a word-final consonant which already has a laryngeal feature, the glottal stop is simply lost. As a result, the forms of the word in isolation and with the Assertive are the same:

(22) dolóμ=ʔ → dolón ‘it’s a wildcat’ [2.28]
hec=ʔ → hêc ‘it’s a nail’ [2.108]
boië=ʔ → bóië ‘it’s soft’ [3.10]
kiłakʰ=ʔ → kiłâkʰ ‘it’s an eagle’ [2.28]
ho difíc=ʔ → ho difíc ‘it’s warm’ [2.109]

Longer forms show that the glottal stop is present underlyingly even when Merger does not apply, since Epenthesis is triggered; in addition, the Assertive is necessary to permit these verb suffixes to occur after other parts of speech:

(23) hecʰ=ʔ-qä-e’-mu → hecʰi̞qaʰ-mu ‘that must be a nail’ [3.10]
boië=ʔ-e’-mu → bóië-mu ‘that’s soft’ [3.10]
kiłakʰ=ʔ-e’-mu → kiłakʰé’-mu ‘that’s an eagle’ [2.28]
ho difíc=ʔ-ńo → ho difícdo ‘they say it’s warm’ [2.109]

The same is true for fricatives, where Epenthesis precedes the loss of the glottal stop:

(24) biyeš=ʔ-qä → biyeši̞iqʰ → biyešiqʰ ‘it must be a louse’ [82]
biyeš=ʔ-hatı → biyeši̞iniatı → biyešiniatı ‘even though a louse’ [82]
qʰamos=ʔ-suwi → qʰamosi̞išuwa → qʰamosi̞išuwa ‘it will be the ocean’ [262]

The presence of [asp] on the plain fricatives explains why they behave in the same way as the forms in (23).
If Merger were treated as shown in (17), the laryngeal features of the first consonant would be replaced by those of the glottal consonant. A similar option is rightward spreading at the Root node level, where the features of the glottal are dislodged, but the Laryngeal node relinks if none is already present:

\[
\mu \overline{+} \overline{+} \mu \\
\text{RC} \quad \text{RC} \\
\text{Place} \quad \text{Lar}
\]

The spreading consonant must also delink from the original mora since a degemination rule makes false predictions (§3.5.3). The (merged) consonant relinks as a coda if necessary, otherwise it serves as an onset. This account is problematic for a different reason. In §6.1.3 I argue that invariant long vowels such as that in *resárt- 'pray' from (5) have exceptional underlying mora structure; in *resárkte the vowel remains long, but if the /r/ has spread to a new mora it should then cause Closed-Syllable Shortening (§6.2), which is wrong. Thus, while the formulation in (15) is not ideal, it appears to create the fewest difficulties elsewhere in the grammar.

There is a particular type of Glottal Merger which is not covered by the rule in (15). We see in §3.2 word-final clusters [ʔy, hy] which become [ʔ, ʔ] respectively. In all other cases the glottal consonant follows the supralaryngeal consonant with which it merges, and Glottal Merger would have to be modified from its form in (15) to deal with these other cases. Saying that (15) is a mirror-image rule will not work, since intervocalic sequences [ʔy, hy] are unaffected by the rule. Since by normal processes (chapter 6) final clusters such as [ʔy, hy] are linked to the same mora, we may not need Glottal Merger per se at all: some process, however, must ensure their merger:
(26)  \[
\begin{array}{ccc}
\mu & & \\
\RC & \RC & \\
\downarrow & \downarrow & \\
\text{Place} & \text{Lar} & \text{RC} \\
\end{array}
\rightarrow
\begin{array}{ccc}
\mu & & \\
\RC & & \\
\downarrow & \downarrow & \\
\text{Place} & \text{Lar} & \text{Lar} \\
\end{array}
\]

This change resembles the Twin Sisters Convention (Clements and Keyser 1983), and may be related to it formally.

While I have not found any examples of consonant-glottal stop clusters in a surface string in Kashaya, a few forms with /h/ show that Glottal Merger applies in derived environments only:

(27)  \begin{align*}
\text{balha} & \quad \text{‘paddle, stirrer’} \\
\text{konhómi}^{nu} & \quad \text{‘mountain lizard’} \\
\text{?amhúl} & \quad \text{‘the next day’} \\
\text{tumhu-} & \quad \text{‘buy’ [95]}
\end{align*}

The failure to apply in non-derived environments follows from the Strict Cycle Condition (e.g. Kiparsky 1982) and the structure-changing nature of the rule.

Many underlying instances of word-final glottalized sonorants appear to be derived, at least historically, from a root ending in a plain sonorant to which the Absolutive -ʔ has been added. For example:

(28)  \begin{align*}
a. \text{du-bo}^{m-} & \quad \text{‘cover the finger’ [D]} \\
\text{dobó} & \quad \text{‘thimble’ [2.59]} \\
b. \text{di}^{h}ce^{n-} & \quad \text{‘build a shelter from something falling’ [D]} \\
\text{dîhè} & \quad \text{‘a rain shelter’ [2.59]} \\
c. \text{ci}^{d}do^{m-} & \quad \text{‘bloom’ [2.59]} \\
\text{ci}^{d}dó & \quad \text{‘a flower’}
\end{align*}

This sort of derivation accounts for the large number of words ending in glottalized sonorants, but the fact that the two elements of the complex sonorant originate in different morphemes is irrelevant to the status of the sonorant as a single segment in the phonological output.
3.1.2. Onset Simplification

In §2.3.2 I discussed verb roots with final aspirated sonorants. A fuller list is given here:

(29)  
-ʔkolp-  ‘spill’ [172]
-ʔmalp-  ‘turn’ [75]
-ʔmolp-  ‘turn upside down’ [177]; ‘grow in a clump’ [D]
-ʔcalp-  ‘be skeletal’ [162]
-ʔpolp-  ‘cause liquid to flow out’ [75]
-ʔpanp-  ‘close’ [170]
-ʔsonp-  ‘dent’ [75]
-ʔmunl-  ‘be twitching’ [D]
-ʔcelp-  ‘be obstructed’ [D]
-ʔcel-  ‘carry on the back with a strap’ [D]
-ʔcenp-  ‘have an impediment, build a shelter’ [D]
-ʔcolp-  ‘make a hole’ [D, 3.3]
-ʔpolp-  ‘force open’ [D, 3.3]

These are the only examples of aspirated sonorants which can be seen to alternate between onset and coda position, depending on the following segment. When a vowel follows and the complex sonorant appears in the onset, the aspiration is lost:

(30)  
hiʔmalp-ela → hiʔbalēla  ‘I turned around’ [75]
nuʔmalp-an-i → duʔbaládu  ‘keep turning with the fingers’ [D]
šuʔmunl-ic-á-e’ → šuʔbuniče’  ‘is twitching (NIV)’ [D]
ñaʔcolp-ic-ʔ → daʔcoliʔ  ‘pick one’s (nose)’ [3.3]

After undergoing the loss of [asp], these sonorants are identical to underlyingly plain sonorants. For a discussion of what happens in the coda, see §3.1.6.

A similar loss of laryngeal features is found postlexically, when a word-final complex sonorant resyllabifies as an onset. This resyllabification occurs when the glottal stop of an

---

4 All of these roots end in coronal /n, l/. Elsewhere, Oswalt (1961:39, 1990) gives the root $^h$cam$^+$, which occurs only with the Semelfactive and Reflexive suffixes as $^h$cam$^+$-c-íc- ‘shrink’; Oswalt (1990) also has $^a$byôy$^+$ with the same required suffixes: $^a$byôy$^+$-c-íc- ‘be too busy’, borrowed from Southern Pomo. These are the only examples I know where there appears to be a noncoronal aspirated sonorant at the end of a root. Since the Semelfactive -c always follows, there is no alternation between $^R$ and $^R$. It happens that all the roots I have found are monosyllabic and require an instrumental prefix, but these facts do not seem important for the synchronic analysis.
inflected Assertive clitic is followed by a vowel — either the vowel-initial suffix -e (as in (20)) or due to Epenthesis before a consonant-initial suffix (as in (21)). Since a complex sonorant in onset position is ill-formed, the glottalization is lost whether it is underlying or the result of Merger:

(31) ćiškan=ʔ-e’ mu → ćiškane’ mu ‘that’s pretty’ [82]
balay=ʔ-e’ mu → balayē’ mu ‘that’s blood’ [82]
dolom=ʔ-e’ mu → dolomē’ mu ‘that’s a wildcat’ [2.50]
man=ʔ-e’ mu → manē’ mu ‘that’s her’ [2.49]
buhq’al=ʔ-e’ mu → buhq’alē’ mu ‘that’s a burden basket’ [3.3]
ʔahsiy=ʔ-e’ mu → ʔahsiyē’ mu ‘that’s hard’ [3.3]

(32) ćiškan=ʔ-qā → ćiškaniq’ ‘it must be pretty’ [82]
balay=ʔ-qā → balayiq’ ‘it must be blood’ [82]
ćiškan=ʔnati → ćiškaniati ‘even though pretty’ [82]
sinam=ʔ-no → sinamido ‘they say he drowned’ [242]
man=ʔ-no → manido ‘they say it’s her’ [2.49]

In (32) the epenthetic vowel is the only overt evidence that the Assertive was present underlyingly (aside from the fact that these verb suffixes cannot be added directly to nouns), similar to (23) and (24).

The derivation involves, among other steps, Glottal Merger followed by Onset Simplification:

(33)  
<table>
<thead>
<tr>
<th>Step</th>
<th>Example</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>UR</td>
<td>balay=ʔ-e’ mu</td>
<td>‘that’s blood’ [82]</td>
</tr>
<tr>
<td>Glottal Merger</td>
<td>balayē’ mu</td>
<td></td>
</tr>
<tr>
<td>Onset Simplification</td>
<td>balayē’ mu</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(34)  
<table>
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<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>UR</td>
<td>balay=ʔ-qā</td>
<td>‘it must be blood’ [82]</td>
</tr>
<tr>
<td>Epenthesis</td>
<td>balayiq</td>
<td></td>
</tr>
<tr>
<td>Glottal Merger</td>
<td>balayiqʰ</td>
<td></td>
</tr>
<tr>
<td>Onset Simplification</td>
<td>balayiqʰ</td>
<td></td>
</tr>
</tbody>
</table>

The fact that both [asp] and [gl] are lost in this context shows that the rule is deletion of the Laryngeal node rather than one of the individual features:
(35)  **Onset Simplification**

\[
  [\sigma \quad \text{RS} \quad + \quad \text{Lar}]
\]

The rule of Onset Simplification expresses the generalization that complex sonorants are not permitted in onsets.

3.1.3. **Desonorization**

I argued in §2.3.3 that the surface segments [b, d] derive from the underlying glottalized nasals /\text{m}, \text{n}/, and gave an informal representation of the rule which effects this change. What would the rule look like formally? There are two basic changes which occur: [gl] must be 'replaced' by [voiced], and the class must change from sonorant to obstruent (with concomitant loss of nasality). Features for place of articulation remain unchanged, as does the value of [continuant]. I show here that the change from glottalized nasal to voiced stop is the result of several processes which are set in motion by one basic change: Desonorization. This rule — which operates only in the lexicon — simply converts a glottalized nasal in onset position to an obstruent:

(36)  **Desonorization**

\[
  [\sigma \quad \text{RC} \quad (+\text{son}) \rightarrow (-\text{son}) \quad / \quad \text{Lar} \quad (+\text{nas}) \quad | \quad [gl]]
\]

Once (36) applies, however, an ill-formed representation results: in Kashaya, the features [-son] and [+nas] cannot cooccur. This restriction is expressed as a persistent rule:

(37)  **RO**

\[
  [\sigma \quad (+\text{nas})]
\]
This rule, in addition to expressing the underlying cooccurrence restriction, applies to the output of (36) to remove the nasality from the newborn obstruent.

There is still one other change: [gl] must ‘become’ [voiced]. In fact, however, this change is in two steps. First let us consider how [voiced] is added. Recall that [voiced] is not present in underlying representations in Kashaya. We already need a redundancy rule as given in §2.2.3 which states that sonorants are voiced, but will that apply to /in/ and /n/ before they become obstruents? A persistent rule of the following form expresses the fact that the feature is not permitted in underlying representations in Kashaya (repeated from chapter 2):

\[(38) \quad \text{Lar} \quad + \quad [\text{voiced}]\]

Before even considering how it comes about, however, we know that in Kashaya lexical derivations it is possible to create a voiced segment: glottalized nasals become voiced stops only if they appear in onset position in the lexicon; postlexically they become plain nasals, as illustrated in (31) and (32). This can mean nothing other than that the persistent rule in (38) is turned off at some point early in the lexicon, perhaps as early as the beginning of level 1, in which case the rule serves only as a morpheme structure condition. Once this rule is inactive — which it must be to capture the fact that voiced segments are created in the lexicon — the redundancy rule \([+\text{son}] \rightarrow [\text{voiced}]\) can apply immediately, since there is nothing to stop it. The result of this application of the rule early in the lexicon is, for the most part, unimportant, since no rules directly target [voiced]. It does have one consequence, however, with regard to the feature [son]: when (36) applies, it has the potential of bleeding the redundancy rule. But since the voicing rule is able to apply early in the derivation, e.g. first thing in level 1, it is not bled and the later application of (36)

\[5\text{ In the terms of K.P. Mohanan (1986), voiced stops are excluded from the 'underlying alphabet', but not from the 'lexical alphabet'.}\]
How then do we get rid of [gl]? The Laryngeal node must be delinked before [voiced] is inserted, since an underlying incremented consonant /d/ becomes [ʔd]: the [gl] feature is preserved in the increment even though it is lost on the consonant itself, and there is no reason to think that [voiced] is linked to the [ʔ]. A persistent rule of the following type would do the job in a brute-force way:

\[
\begin{array}{c}
\text{RO} \\
\text{ Lar}^{+[\text{nas}]} \\
\text{[gl]} \\
\end{array}
\]

This rule expresses the fact that an obstruent with the feature [+nas] cannot be glottalized. But it seems odd that the Laryngeal node should be deleted, since we already have a rule in (37) which could correct the configuration by deleting [+nas]. One possibility is that Desonorization applies simultaneously with Onset Simplification — since the second of these rules has to exist anyway, it seems a waste to phrase it separately as in (39), which is rather unmotivated. The best way to implement this notion is a bit unclear: in some sense Desonorization is connected to Onset Simplification and applies in conjunction with it. That is, Desonorization somehow ‘piggybacks’ on Onset Simplification when appropriate — the latter applies independently (as shown in the previous section) but the former does not. I tentatively assume a ‘conjunctive block’ of rules whose members have the opportunity to apply simultaneously.

Postlexical Onset Simplification, which follows resyllabification, is simply the deletion of the glottal feature from a sonorant in onset position. In principle, it serves as a morpheme structure condition, but cannot actually apply to undervived lexical

---

\[^6\text{I have just said that [voiced] is already present in the representation of sonorants by this point, so all sonorants will have a Laryngeal node, and all those in onset should undergo Onset Simplification. This is unproblematic, however, since the rule inserting [voiced] on sonorants continues to be in effect after Onset Simplification is eventually turned off, and at that point the feature [voiced] will remain intact.}\]
representations. The reason for this is that it depends on syllable structure, which is not present underlyingly. I assume that as soon as Syllabification applies to a form, Onset Simplification is able to apply as well: there is a necessary feeding relationship between the two rules. Postlexically, Deonorization turns off but Onset Simplification continues to be active, so that /h/ becomes [n] rather than [d] in that component, as illustrated in §3.1.2.

3.1.4. Glottal Transfer

Note that the rule of Onset Simplification merely delinks the Laryngeal node from a sonorant; actual deletion of the floating node occurs by Stray Erasure if the node fails to find a new place to link. Before that point, there is in effect a glottal stop adjacent to the erstwhile complex sonorant. When a consonant precedes the sonorant — in all attested cases a glottalized nasal — the floating Laryngeal node links to the consonant and glottalizes it:

(40)  ná-hyut-ma → dahuţi̇ba → dhuţi̇ba ‘after breaking it’ [2.94]
    suwac-ma → suwac̱ba → suwac̱ba ‘after drying’ [2.95]
    yoqóc-ma → yoqóc̱ba → yoqóc̱ba ‘after keeping’ [99]
    ná-hyü̇t-ma → dahuţi̇ba → dahuţi̇ba ‘after rubbing’ [2.12]
    pʰ-a-nem-ma → pʰanem̱ba → pʰanem̱ba ‘after punching’ [2.62]
    nü-hitäy-ma → dhuhtay̱ba → dhtay̱ba ‘after touching’ [2.54]
    nü-hitäy-nō → dhuhtay̱do → dhtay̱do ‘they say he touched’ [2.50]
    pʰ-a-nem-nō → pʰanem̱do → pʰanem̱do ‘they say he punched’ [2.106]

Clearly, this is very similar to Glottal Merger (§3.1.1), and it appears that the phenomenon of transfer is actually due to this rule when the preceding consonant is a sonorant. When the consonant is an obstruent, however, there is evidence that a separate rule is responsible for the change, specifically Glottal Transfer. (This evidence is presented in §3.2.1.) The rule itself is nothing more than linking of a Laryngeal node to an obstruent which precedes the consonant from which the node has been delinked:
(41) **Glottal Transfer**

\[
\begin{array}{l}
\text{RO} \quad \text{RS} \\
\Rightarrow \\
\text{Lar}
\end{array}
\]

The delinking is shown in the rule for clarity, though it actually occurs due to Onset Simplification. In §4.3.4 I suggest that Glottal Transfer is not a proper rule at all, but a special case of the general process of Stray Node Linking illustrated in (16).

Since plain stops are not found word-finally, it is not possible to test whether Glottal Transfer applies there; Debuccalization (§3.2.3) bleeds it:

\[(42)\]
\[
\begin{array}{ll}
\text{yah} & \text{hot}=\text{miak}'e \quad \rightarrow \quad \text{yah} & \text{mô} & \text{ba} & \text{k}'e & \quad \text{for a mountain lion} \quad [3.10] \\
\text{s} & \text{hç} & \text{ac}=\text{miak}'e & \quad \rightarrow \quad \text{s} & \text{hç} & \text{á} & \text{ba} & \text{k}'e & \quad \text{for a while} \quad [D]
\end{array}
\]

We can see, however, the effect of Glottal Merger applying to the output of Desonorization across a clitic boundary:7

\[(43)\]
\[
\begin{array}{ll}
\text{ba} & \text{lai}=\text{miak}'e & \quad \rightarrow \quad \text{ba} & \text{lai} & \text{yba} & \text{k}'e & \quad \text{for blood} \quad [2.54] \\
\text{mu} & \text{ñaw}=\text{miak}'e & \quad \rightarrow \quad \text{mu} & \text{ñaw} & \text{ba} & \text{k}'e & \quad \text{for cooking} \quad [2.106] \\
\text{ma} & \text{ñaw}=\text{miak}'e & \quad \rightarrow \quad \text{ma} & \text{ñaw} & \text{ba} & \text{k}'e & \quad \text{for eating} \quad [319] \\
\text{man} & \text{ew}=\text{miak}'e & \quad \rightarrow \quad \text{man} & \text{ew} & \text{ba} & \text{k}'e & \quad \text{for dancing} \quad [2.107]
\end{array}
\]

Glottal Merger does not apply across a word boundary, even when that boundary is created lexically as in the case of reduplication (§8.3.2):

\[(44)\]
\[
\text{ni}-\text{ñ} & \text{mi} & \text{a}-\text{ñ} & \text{mi} & \text{a}-\text{?} \quad \rightarrow \quad \text{[duŋ} & \text{b} & \text{a} & \text{l}]\text{[duŋ} & \text{b} & \text{al}] & \quad \text{turn back and forth quickly} \quad [D]
\]

Fricatives (which are [asp] at this point) and other segments with laryngeal features do not merge with the [gl] feature:

---

7 Since Desonorization appears to be lexical, the clitic may undergo the rule lexically to produce the intermediate form [Bal'k'e], which undergoes Merger postlexically. This question depends partly on the unresolved issue of whether the Assertive is actually a clitic or a suffix (§7.2.4).
(45) iu-kis-ma → dukísba → dukísba ‘after scratching’ [2.107]
cumùs-ma → cubušba → cubušba ‘after sprouting’ [3.10]
kilak³-tak³e → kilak³-tak³e → kilak³-tak³e ‘for an eagle’ [3.10]

Here [gl] is stray-erased.

3.1.5. Aspirate Dissimilation

In §2.3.2 we saw examples of a rule which deaspirates an aspirated stop when a following consonant is also aspirated. In most cases the dissimilation occurs between an instrumental prefix and the initial consonant of a verb root (a level 1 process):

(46) c³-i-x³-a³-w → cic³-áw ‘grasp with handled instrument’ [74]
p³-i-hni-w → pihniw ‘see in detail’ [2.55]
p³-u-hx³-a³-w → puhc³-áw ‘blow over’ [145]
p³-a-hol³ → pahól³ ‘look for an unseen object with end of stick’ [2.54]

This Aspirate Dissimilation also applies, however, when its environment is met in reduplication (also level 1; see §8.3.1, §8.6):

(47) k¹-i-k¹ → kik¹ ‘gill cover’
t⁶-e-t⁶-e-n → te⁶-te⁶-n ‘my mother’

The rule applies to a word-initial stop which is separated from the following aspirated consonant by a vowel only; the following consonant can be in either coda or onset position.

Formally, Aspirate Dissimilation is delinking of the Laryngeal node dominating [asp]:

(48) Aspirate Dissimilation

\[
\begin{array}{ccc}
[RC & RV & RC \\
+ & | & \\
Lar & Lar & \\
| & | & \\
[asp] & [asp] & \\
\end{array}
\]

---

8 This is similar to Grassmann’s Law, which operated historically in Greek and Sanskrit (Grassmann 1863).
9 Oswalt (1961) gives the form pim³niw, as discussed in §2.3.2 and §6.4.3.
It does not apply to word-internal stops, as seen below:

(49)  hi-hc^a-hqa-w → hihc^ahqaw  "knock over" [2.106]

Nor to word-initial aspirates followed by an /h/ which is added later than level 1:

(50)  hc^a-hqa-w → c^ahqaw  "cause to fall" [2.57]
     hc^o-hqa-w → c^öhqaw  "be missing" [3.4]
     hp^a-hqa-w → p^ahqaw  "bake (tr)" [3.4]

Similarly, the Dissimilation is not triggered by Coda Aspiration which occurs at later levels (§3.1.7):

(51)  hc^oc-p^ila → c^öc^p^ila  "if there were a lack" [280]
     c^at-qa-ti → c^ätqati  "going to go trapping" [2.106]

While it is possible to account for (49) and (50) by turning off Aspirate Dissimilation before the suffixes are added (levels 3 and 5), other reduplication data show that the specification as word-initial must be included in the rule:

(52)  ku^u-tu → *ku^u^tu  "whelk"
     ca^hi-ti-h-ti- → *ca^hi^hi^ti-  "riddle" [45]

Since the word-initial aspirates in the reduplications in (47) undergo Aspirate Dissimilation (and are generated by the same level 1 morphological process; see §8.3.1), the rule must be active when the forms in (52) are created. Aspirate Dissimilation also does not apply across the word boundary in a compound:

(53)  qa qa*ät^o → *qa qa*ät^o  "tidal pool" [306]
     qa f^i^ul → *qa f^i^ul  "stagnant water" [306]

Since there is some evidence that reduplication as in (47) results in two phonological words, such as exist in (53), it may simply be the case that compounding occurs after level 1, and that is why no Dissimilation is found.
Aspirate Dissimilation does not apply to /h/ even in initial position:

(54)  
\[ \begin{align*} 
  \text{hi}-\text{he}^2\text{a}^-\text{w} & \rightarrow \text{hihe}^3\text{aw} & \text{‘be knocked over, collapse’ [2.106]} \\
  \text{ha}-\text{he}^2\text{a}^-\text{w} & \rightarrow \text{hahe}^3\text{aw} & \text{‘be knocked over by swinging or kicking’ [141]} 
\end{align*} \]

This is perhaps attributable to the Segmental Licensing requirement discussed in more detail in §3.2: the removal of the Laryngeal node would leave no features under the Root node, so it is blocked. Alternatively, we could attribute the blocking to the need for an onset in every syllable in Kashaya.

There are only a few words which show that Aspirate Dissimilation fails to apply in nonderived environments:¹⁰

(55)  
\[ \begin{align*} 
  \text{ṭe}^\text{a}\text{ḥqa}^- & \rightarrow \text{ṭe}^\text{a}\text{ḥqa} & \text{‘play’} \\
  \text{q}'\text{ṭoh}^\text{ā} & \rightarrow \text{q}'\text{ṭoh}^\text{ā} & \text{‘eighty’} \\
  \text{ṭe}^\text{a}\text{ṭeq}^\text{ā} & \rightarrow \text{ṭeq}^\text{ā} & \text{‘elderberry’} \\
  \text{k}'\text{ṭom}^\text{ī} & \rightarrow \text{k}'\text{ṭom}^\text{ī} & \text{‘eight’} 
\end{align*} \]

Since this is a structure-changing rule, we expect these facts.

I have data on only one verb root which begins with a plain, unincremented fricative and takes one of the aspirated prefixes. In this case, Aspirate Dissimilation applies:

(56)  
\[ \begin{align*} 
  \text{ṭi}^-\text{su}^-\text{w} & \rightarrow \text{ṭi}^-\text{ṣu} & \text{‘scratch with an instrument’ [3.15]} 
\end{align*} \]

The operation of the rule here supports the idea that fricatives bear the feature [asp], as suggested in §3.1.1.

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¹⁰ Only the first of these is particularly strong evidence, since the other three could be treated as compounds. The clearest compound here is q’b-hay made up of q’b- ‘two’ along with hay, an element of limited distribution meaning ‘twenty’. The word ṭeq’ale seems to contain q’ale ‘tree’, though ṭe is obscure; it may be the apetized form of ba’ṭe ‘big’. In both of these cases the stress and vowel length facts support a compounding analysis (§8.5), in which case, as in (53), Aspirate Dissimilation would not apply. On the other hand, while k’bom’ca is historically a morphologically complex word consisting of k’b ‘two’ and m’ca ‘four’, it is probably nonderived in the modern language, as evidenced by the fact that the component forms are Southern Pomo, and not Kashaya q’b- and m’ca; in addition, the fact that stress does not fall on the first syllable suggests that k’bom’ca is a single unit and not a compound.
3.1.6. Cluster Deaspiration

In (29) we saw a number of roots which end in an aspirated sonorant, and which undergo Onset Simplification before a vowel. The underlying aspiration surfaces when the sonorant is followed by either /m/ or /c/:

(57) 尼亚-polʰ-m-w → dapoltmaw  ‘squeeze in the hand, held over the ground, so liquid flows out’ [75]
hi-ɾnalʰ-mulʔ → hiʔbólʰmul’  ‘turn around’ [75]
ɾma-ɾnalʰ-c-w → baʔbólciw  ‘discuss a subject thoroughly’ [D]
mu-ʔsonʰ-c-w → moʔsonʰciw  ‘dent with a thrown object’ [75]
ɾni-ʔmoltʰ-c-w → diʔbólciw  ‘fall and tumble over’ [D]
ʂu-ʔmuntʰ-c-w → ʂuʔbunčiw  ‘twitch once’ [D]

These roots contrast in this context with roots ending in plain sonorants:

(58)  kel-mulʔ → kelmul’  ‘peer around’ [2.105]
 kel-m-w → kelmaw  ‘peer down at’ [158]
 kel-c-w → kelićiw  ‘peek’ [165]
 ʂu-ʰweʔn-m-w → ʂuhwenmaw  ‘shake (pl)’ [173]
 ʂu-ʰweʔn-c-w → ʂuhwenciw  ‘shake once’ [3.10]

When any other consonant follows the aspirated sonorant, the aspiration is lost:

(59)  ni-ʔmoltʰ-iaʔ-ʔmolʰ-iyiʔ → daʔbóldaʔboliʔyiʔ  ‘keep turning self over’ [D]
 hi-ɾnalʰ-qa-w → hiʔbólqaw  ‘cause to turn around’ [75]
 ʂu-ʔpantʰʔ → ʂuʔpán  ‘pull closed’ [170]
 ʂu-ʔpantʰ-ta-w → ʂuʔpántaw  ‘pull closed (pl)’ [170]

The problem is how to formulate the rule so that it picks out the right consonants. There is no obvious way to group together [d, t, q, ʔ] while excluding [m, c]. A solution based on lexical levels is problematic since the suffixes involved cannot be divided into two distinct blocks. It may be that the Semelfactive suffix -c is simply irregular in not triggering this rule. If so, it is much easier to distinguish /m/ from the others, for example on the basis of sonority, by saying that Deaspiration occurs only before obstruents:11

---

11 Under this analysis, the change of the sonorant /h/ to the obstruent [d] (§3.1.3) must precede Cluster
3.1.7. Coda Aspiration

There are no surface examples in Kashaya of plain stops in coda position. Glottal Merger and Glottal Transfer are two sources of laryngeal features on coda stops, but when these rules are inapplicable a plain stop in the coda becomes aspirated. The following pairs show the alternation depending on position in the syllable:\(^\text{12}\)

(62)  \begin{align*}
\text{\textipa{̣na-hyut-i}} & \rightarrow \text{\textipa{dahyutí}} & \text{‘break it! (sg)’ [2.94]} \\
\text{\textipa{̣na-hyut-me?}} & \rightarrow \text{\textipa{dahyút’mé?}} & \text{‘break it! (formal)’ [2.94]}
\end{align*}

(63)  \begin{align*}
\text{\textipa{suwac-i}} & \rightarrow \text{\textipa{suwací}} & \text{‘dry it! (sg)’ [2.93]} \\
\text{\textipa{suwac-me?}} & \rightarrow \text{\textipa{suwác’mé?}} & \text{‘dry it! (formal)’ [2.94]}
\end{align*}

\(^{12}\) In Kashaya this is a structure-preserving change, since aspiration is distinctive. I know of two languages where word-final stops also aspirate, but allophonically: Nisg̱a (Pat Shaw, personal communication) and Lenakel (Waksler 1990).
These stops are aspirated phonologically, and not simply subject to some rule of obligatory release at the phonetic level; we know this not only because they are pronounced in the same way as underlyingly aspirated stops, but more importantly because the feature [asp] is what surfaces if the stop debuccalizes (§3.2). This process of aspiration can be formalized as the insertion of [asp] on a syllable-final obstruent:

\[
\text{(64) Coda Aspiration} \\
\emptyset \rightarrow [\text{asp}] \quad /_0^1_
\]

I assume that a Laryngeal node path is automatically created (as discussed in §2.2.3). A glottalized consonant already has the feature [gl]; this is incompatible with [asp], so the rule is blocked and glottalized consonants in the coda are unaffected. The fricatives /s, ʃ/ in all positions are already [asp], as discussed in §3.1.1.

Since the rule of Coda Aspiration already exists, and the generalization that it expresses is true also of nonderived words, I treat nonalternating cases of aspirated stops in codas as underlyingly plain and derive the aspiration by rule. This explains, for example, why coda stops in loanwords are aspirated even if they were not in the source language:

\[
\text{(65)} \quad \begin{array}{ccc}
\text{taqma} & \rightarrow & \text{taq}^{\prime}\text{ma} \\
\text{tápla} & \rightarrow & \text{táp}^{\prime}\text{la} \\
\text{ʔalíʔka} & \rightarrow & \text{ʔalí}^{\prime}\text{ʔka} \\
\text{pěčka} & \rightarrow & \text{pě}^{\prime}\text{čka} \\
\text{háŋʔe} & \rightarrow & \text{háŋ}^{\prime}\text{ʔe} \\
\text{luŋčaqbe} & \rightarrow & \text{luŋčaq}^{\prime}\text{be} \\
\text{haŋko} & \rightarrow & \text{haŋ}^{\prime}\text{ko} \\
\text{ščlay} & \rightarrow & \text{ščlay} \\
\text{ɕiʔbuklan} & \rightarrow & \text{ɕiʔbůk}^{\prime}\text{lan}
\end{array} \quad \begin{array}{l}
\text{‘dress’ (Alutiiq taqma-)} \\
\text{‘board, plank’ (Span. tabla)} \\
\text{‘turnip’ (Russ. redčka ‘radish’)} \\
\text{‘brick’ (Russ. pečka ‘oven’)} \\
\text{‘center pole’ (Southern Pomo)} \\
\text{‘ceremonial clay pipe’}^{13} \\
\text{‘lying, untruthful’} \\
\text{‘white willow’} \\
\text{‘plant used to make bows’ [D]}
\end{array}
\]

\[^{13}\text{Although it is not important to the phonological analysis, we can note here that the origin of the last four words is not clear. As Oswalt (1990) reports, in luŋčaq}^{\prime}\text{be the element }-q^{\prime}\text{be, cognate with Kashaya q}^{\prime}\text{a}^{\prime}\text{be ‘rock’, shows syncope typical of Southern and Central Pomo; luŋ}^{\prime}\text{va- is ultimately from Wappo l}^{\prime}\text{uce ‘tobacco’. I do not know the origin of haŋ}^{\prime}\text{ko, which could be native. In the last two words, the element k}^{\prime}\text{a may be related to Central Pomo k}^{\prime}\text{le ‘tree’ (in Kashaya c}^{\prime}\text{y}^{\prime}\text{bu}^{\prime}\text{na- is ‘to weave’), but given the existence of Coda Aspiration there is no need to treat the [k]}^{\prime}\text{a}^{\prime}\text{ as underlyingly aspirated in Kashaya.}}\]
Since Aspiration is a structure-building rule, its application in nonderived environments is expected.

Cases of word-final aspirated stops in nonderived environments, whether borrowed or
native, must be treated as underlyingly aspirated; see §3.2.3. There is at least one
exception to Coda Aspiration, namely the imitative interjection *flip*, used also as a noun
meaning ‘flivver’ (Oswalt 1961:321). Given its onomatopoeic nature, I do not consider it a
problem for this analysis.

3.2. Place Node Delinking

In several contexts a consonant loses its supralaryngeal features and becomes [?] or [h],
depending on whether the original consonant was glottalized or aspirated. Though
formally this consists of delinking the Place node, I refer to it by the descriptive term
DEBUCCALIZATION. There are four classes of segments to which debuccalization applies: a
coronal immediately preceding another coronal (§3.2.1); a uvular in coda position,
regardless of the following consonant (§3.2.2); a word-final plain stop, and any stop at the
end of a verb (§3.2.3).

Debuccalization of coronals and uvulars is a lexical process, and subject to a restriction
suggested by Clements (1985a) in his discussion of debuccalization in Klamath: A Place
node can be delinked only when a Laryngeal node is also present under the same Root
node. The principle behind this (probably language-specific) restriction is that a Root node
which dominate neither a Place nor a Laryngeal node is ill-formed, and should perhaps be
identified with the Segmental Licensing principle of Paradis (1988:76):

(66)  *Segmental Licensing:* a timing unit (a slot) must be attached to a segment or be
deleted.

An equivalent in a moraic framework is given by Hayes (1989a:264): 'higher-level
phonological elements, such as moras, are also subject to Stray Erasure if they fail to
dominate any lower-level element.’ I extend this principle to entail that, at least in some languages, a Root node must dominate some other node. A rule which would result in a violation of this principle is blocked (see chapter 4). In other words, the lexical rules given below which delink Place are blocked from applying when no Laryngeal node is present, and this fact need not be given in the rules themselves. This principle may apply in the case of Aspirate Dissimilation as well (§3.1.5). The postlexical rules in §3.2.3 are not, however, subject to the Segmental Licensing requirement.

3.2.1. Coronal Debuccalization

When a noncontinuant coronal occurs before another coronal segment, the first of the two consonants loses its Place features and reduces to [h] or [ʔ]. In practice, the only ‘non-continuant coronals’ which undergo Debuccalization are the stops and the glottalized nasal /ň/. Participation in this rule shows that not only are dentals, alveolars, and alveopalatals treated as Coronal, but also the palatal glide; and further, that all of these consonants are SPECIFIED as Coronal in order to trigger the rule (§2.2.2).

First, consider examples where the laryngeal features are underlying; one suffix example from each place of articulation is provided where possible:

(67)  si-hwai-t⁶  →  sihwaiʔ⁶  ‘didn’t sag’ [2.92]
      si-hwai-no  →  sihwaiʔdo  ‘they say it sagged’ [2.92]
      si-hwai-se  →  sihwaiʔse  ‘I wonder if it sagged’ [2.92]
      si-hwai-y  →  sihwaiʔy  ‘I saw it sag’ [2.92]

(68)  hoʔ-t⁶  →  hoʔt⁶  ‘it wasn’t warm’ [2.103]¹⁴

(69)  can-t⁶  →  canʔ⁶  ‘didn’t look’ [2.92]
      can-no  →  canʔdo  ‘they say he looked’ [2.92]
      can-se  →  canʔse  ‘I wonder if he looked’ [2.92]
      can-y  →  cay  ‘I saw him look’ [2.92]

¹⁴ The word hoʔ⁶ is an adjective meaning ‘warm’, which I could not elicit with a full range of verb suffixes; the example here is the only form I have which illustrates Debuccalization of an underlyingly aspirated stop.
(70) šunilič-t° → şubiliřt° 'didn’t blaze up’ [2.92]
šunilič-n° → şubiliřdo ‘they say it blazed up’ [105]
šunilič-še → şubiliřše ‘I wonder if it blazed up’ [2.93]
šunilič-c'ı → şubiliřc'ı ‘if it blazes up’ [2.93]
šunilič-y → şubiliyük ‘I saw it blaze up’ [2.93]

The only suffix beginning with an alveopalatal affricate that triggers Debuccalization is -c'ı ‘if’, which is an optional allomorph occurring only after /c, č/, so that it cannot be illustrated with other coronals (see §3.5 for other /c/-initial suffixes). Word-finally, the sequence [ɬɣ] undergoes Glottal Merger to become [ɣ] (§3.1.1).

Turning to underlingly plain obstruents, we see that Debuccalization follows Glottal Transfer and Coda Aspiration, because the output depends on which of these rules has applied. If the following segment is one which glottalizes, the preceding stop reduces to [ɬ]; otherwise it becomes [h]:

(71) ń-ahyut-t° → dahyut³ → dahyu³ht° ‘didn’t break it’ [2.93]
ń-ahyut-n° → dahyutdo → dahyu³do ‘they say he broke it’ [2.93]
ń-ahyut-še → dahyuteše → dahyu³še ‘I wonder if he broke it’ [2.93]
ń-ahyut-y → dahyutey → dahyu³y° ‘I saw him break it’ [2.93]

(72) c'iwoct° → c'iwoct° → c'iwocht° ‘didn’t stir it’ [2.93]
c'iwoct-n° → c'iwoctdo → c'iwocht° ‘they say he stirred it’ [2.93]
c'iwoct-še → c'iwoctše → c'iwochtše ‘I wonder if he stirred it’ [2.93]
c'iwoct-y → c'iwocty → c'iwoch° ‘I saw him stir it’ [2.93]

(73) šuwac-n° → šuwacdo → šuwaçdo ‘they say it dried’ [100]

Word-final [h] also undergoes Glottal Merger, becoming [ɣ]. Just one example is given in (73) for a /c/-final verb stem, since when Glottal Transfer or Glottal Merger does not apply, other processes take over; see §3.5.

The Plural Act suffixes which begin with a coronal, such as -ta, also trigger Coronal Debuccalization:15

(74) du-bluni-ta → dulů³ta- ‘pick (berries)’ [170]
da-yec-ta → daeye³ta- ‘press the hand against something’ [170]

15 The loss of the increment and vowel length are discussed in §6.5 and §6.8.
Similarly, the Plural Act infix -t undergoes Coda Aspiration and debuccalizes to [h] before another coronal:

(75) \( p^a-ne\textit{di}m-w \rightarrow p^a-ne\textit{r}maw \) ‘hit with the fist (pl)’ [170]
     \( p^i-\textit{Ya}t\textit{q}-w \rightarrow p^i-yat\textit{q}aw \) ‘recognize (pl)’ [170]

(76) \( su-t\textit{al-t}w \rightarrow su-t\textit{ra}tw \rightarrow su-t\textit{ah}tw \) ‘twist (pl)’ [172]
     \( tu\textit{mi}t\textit{c}-w \rightarrow tu\textit{ti}t\textit{ci}w \rightarrow tu\textit{bi}ciw \) ‘get up (pl)’ [D]
     \( cu\textit{mi}t\textit{s}-w \rightarrow cu\textit{bi}t\textit{si}w \rightarrow cu\textit{bu}siw \) ‘sprout (pl)’ [D]

No change occurs when the first of two coronals is a fricative, since Debuccalization applies only to noncontinuants:16

(77) \( nu-\textit{ki}t\textit{s}-t^b \rightarrow du\textit{k}t\textit{s}t^b \rightarrow *du\textit{k}h\textit{t}^h \) ‘didn’t scratch’ [2.109]
     \( nu-\textit{ki}t\textit{n}-o \rightarrow du\textit{k}t\textit{d}o \rightarrow *du\textit{k}h\textit{d}o \) ‘they say he scratched it’ [2.109]
     \( nu-\textit{ki}t\textit{s}-\textit{e} \rightarrow du\textit{k}t\textit{s}e \rightarrow *du\textit{k}h\textit{s}e \) ‘I wonder if he scratched it’ [2.109]

(78) \( ci\textit{nu}lu-t^b \rightarrow ci\textit{bu}lu\textit{t}^b \rightarrow *ci\textit{bu}h\textit{t}^h \) ‘didn’t sprout’ [2.109]
     \( ci\textit{nu}lu-\textit{n}-o \rightarrow ci\textit{bu}lu\textit{d}o \rightarrow *ci\textit{bu}h\textit{d}o \) ‘they say it sprouted’ [2.109]
     \( ci\textit{nu}lu-\textit{s}-\textit{e} \rightarrow ci\textit{bu}lu\textit{s}e \rightarrow *ci\textit{bu}h\textit{s}e \) ‘I wonder if it sprouted’ [2.109]

(79) \( \textit{na}-t\textit{qo}t\textit{s}-t^b \rightarrow da\textit{h}q\textit{so}t\textit{s}t^b \rightarrow *da\textit{h}q\textit{so}h\textit{t}^h \) ‘didn’t knead’ [2.109]
     \( \textit{na}-t\textit{qo}t\textit{n}-o \rightarrow da\textit{h}q\textit{so}d\textit{d}o \rightarrow *da\textit{h}q\textit{so}d\textit{do} \) ‘they say it spilled’ [2.109]
     \( \textit{na}-t\textit{qo}t\textit{s}-\textit{e} \rightarrow da\textit{h}q\textit{so}s\textit{e} \rightarrow *da\textit{h}q\textit{so}s\textit{e} \) ‘I wonder if it spilled’ [2.109]

The sonorant coronals /n, l/ do not undergo Debuccalization either:

(80) \( \textit{cih}t\textit{win}-t^b \rightarrow \textit{cih}t\textit{win}t^b \rightarrow *\textit{cih}t\textit{win}t^h \) ‘didn’t get red hot’ [2.109]
     \( \textit{cih}t\textit{win}-\textit{n}-o \rightarrow \textit{cih}t\textit{win}d\textit{o} \rightarrow *\textit{cih}t\textit{win}d\textit{do} \) ‘they say it got red hot’ [2.109]
     \( \textit{cih}t\textit{win}-\textit{s}-\textit{e} \rightarrow \textit{cih}t\textit{win}s\textit{e} \rightarrow *\textit{cih}t\textit{win}s\textit{e} \) ‘I wonder if it got red hot’ [2.109]

(81) \( \textit{na}-t\textit{hal}-t^b \rightarrow \textit{dah}t\textit{hal}t^h \rightarrow *\textit{dah}t\textit{hal}t^h \) ‘didn’t dig’ [2.110]
     \( \textit{na}-t\textit{hal}-\textit{n}-o \rightarrow \textit{dah}t\textit{hal}d\textit{do} \rightarrow *\textit{dah}t\textit{hal}d\textit{do} \) ‘they say he dug’ [2.110]
     \( \textit{na}-t\textit{hal}-\textit{s}-\textit{e} \rightarrow \textit{dah}t\textit{hal}s\textit{e} \rightarrow *\textit{dah}t\textit{hal}s\textit{e} \) ‘I wonder if he dug’ [2.110]

---

16 Examples are not given with the suffix -y since it is unclear whether in all cases that segment is realized, or even possible, after a consonant which does not undergo Debuccalization. It can be heard after /m/ as an off-glide [m'], and after /s/ it is realized as [s]: \( du\textit{-ki}t\textit{s}-y \rightarrow du\textit{k\textit{e}s}\textit{e} \) ‘I saw him scratch it’ [2.109]. In other contexts, however, its presence is often uncertain from the phonetic string.
The coronal glide /y/ also fails to undergo Debuccalization, but is subject to a separate rule of Glide Deletion (§6.7).

Nonconorals (i.e. labials, velars, uvulars, and laryngeals) do not trigger Debuccalization of a preceding coronal. I illustrate with /t/- and /c/-final stems only:

(82)  qa-hyut-meʔ → dahyúʔ meʔ → *dahyu: heʔ "break it! (formal)" [2.94]
      qa-hyut-ʔkʰe → dahyu: kʰe → *dahyu: kʰe "will break it" [2.92]
      qa-hyut-qa → dahyu: kʰe → *dahyu: kʰe "must have broken it" [2.94]
      *sibahhi → *sibahhi "move the body" [278]

(83)  qa-hyut-meʔ → dahyúʔ meʔ → *dahyu: heʔ "break it! (formal)" [2.94]
      qa-hyut-ʔkʰe → dahyu: kʰe → *dahyu: kʰe "will break it" [2.92]
      qa-hyut-qa → dahyu: kʰe → *dahyu: kʰe "must have broken it" [2.94]
      *sibahhi → *sibahhi "move the body" [278]

Similarly, nonconorals do not UNDERGO the rule. This is an empty claim in the case of labials since /p, pʰ, ṭ/ do not occur root-finally. Uvulars are subject to a separate process (§3.2.2). The only velar I have found root-finally is /k/ and while rare, we can see that it does not debuccalize before a coronal or any other consonant, including another velar:

(84)  qa-hyut-ʔkʰe → dahyúʔ meʔ → *dahyu: heʔ "break it! (formal)" [2.94]
      qa-hyut-ʔkʰe → dahyu: kʰe → *dahyu: kʰe "will break it" [2.92]
      qa-hyut-qa → dahyu: kʰe → *dahyu: kʰe "must have broken it" [2.94]
      *sibahhi → *sibahhi "move the body" [278]

Clearly, then, we need to target coronals which are [-cont], though any following coronal can trigger the debuccalization. The rule causing this change can be expressed as follows:

(85)  **Coronal Debuccalization**

```
  RC  /   RC  
 /-
[-cont]  Place  Place
    |  Cor  Cor
```

As expected from its structure-changing nature, Debuccalization does not apply in nonderived environments:
(86) pôrôlo
št̄bat'yaw
kusún'to

‘thistle’
‘pitiful’ [D]
‘wart’

In (69) we see that underlying /ń/ undergoes Coronal Debuccalization. In (80), however, the underlyingly plain nasal /n/ undergoes Glottal Transfer to [ń] before the suffix -ńo, but does not debuccalize. The same is true of /l/ in (81). The generalization is that an underlying glottalized sonorant undergoes the rule, but a glottalized sonorant which is derived does not. The simplest way to account for this difference would be to say that Glottal Transfer is ordered after Debuccalization, so that only the underlying /ń/ meets the Segmental Licensing requirement at the time the rule applies. This solution will not work, however, since we see in (71) and (72) that Glottal Transfer (as well as Coda Aspiration) must precede Debuccalization in order to get the correct laryngeal features in the output. We cannot say that Glottal Transfer dislodges the /ń/ and replaces it with /ń/, since underlying cases of [asp] resist the rule, as illustrated in §3.1.4.

I suggest that the rule is not sensitive to the difference between underlying and derived glottalized sonorants (which requires considerable globality), but rather that obstruents and sonorants undergo Glottal Transfer and Merger differently. Specifically, as I claimed in §3.1.4, Glottal Transfer targets obstruents only. It is ordered before Coronal Debuccalization, and feeds it. Sonorants acquire [gl] from the following nasal by Glottal Merger, which applies after Coronal Debuccalization, in counterfeeding order. At the point where Debuccalization applies, it is blocked by Segmental Licensing from applying to eventual derived complex sonorants, since the Laryngeal node is not yet linked to the consonant. In §4.3.4 we see that this analysis may be better motivated in a constraint-based theory.
There are two level 2 suffixes which begin with coronals: Semelfactive -c and Terrestrial -c. Both fail to trigger Coronal Debuccalization, though Coda Aspiration does apply: 17

(87)  
\[
\begin{align*}
\text{ni-\text{hyut-c-w}} & \rightarrow \text{dihy\text{\texttexttt{u}t-ciw}} \quad & \text{‘break by dropping on the ground’} [161] \\
\text{na-\text{hyut-c-w}} & \rightarrow \text{dahy\text{\texttexttt{u}t-ciw}} \quad & \text{‘break it once’} [103] \\
\text{nu-\text{wit-c-w}} & \rightarrow \text{duh\text{\texttexttt{w}i\text{\texttexttt{t}}-ciw}} \quad & \text{‘pick out one’} [164] \\
\text{ciwot-c-w} & \rightarrow \text{ci\text{\texttexttt{w}o\text{\texttexttt{t}}-ciw}} \quad & \text{‘stir once’} [2.94] \\
\text{limit-c-i\text{\texttexttt{c}-i}} & \rightarrow \text{libi\text{\texttexttt{c}-ci\text{\texttexttt{c}}}i} \quad & \text{‘duck back out of sight!’} [201] \\
\text{si-\text{hwat-c-w}} & \rightarrow \text{si\text{\texttexttt{w}a\text{\texttexttt{t}}-ciw}} \quad & \text{‘sag (sg)’} [172] \\
\text{si-\text{\texttexttt{n}o\text{\texttexttt{i}}\text{\texttexttt{t}-c-w}} & \rightarrow \text{si\text{\texttexttt{b}o\text{\texttexttt{c}-ciw}}} \quad & \text{‘disintegrate in water’} [D]
\end{align*}
\]

There are two ways of accounting for the failure of Coronal Debuccalization in (87). First, we could say that the rule is inactive in level 2. While this analysis violates the Strong Domain Hypothesis (Kiparsky 1984), it obeys the weaker Stratum Domain Hypothesis (K.P. Mohanan 1982), which requires that the set of levels in which a given rule applies be continuous. Since the earliest examples of its application are in level 3 (with the Plural Act infix -t- and suffix -\text{\texttexttt{a}}), Coronal Debuccalization is unnecessary in level 1 and it is possible to say that the rule does not turn on until level 3. If it were active in levels 1 and 3, but not in level 2, both ‘Domain’ hypotheses would be violated. To satisfy the Strong Domain Hypothesis, a different and less appealing solution is required: both the Semelfactive and Terrestrial are marked as idiosyncratic exceptions to Coronal Debuccalization. Since this approach is completely ad hoc, I prefer to ignore the Strong Domain Hypothesis: Coronal Debuccalization turns on in level 3 and continues to the end of the lexicon. We see in the next section that Uvular Debuccalization appears to be inactive in these levels as well. 18

17 The first of these examples, dihy\text{\texttexttt{u}t-ciw}, contains the Terrestrial suffix; all other instances of -c in this section are the Semelfactive. Oswalt gives few examples, and I have found both suffixes rather difficult to elicit, especially the Terrestrial which appears to be rare and perhaps lexicalized; Oswalt (1961:161) implies that it occurs only with ‘a few verbs’. It is clear from (87) that both fail to trigger Debuccalization, but I have no example which demonstrates that the Terrestrial in fact undergoes Gemination. In the following discussion I assume that it does, i.e. that the Terrestrial patterns like the Semelfactive in this respect as well.

18 One could preserve the Strong Domain Hypothesis by proposing some sort of constraint, operative in levels 1 and 2, which prevents the delinking of a Place node, so that even though Coronal Debuccalization is active in those levels it is unable to apply. Unless a principled theory of such
3.2.2. Uvular Debuccalization

The uvulars also undergo Debuccalization, but not simply when they precede another
Dorsal consonant: they lose their Place node whenever they occur in coda position. The
nature of the following consonant is relevant only insofar as it determines whether Glottal
Transfer (or Coda Aspiration) applies:

(88) sima'q-me? → sima'q'me? → simahmez? ‘go to sleep! (pl)’ [100]
    sima'q-ti → sima'q'ti → simahtti ‘about to fall asleep’ [100]
    sima'q-nia → sima'qba → sima?ba ‘having fallen asleep’ [100]
    sima'q-še → sima'q'se → simahše ‘I wonder if he’s asleep’ [2.14]
    mic'aq-p'i → mic'aq'p'i → mic'ahp'i ‘if he sweats’ [100]
    k'ununq'-nio → k'ununq'do → k'unuʔdo ‘they say it spoiled’ [100]
    hloq'-še → hloq'se → lóhše ‘I wonder if it fell off’ [101]
    qaš'q'-nio → qaš'q'do → qašoʔdo ‘they say he’s getting well’ [101]

The rule of Uvular Debuccalization delinks a consonantal Place node which dominates
[-high] in the coda:

(89) **Uvular Debuccalization**

\[
\begin{array}{l}
\text{RC} \\
\downarrow \text{Place} \\
\downarrow \text{Dorsal} \\
\downarrow [-\text{high}]
\end{array}
\]

Descriptively, this amounts to saying that uvulars debuccalize when followed by another
consonant, since stem-final tokens are shielded by extraprosodicity and retain their place
features. All word-final examples of /q/ are derived by deletion of a following /ə/ by the
rule discussed in §6.3.2.

(90) mo-haʔ-qā → mōhtaʔqā → mōhtaʔqā^b ‘must have run (pl)’ [105]
    ce-əq-ā → ce'q → ce'q^b ‘is open out hence’ [100]

constraints can be devised, however, this type of solution renders the Strong Domain Hypothesis
unfalsifiable.
I assume that /a/ Deletion follows Uvular Debuccalization, and since this situation arises only in the noncyclic level 5, there is no chance for the uvular to lose its place features. It simply undergoes Coda Aspiration postlexically, where Uvular Debuccalization is no longer active. The absence of the rule postlexically is supported by the existence of words in which /q/ precedes another consonant (where it is aspirated):

\[
\begin{align*}
&\text{taq}^\text{h} \text{ma} & \text{‘dress’ (Alutiiq)} \\
&\text{qeq}^\text{h} \text{se} & \text{‘fishhook’ (Alutiiq or Tanaina)} \\
&\text{luc}^\text{h} \text{cqc}^\text{h} \text{be} & \text{‘pipe’ (Central/Southern Pomo)}
\end{align*}
\]

Uvular Debuccalization is a lexical structure-changing rule that applies only in derived environments.

Uvular Debuccalization, like Coronal Debuccalization, does not apply in levels 1 and 2 of the lexicon. As a result, a uvular surfaces intact before the Semelfactive -c and Essive -m, which are level 2 suffixes. The Plural Act suffix -m (perhaps by analogy with the Essive) also appears to be added in this level, and does not trigger Debuccalization:

\[
\begin{align*}
&\text{ni-} \text{i-mq-c-w} & \rightarrow & \text{di} \text{boq}^\text{h} \text{ciw} & \text{‘fall hard’ [D, 3.4]} \\
&p^\text{h} \text{a-} \text{c} \text{q-c-w} & \rightarrow & \text{p}^\text{h} \text{a-c} \text{qciw} & \text{‘stab once, leaving weapon behind’ [3.11]} \\
&\text{qac}^\text{h} \text{laq-c-w} & \rightarrow & \text{qac}^\text{h} \text{ulaqciw} & \text{‘miss hitting (with one shot)’ [3.11]} \\
&\text{ni-} \text{mq-m-w} & \rightarrow & \text{di} \text{boq}^\text{h} \text{maw} & \text{‘fall hard (pl)’ [3.4]} \\
&\text{su-} \text{mq-m-w} & \rightarrow & \text{so} \text{boq} \text{maw} & \text{‘slam onto (table)’ [D]} \\
&\text{na-} \text{hoq-m-w} & \rightarrow & \text{dahy} \text{bq} \text{maw} & \text{‘stir objects around’ [2.76, 3.4]} \\
&p^\text{h} \text{a-c} \text{q-m-w} & \rightarrow & \text{p}^\text{h} \text{a-c} \text{q} \text{maw} & \text{‘stab (pl)’ [3.11]} \\
&\text{h} \text{coq-m-w} & \rightarrow & \text{c} \text{q} \text{maw} & \text{‘shoot (pl)’ [3.11]}
\end{align*}
\]

This is evidence that the general process of Debuccalization (§4.3.1) is inactive until level 3, in contradiction of the predictions of the Strong Domain Hypothesis.

3.2.3. Debuccalization of Word-Final Stops

We saw in (4) that word-final plain stops merge with the Assertive to form ejectives.

When these words occur in isolation, however, the final stops reduce to glottal stop:
(93) a. qahmat → qahmáʔ ‘angry’ [2.51]
    šeťet → šeʔeʔ ‘basket’ [Os64b: 155]
    mahsit → mahsíʔ ‘embers’ [Os64b: 159]
b. siq’oq’ → siq’ʔoʔ ‘acorn grounds’ [2.49]
    q’aʔnoq’ → q’aʔabóʔ ‘garter snake’ [2.51]
    sulemat → sulemáʔ ‘rope’ [Os64b: 159]
c. waq’ac → waq’áʔ ‘frog’ [82]
    mar’ac → maɾcáʔ ‘they’ [2.49]
    šibac → šibcáʔ ‘a while ago’ [D]
d. mihiq → mihiʔ ‘woodrat’ [3.2]
    mic’aq → mic’áʔ ‘sweat’ [3.2]

Notice that these are all non-derived forms, which is consistent with the fact that Word-Final
Debuccalization is a postlexical rule.

Debuccalization does not apply to nonverbs which end in glottalized stops; in this
respect they behave like forms that include the Assertive, since those ejectives surface
untouched as well:

(94)  tóp’ ‘pop’ [320]19
    sóʔ ‘lungs’
    háʔ ‘baynut flesh’
    bášk’oq’ ‘raspberry’
    héc ‘nail, claw’
    hosíq ‘screech owl’ [38]

There are a number of words, many of them obvious borrowings, which surface with final
aspirated stops. To distinguish them from the classes of words in (93) and (94), I treat the
stops as underlyingly aspirated:

19 Imitatives are the only forms I have found with final /p/; labial stops are normally not found at the
ends of roots and stems.
(95) 

<table>
<thead>
<tr>
<th>word</th>
<th>meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>tep</td>
<td>'unmarked game stick' [26]</td>
</tr>
<tr>
<td>hót</td>
<td>'warm' [38, 2.65]</td>
</tr>
<tr>
<td>kilák</td>
<td>'eagle'</td>
</tr>
<tr>
<td>yuk</td>
<td>'please (interjection)'</td>
</tr>
<tr>
<td>šakitaq</td>
<td>'puffin' (Alutiiq šakita-q 'species of pelagic bird') [38]</td>
</tr>
<tr>
<td>kulwa</td>
<td>'cattle' (Alutiiq kuluwa-t 'cows', from Russ. koróva 'cow')</td>
</tr>
<tr>
<td>čáynik</td>
<td>'teapot' (Russ. čáynik)</td>
</tr>
<tr>
<td>čawik</td>
<td>'iron, metal, nail' (Alutiiq čawik)</td>
</tr>
<tr>
<td>mišúk</td>
<td>'sack' (Russ. mešók)</td>
</tr>
<tr>
<td>nuhkúk</td>
<td>'jerkey' (Alutiiq neqka-q 'prepared food')</td>
</tr>
<tr>
<td>kalikák</td>
<td>'paper, book, letter' (Alutiiq kalika-q)</td>
</tr>
</tbody>
</table>

As with coronals, Word-Final Debuccalization does not apply to fricatives, whether glottalized or plain:

(96) 

<table>
<thead>
<tr>
<th>word</th>
<th>meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>kís</td>
<td>'red'</td>
</tr>
<tr>
<td>kanás</td>
<td>'sickly'</td>
</tr>
<tr>
<td>šiwíš</td>
<td>'reed'</td>
</tr>
<tr>
<td>tulúš</td>
<td>'whirlwind'</td>
</tr>
<tr>
<td>mós</td>
<td>'sour'</td>
</tr>
</tbody>
</table>

To account for these facts, we need a new rule which applies postlexically to word-final stops that bear no laryngeal features:

(97) **Word-Final Debuccalization**

\[
\begin{array}{c}
\text{RO} \quad \text{l}^w \\
/ \quad \quad \quad \\
\text{Lar} \quad \text{Pl} \quad [-\text{cont}] \\
\end{array}
\]

The forms in (94) and (95) are unaffected by the rule since their final stops have a Laryngeal node. In Coronal and Uvular Debuccalization, which apply lexically, the stop which undergoes the rule always has a Laryngeal node thanks to the prior application of Glottal Transfer or Coda Aspiration. This satisfies the Segmental Licensing requirement.

In the case of Word-Final Debuccalization, however, Glottal Transfer is inapplicable, and extraprosodicity (§6.3.4) has prevented Coda Aspiration from applying.\(^{20}\) As a result,

\(^{20}\) Coda Aspiration precedes all Debuccalization rules. The uvulars in (90) undergo Coda Aspiration postlexically, bleeding Word-Final Debuccalization. Non-derived words, such as those in (93), retain their Final-Consonant Extraprosodicity from the lexicon and do not undergo Coda Aspiration. Eventually,
when the Place node is deleted, a Laryngeal node dominating [gl] must be provided. I assume that a placeless consonant with the feature [-cont], which characterizes all stops, receives the feature [gl] and (as a path) a Laryngeal node.\textsuperscript{21}

We saw in §3.1.1 that the normal allomorph of the Absolutive after a consonant is -?. When this suffix is added to a stop-final verb stem, however, we do not see an ejective on the surface, as we did with the Assertive and nouns. Rather, the stop surfaces as [?]:

\begin{tabular}{ll}
(98) & \textbf{STEM} & \textbf{ABSOLUTIVE} \\
\hline
\text{núnu}- & libú? & \text{‘whistle’} [103] \\
\text{p\textdegree o\textdegree }- & p\textdegree o? & \text{‘knock off’} [102] \\
\text{s\textdegree wac-} & \text{swá?} & \text{‘get dry’} [99] \\
\text{ca\textdegree }- & ca? & \text{‘see (pl)’} [105] \\
\text{n\textdegree u\textdegree še’k-} & \text{dušé?} & \text{‘pleat’} [3.4] \\
\text{sima\textdegree q-} & \text{simá?} & \text{‘sleep’} [100] \\
\text{loq’-} & \text{lo?} & \text{‘flow’} [101] \\
\end{tabular}

A possible analysis of these facts is to say that a stop is deleted before a glottal stop, but this is not the behavior we have seen elsewhere in the phonology: what we expect is Glottal Merger. I propose that Merger does occur, but then the ejective debuccalizes:

\begin{tabular}{lll}
(99) & li\text{núna-?} & \rightarrow \text{libú} \\
\text{p\textdegree o\textdegree -?} & \rightarrow \text{p\textdegree o\textdegree } & \rightarrow \text{p\textdegree o?} \\
\text{s\textdegree wac-?} & \rightarrow \text{swác-} & \rightarrow \text{swá?} \\
\text{ca\textdegree -?} & \rightarrow \text{ca\textdegree } & \rightarrow \text{ca?} \\
\text{n\textdegree u\textdegree še’k-?} & \rightarrow \text{dušé’k-} & \rightarrow \text{dušé?} \\
\text{sima\textdegree q-?} & \rightarrow \text{simáq-} & \rightarrow \text{simá?} \\
\text{loq’-?} & \rightarrow \text{loq’} & \rightarrow \text{lo?} \\
\end{tabular}

This Verb-Final Debuccalization cannot be generated by the same rule as Word-Final Debuccalization, since for example underlying /\textdegree c/ suffers different fates in (94) and (99). A rule specific to verbs is necessary, one which targets any final stop:

---

Extraprosodicity and Aspiration turn off, at which point Word-Final Debuccalization applies. This account may require dividing the postlexical component into two parts (cf. Kaisse 1985).

\textsuperscript{21} This may not be a cross-linguistically valid assumption. For example, in Hayu a stop preceding a homorganic consonant becomes [?] if the following consonant is a sonorant, but [x] if it is another stop (Michailovsky and Mazaudon 1973). In this case there is some dissimilatory effect on the value of [cont].

102
(100) **Verb-Final Debuccalization**

RO \verb

The failure of this rule to affect a stop preceding the Factual -₄, even if the stop surfaces as word-final, indicates that like Uvular Debuccalization it is ordered before /₃/ Deletion (§6.3.2). If, however, the notation ‘verb’ in (100) is interpreted as a postlexical category (i.e. a complete word which is also a verb), or if Verb-Final Debuccalization is simply restricted to the postlexical component, this ordering statement is unnecessary: /₃/ Deletion is lexical only.

3.3. **Vowel-Consonant Interactions**

Several rules of Kashaya involve the traditional vowel features [high], [back], and [round], which occur on both vowels and consonants. We begin in §3.3.1 by demonstrating that /i/ is the epenthetic vowel, and that where /i/ alternates with other vowels it is the latter which are derived by rule. Specifically, after a uvular any vowel takes on the consonant’s place features (§3.3.2); after /m/ the feature [+back] is inserted on /i/ to create [a] (§3.3.3); and [+round] is inserted on /i/ after /h/ to make [u] (§3.3.4). In §3.3.5 we see that /i/, prespecified as [+high], changes a preceding uvular to a velar. The raising of /e/ to [i] between two Dorsal consonants is described in §3.3.6.

3.3.1. **The Epenthetic Vowel**

I assumed in §2.2.4 that /i/ is the default vowel in Kashaya. According to the principles of Radical Underspecification, when a particular vowel behaves asymmetrically with respect to the other vowels — for example, if it is transparent to harmony rules or is inserted epenthetically — that vowel should be completely underspecified and receive its features by default. In this section we examine the evidence for the special status of /i/ in Kashaya.
Epenthesis exists to a limited extent in Kashaya (§6.3.1 for prosodic conditions), but the quality of the inserted vowel varies. After coronal and velar consonants, the vowel [i] occurs, after labials and uvulars we find [a], and after /q/ we find [o]:

(101) mo-hi-mul-ʔ → mōhtimul’ ‘run around (pl)’ [2.74]
kel-hi-mul-ʔ → kēhlimul’ ‘peer around (pl)’ [188]
hi-hi-m-ʔ → tūtim’ ‘put feet above ground (pl)’ [158, 2.74]
nu-nikitis-w → dukhiśiw ‘scratch across (pl)’ [178]
mu-ni-oñhik-w → mobohkiw ‘swell up (pl)’ [D]
ni-hyut-c-w → dihyūt’ciw ‘crumble by dropping on an object on the ground’ [161]

(102) kel-m-w → kēlma’w ‘peer directly down at’ [158]
p’i-ʔya’udlq-w → p’iyatqaw ‘recognize (pl)’ [170]
ni-hyut-m-w → dihyut’ma’w ‘crumble by dropping on an object off the ground’ [162]

(103) p’a-čotlqʷ-w → p’ačotqow ‘stab (pl)’ [170]

The vowel /o/ is not a serious choice as the epenthetic vowel, due both to its markedness and the fact that it is not found at the beginning of any Kashaya suffix. The real options are to insert /i/ epenthetically and change it to [a] after labials and uvulars, or insert /a/ and change it to [i] after a coronal or velar.

Only the first solution is viable, however, since suffixes beginning with /a/ never change to [i], whereas there are a number of suffixes beginning with /i/ which change to [a]. For example, the suffixes -an’ (an allomorph of the Durative) and -ala (‘down’, Inchoative) can be seen to take these forms after a variety of consonants, including the coronals that are followed by epenthetic [i] in (101) above:

(104) mo-m-añ-i → moma’du ‘keep running across’ [213]
nu-ñu-m-añ-i → duhluđa’du ‘keep picking’ [213]
ie-ay-añ-i → ietayardu ‘keep standing against’ [213, 3.2]

(105) ciwa-alal-ʔ → ciwalaw ‘crawl down’ [193]
c’eʔet-ala-w → c’eʔetalaw ‘scoop up and pour out’ [194]
caq’am-alal-ʔ → caq’amalaw ‘cut downward’ [194]
This contrasts with suffixes beginning with /i/, such as -i (Singular Imperative) and -in (‘while’). The underlying form surfaces after coronals — dentals, alveolars, and palatals — as well as velars:

(106) a. ńu-ie-r-in → dui-rún ‘while fastening’ [70]
    b. ṣu- qa-t-i → ṣuqa-ti ‘groan!’ [2.89]
       ṣu- ṣha-wen-i → ṣuhwe-ni ‘shake it!’ [2.89]
       mo-mul-in → momú-lín ‘while running around’ [70]
       ni-ku-is-in → dukisin ‘while scratching’ [70]
       mansár-in → mansá-rín ‘while taming’ [70]
       resá-r-i → resá-ri ‘pray!’ [2.89]
    c. ńu-mac-in → momác-in ‘while running in from here’ [70]
       ṣo-c-i → ṣocí ‘drink it’ [2.84]
       ṣu- ṣu-hay-in → duh-tayín ‘while touching’ [2.89]
       hanoy-i → hanoyí ‘limp!’ [2.89]
    d. ńu-še-k-i → duše-ki ‘pleat it!’ [3.4, 2.85]

The fact that /a/ and /i/ contrast here shows that these suffixes have distinct underlying vowels. We see below that the suffixes -i and -in assimilate to the preceding consonant. The natural conclusion is that the epenthetic vowel is /i/ and in (102) becomes [a] by the same rule.

Epenthesis occurs also postlexically after the Assertive, as illustrated in §3.1.1. Since at this point no consonant-vowel assimilation occurs, the epenthetic vowel surfaces unchanged. Significantly, that vowel is [i] regardless of the preceding consonant:

(107) waṭac=ʔ-q → waṭačίqʰ ‘it must be a frog’ [82]
     sinarn=ʔ-nio → sinamίdo ‘they say he drowned’ [242]

This is consistent with the idea that /i/ is the default vowel; the rule simply inserts a vocalic mora, and the specific features follow from the redundancy rules. Either the rule inserting [+back] after /m/ is no longer active in the postlexical component, or it precedes Glottal Merger.

105
3.3.2. Uvular Assimilation

When any vowel follows a uvular, it undergoes a rule of assimilation. After unrounded /Ɂ/ it becomes [a]. This process can be demonstrated for /i, e, a/, though in the last case the assimilation is vacuous:

(108) a. šuhaq-in → šuhlaqán ‘while getting a stomach ache’ [70]
    ʔusaq-in → ʔusáqán ‘while washing the face’ [2.89]
    ce-aq-in → ceqán ‘while opening out from here’ [2.89]

b. simaq-eti → simaqatí ‘although he’s asleep’ [2.96]
    simaq-em → simaqám ‘is sleeping (Resp)’ [3.4]
    p³iʔyaq-ela → p³iʔyaqalá ‘I recognize it’ [2.96]

c. mo-aq-ani-i → moqaˈdu ‘keep running out from here’ [2.88]
    simaqa-ani-i → simaqaˈdu ‘keep sleeping’ [2.88]
    k³unuqa-ani-i → k³unuqaˈdu ‘keep spoiling’ [2.88]
    niʔtaq-ala-w → duʔtaqˈlaw ‘smear downward’ [2.88]
    niʔyaq-ala-w → duʔyaqˈlaw ‘have a thought’ [194]

After rounded /Ɂ/ these vowels all become [o]:

(109) a. woq-‘in → woqón ‘while flowing’ [70]
    coq-‘i → coqó ‘shoot!’ [2.89]
    p³aʔsoq-‘in → p³aʔsoqón ‘while mashing’ [2.90]
    p³aʔkoq-‘in → pahkoqón ‘while setting upright’ [2.90]
    ce-aq-‘in → ceqón ‘while opening out toward here’ [2.90]

b. mo-maq-‘eti → momáqoti ‘although he ran in here’ [280]
    mo-aq-‘eti → moˈqtí ‘even though he ran out’ [2.91]
    woq-‘em → woqóm ‘while flowing’ [272]
    mo-maq-‘ela → momáqola ‘I am running in’ [71]

c. qaʔsoq-‘ani-i → qaʔsoqˈdu ‘be getting well’ [213]
    mo-aʔkoq-‘ani-i → moʔkoqodú ‘keep running up’ [213]
    p³aʔsoq-‘ala-w → p³aʔsoqˈlaw ‘mash downward’ [2.88]

No suffix Ɂ begins underlyingly with one of the rounded vowels /u, o/.

This Uvular Assimilation can be formulated as the spreading of the Place node from a uvular to a following vowel:
The existing Place node on the vowel is dislodged by the one which spreads from the consonant. No Labial node is specified in the rule, since it is not a necessary characteristic of the triggering stop. Spreading is at the Place node, however, so if Labial is present it spreads along with Dorsal, and /q/ changes the following vowel to [o], which is [+round] in addition to [-high]. The feature [+back] is later inserted by default rule.  

22 This raises an interesting issue, since in §2.2 I assumed that while [-back] is the default value for vowels, the default for a Dorsal consonant is [+back]. Which rule applies to a Place node which is linked to both consonantal and vocalic Root nodes? In this particular instance a simple answer comes from cooccurrence restrictions: while a nonhigh vowel can be front, there is no consonant which is both [-back] and [-high]. Since [-high] is already present in the feature specification, only the [+back] default rule can apply. The question of which default rule takes precedence when the consonant and vowel defaults are equally compatible is an empirical one, and remains unanswered by the Kashaya data.
assimilation of the vowel to [o] is straightforward. The phonetic evidence does not compel us to this conclusion, but it is consistent with it, and the phonological evidence strongly encourages it. We turn now to this evidence in more detail.

One potential reason to abandon /q'/ is that every instance of a verb-root-final /q'/ is preceded by /o/. As a result, the change I have described as in (111a) might also be interpreted as shown in (111b):

(111) a. woq*-in → woqon
    b. woq-in → woq-an → woqon

That is, rather than assimilating solely in place to the preceding consonant, we could treat the change in two parts: assimilation to the Dorsal features of the plain uvular, followed by rounding harmony between the vowels. In this way we avoid the need for an additional segment /q'/ in the inventory. There are three problems with such an analysis, however. First, the supposed rounding harmony occurs only when the consonant between the two vowels is /q/; with other consonants it does not apply:

(112) mo-m-an'-i → momá'du (*momó'du)  'keep running' [213]
     Soyt-an'-i → Soytató'du (*Soytótó'du)  'scatter, spread' [2.90]
     p'o-t-an'-i → p'otató'du (*p'otótó'du)  'keep knocking off' [2.91]

Compare these with the examples in (109c). Under the harmony analysis there is no explanation for why the harmony should be so restricted, whereas if /q'/ is the only consonant with a [+round] feature, the reason is obvious.23

23 Paradis and Prunet (1990) suggest that in Chinook rightward spreading of [+round] across velar and uvular consonants, e.g. /oqa/ → [oqo], happens in two stages: the feature spreads first to the consonant ([oq'o]) and from there to the vowel ([oq'o]). In their analysis, when the vowel following the consonant is front, it cannot be rounded and there is an off-glide from the rounded consonant: /oqe/ → [oq'e]. Of consonants with place features, only velars and uvulars are transparent to this spreading; this restriction makes sense if only velars and uvulars can be rounded, which in turn is typologically common (especially among Northwest Coast languages). Although they do not discuss this explicitly, it appears that Paradis and Prunet must make the assumption that [oq'0] is not distinct from [oqo], and in this respect their analysis resembles mine. On the other hand, I have argued that in Kashaya the feature [+round] originates with the uvular, NOT with the adjacent vowel.
Second, there are suffixes ending in /q/ which do not contain the vowel /o/ and so there is nothing to trigger the harmony. These include the Directionals -aq" ‘out here’ and -maq" ‘in here’ (both exemplified in (109b)). A possible analysis is to say that these suffixes actually contain the sequence /aoq/; the independently motivated rule of Elision (§6.6) ensures that only the first of the two vowels surfaces.\(^{24}\) Not only is this a completely ad hoc solution — no other vowel clusters exist in the language — but it makes no progress against the first problem raised here, nor a third: namely, it is clearly the uvular consonant which triggers rounding of the following vowel. Verb roots undergo various modifications to mark them as plural; one of these is infixation of -ta- before the last consonant of the root (§8.2):

\[(113)\]

<table>
<thead>
<tr>
<th>SINGULAR</th>
<th>PLURAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ẖuqur-</td>
<td>ẖuqalalc-</td>
<td>‘get lost’ [171]</td>
</tr>
<tr>
<td>ḍḥ-laq/a'lam-</td>
<td>ḍḥ-laq/alalm-</td>
<td>‘feed’ [171]</td>
</tr>
</tbody>
</table>

To be formalized simply, the infixation must occur before the next suffix is added. Yet when the root ends in /oq/ and the vowel and consonant are separated by the infix, that suffix still undergoes the assimilation:

\[(114)\]

<table>
<thead>
<tr>
<th>Root</th>
<th>qašoq&quot;-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infixation</td>
<td>qašotalq&quot;-</td>
</tr>
<tr>
<td>Suffixation</td>
<td>qašotalq&quot;-ac&quot;-</td>
</tr>
<tr>
<td>Assimilation</td>
<td>qašotaqoc&quot;-</td>
</tr>
</tbody>
</table>

One might counter that the harmony skips over unrounded vowels, but the following examples show that such an account fails:

\[(115)\]

<table>
<thead>
<tr>
<th>ša-qot-aq-an-i</th>
<th>daq'otá quadratic</th>
</tr>
</thead>
</table>
| woq"-aq-an-i   | woq'ó quadratic     | ‘keep pulling out from here’ [2.91]

\(^{24}\) Actually, the application of Elision in a non-derived environment such as would be required here is potentially problematic in itself.
Even with the supposed /q/ trigger present in front of the target /a/, the harmony fails to apply in *daqʔotáʔqadu*; and even more convincingly, the only assimilation in *woqóʔqadu* is from the underlying /qʷ/, not from the /q/ which happens to be preceded by /o/. It is clear that we require the segment /qʷ/ to account for these facts.

To express the generalization that all roots containing /qʷ/ have adjacent /o/’s, we might apply Uvular Assimilation bidirectionally as a morpheme structure condition on lexical roots (this is not true of suffixes, e.g. -*aqʷ* “out here”). It is not the case, however, that every /q/ is adjacent only to /a/’s; while /q/ is followed only by that vowel, there are cases where /u/ precedes it:

(116)  
\[
\begin{array}{ll}
\text{k̡unurq-} & \text{‘spoil’ [100]} \\
\text{muʔqa-} & \text{‘be stiff’ [129]} \\
\text{ṣuqʷac-} & \text{‘sit on ground or floor (sg)’ [161]} \\
\end{array}
\]

If Uvular Assimilation is spreading at the Place node, and (at least at this level) restricted to structure building, then only /i/ and /e/ will undergo the rule; /u/ would lose its [+round] marking and therefore the rule is blocked. Under these assumptions bidirectional Uvular Assimilation from both types of uvulars will account for the root vowel cooccurrences in the verb.

The leftward application of Uvular Assimilation is less secure in nouns, since /q/ is preceded by not only /u/ but also /i/ in at least two examples:

(117)  
\[
\begin{array}{ll}
\text{a. ṭuhqʷa} & \text{‘belly’} \\
\text{buḫqʷá} & \text{‘burden basket’} \\
\text{cuqʷáʔ} & \text{‘scrubbing brush’} \\
\text{b. ṭihqʷόʔ} & \text{‘root’} \\
\text{hosíq} & \text{‘screech owl’ [38]} \\
\end{array}
\]

In addition, we find the sequence [aʔo]:

110
(118) qahqo  
    šahqo  
    haqo  
    ḥahqol, ḥaqoláy  
    baqo  
    ‘field, opening; bare, nude; plain, evident’  
    ‘grasshopper’  
    ‘fish trap’  
    ‘long, tall (sg, pl)’  
    ‘what’

Assuming that Uvular Assimilation always applies at least rightward — to express the fact that uvulars are followed only by /o/ or /a/ — the uvulars in these nouns must be /q̥/, since they are followed by /o/. The sequence /q̥/ plus /o/ is impossible, since they have different Place nodes: it must be /q̥o/. This in turn means that Uvular Assimilation does not apply leftward in these nouns, since that would predict the output [oq̥o]. I conclude that while Uvular Assimilation may be bidirectional as a morpheme structure condition in verb roots, it applies only to the right in nouns.

Although (in general) uvulars in Kashaya are followed only by [a] and [o], it is not possible to treat [q] as an allophone of /k/ before /a, o/, since there are (near) minimal pairs:

(119) -kaw-  
    -qaw-  
    ‘groan’ [40]  
    ‘scrape off’ [102]

(120) -qo-  
    -ʔqoʔi-  
    ‘hit lightly’ [73]  
    ‘do permanently, for good’ [152]

Similar contrasts can be seen in (165). In addition, the existence of surface sequences [qi] and [qe], shown in §3.3.5, militates against an allophonic analysis.

When the Factual suffix -a is added to a stem ending in /q̥/, the rounding is lost on the uvular. This is true whether the vowel /ə/ surfaces or not:

(121) hce-aq̥-ə  →  ceʔq̥  ‘is open out towards here’ [101]  
    hce-aq̥-ə-em  →  ceʔq̥ám  ‘is open out towards here (Resp)’ [3.11]

The rule effecting this change can be formalized as applying either before /ə/ or before an Evidential suffix (before the other Evidentials, the uvular is in coda position and debuccalizes anyway). I choose to appeal to a special representation of the vowel, since it is also special in that it deletes word-finally (§6.3.2). The natural choice, given the facts in
(11), is to give the default feature [-round] underlyingly, similar to the use of [+high] for /i/. The loss of rounding on the preceding uvular can then be treated as spreading of the Labial node:

(122) [-round] Spreading

\[
\begin{array}{c|c}
RC & RV \\
\hline
\text{Place} & \text{Place} \\
\hline
\text{Lab} & \text{Lab} \\
\hline
\text{[-round]} & \\
\end{array}
\]

Spreading has an effect only in the case of /q/⁷, since it is the only consonant with a Labial node which bears the feature [+round] (even the true labials are unrounded). The rule must precede both Uvular Assimilation (which is still active in level 5, where the Factual is added) and /ɔ/ Deletion, which results in the loss of the triggering vowel when it is word-final (§6.3.2).

3.3.3. [+back] Insertion

I mentioned in §3.3.1 that a suffix-initial /i/ becomes [a] after /m/. The following data further illustrate this fact:

(123) \begin{align*}
\text{mo-m-in} & \rightarrow \text{momán} \quad \text{‘while running across’ [70]} \\
p^a\text{-nem-i} & \rightarrow p^anemá \quad \text{‘punch him!’ [2.90]} \\
\text{mo-m-ins} & \rightarrow \text{mománš} \quad \text{‘I guess he ran across’ [2.90]}
\end{align*}

Only /i/ is affected by this change. The mid vowel /e/ and the special vowel /i/, which is prespecified as [+high], do not change after /m/:

(124) \begin{align*}
a. \quad & \text{p}^a\text{-nem-eti} \rightarrow p^aneméti \quad \text{‘even though he was hit’ [2.91]} \\
& \text{p}^a\text{-nem-em} \rightarrow p^anemém \quad \text{‘while he is hitting’ [2.93]} \\
& \text{caq}^\text{am-ela} \rightarrow \text{caq}^\text{amél}á \quad \text{‘I’m cutting it’ [2.95]} \\
b. \quad & \text{caq}^\text{am-ímic-?} \rightarrow \text{caq}^\text{amímbí?} \quad \text{‘start to cut with a knife’ [194]} \\
& \text{q}^\text{ošam-ímic-?} \rightarrow \text{q}^\text{ošamímbí?} \quad \text{‘winter to begin’ [194]}
\end{align*}

112
The connection between [m] and [a] is reminiscent of the acoustic feature [+grave], which applies to both labials and back vowels (Jakobson, Fant, and Halle 1952, Hyman 1973). But in the feature system adopted here, there is no means of achieving this change by autosegmental spreading. Accordingly, I assume a rule inserting [+back] on an unspecified vowel after a labial:

(125) [+back] Insertion

\[
\emptyset \rightarrow \text{[+back]} \quad / \quad \begin{array}{c}
\text{RC} \\
\text{RV}
\end{array}
\]

While it might be deemed preferable to have a rule which applies in a truly assimilatory fashion by spreading a feature, as with Uvular Assimilation, there are two factors which support the more arbitrary rule in (125). First, only underspecified /i/ undergoes [+back] Insertion, unlike Uvular Assimilation which applies to all vowels. Second, the other vowel change which affects only /i/ is completely unmotivated on phonetic grounds, and requires the type of rule seen in (125). We turn to this rule now.

3.3.4. [+round] Insertion

A quite unexpected alteration takes place after [d], which is the realization of underlying /i/ in onset position (§2.3.3, §3.1.3). Here /i/ becomes [u]:

(126)

<table>
<thead>
<tr>
<th>Arabic</th>
<th>Arabic</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>wa-an'i</td>
<td>→</td>
<td>wa'du 'come here!' [254]</td>
</tr>
<tr>
<td>ca-n'i</td>
<td>→</td>
<td>cadú 'look!' [2.90]</td>
</tr>
<tr>
<td>mabsan-in</td>
<td>→</td>
<td>mahsadún 'while taking away' [70]</td>
</tr>
<tr>
<td>?oloq'-an-in</td>
<td>→</td>
<td>?oloqodún 'while poking one's head up' [271, 2.112]</td>
</tr>
<tr>
<td>moaq-an-in</td>
<td>→</td>
<td>moqadún 'while running out from here' [272]</td>
</tr>
<tr>
<td>ca-niš</td>
<td>→</td>
<td>cadúniš 'I wonder if he saw it' [2.84]</td>
</tr>
</tbody>
</table>

Once again, /e/ and /i/ are unaffected, as is /a/:
(127) mići-o-ii-em → mići'dem ‘while he is lying down’ [272]
cahño-an-i-fiyi-c? → cahnodi-yi? ‘talk to oneself’ [199, 2.102]
niu-ñun-an-i → duhludá'du ‘keep picking’ [213]

There is little hope of deriving this change from a natural phonological process — in fact, there would be something suspect about any feature system which could do so.\(^{25}\) Rather than assimilation expressed as autosegmental spreading, we need a rule which in derived environments adds [+round] to an unspecified vowel following /i/ or /u/, depending on whether the rule precedes or follows Desonorization. See §3.5.2 for evidence suggesting that the rule makes reference to the underlying features:

(128) [+round] Insertion

\[
\emptyset \rightarrow [+\text{round}] / \text{RO} \quad \text{RV} \\
\quad / \backslash \text{Lar} \quad \text{Place} \\
\quad / [\text{[g]}] \quad _{\quad} \\
\]

[+round] Insertion as formulated here must precede Desonorization.

\(^{25}\) R. Oswalt (personal communication) has suggested that the general affinity between [d] and /u/ in Kashaya may be related historically to the allomorphy of the Absolutive, which is -w after vowels and -u after [d]. Synchronically, I treat the latter allomorph as underlyingly /i/ and derive it by [+round] Insertion.
3.3.5. Uvular Raising

The generalization expressed by Uvular Assimilation in (110) is that only vowels which are [+back, -high] can follow consonants which are also [+back, -high]. No doubt this is due to the historical change of *q to k before all vowels except /a, o/. In the examples we have seen so far, the synchronic language corrects ill-formed sequences such as /qe/ and /qi/ by changing the vowel, which is the opposite of the historical change. For two suffixes, however, the historical process is recapitulated by changing apparent /qi/ to [ki]. This rule of Uvular Raising operates synchronically before the suffix -ινικ `up, away, Inceptive`:

(129) ṣusaq-ίνικ-ʔ → ṣusakibìʔ ‘start to wash the face’ [100]
    mic'aq-ίνικ-ʔ → mic'akibìʔ ‘start to sweat’ [2.78]
    śiniyaq-ίνικ-ʔ → śiniyakibìʔ ‘start to shrink’ [2.78]
    pʰi²yaq-ίνικ-ʔ → pʰiyakyakibìʔ ‘finally notice’ [2.102]

This case differs from that illustrated in (108) — where the output is [qa] — in that the first vowel in -ίνικ, instead of being completely underspecified like most instances of /i/, is irregularly specified as [+high]; this feature spreads leftward and changes /q/ to [k].

A similar pattern to that of -ίνικ is found with the Reflexive, although in this case there are complications due to partially unpredictable allomorphy. One allomorph is -ιγιε, where the initial vowel is completely unspecified and assimilates to the preceding consonant by the rules discussed in previous sections:

(130) ca⁵no-an-ιγιε-ʔ → cahnodu'yiʔ ‘talk to oneself’ [199, 2.102]
    ṭusaq-ιγιε-i → ṭusáqayi'ci ‘wash yourself!’ [2.103]
    mi²noq-ιγιε-i → diʔbogóyi'ci ‘hide yourself!’ [D]

Another allomorph is the slightly different form -ιγιε, where the initial vowel includes the

26 This is the position taken by McLendon (1973). Oswalt (1964b) argues that modern /q/ originated as an allophone of /k/.
[+high] specification; as a result the vowel does not undergo assimilation. This allomorph is also possible with caⁿ-no- 'talk' as in (130), but not with ḫusaq- 'wash':

(131) pʰiʔ-yaʔ-q-ṭiʔ-ċ [2.102] → pʰiʔ-yak-riʔ-辜t‘notice (about) oneself’
caⁿ-no-an-ā-ṭiʔ- cà [199, 2.102] → canno-diʔ-辜r‘talk to oneself’
*ʔusaq-ṭiʔ-ċi [2.103] → *ʔusak-iṭ-辜r ‘wash oneself’

Since the suffix on caⁿ-no- can take either of these two allomorphs, but that on ḫusaq- cannot, we have evidence that the type of assimilation which occurs is determined by the representation — /l/ versus /ʃ/ — and not, say, the lexical level. Rather than saying that Uvular Raising is optional with some verbs before some allomorphs of the Reflexive (but always obligatory with -ṭi ni), I prefer to locate the irregularity in the Reflexive itself, which already exhibits some allomorphy (§7.2.3); -ṭi ni does not vary, so not surprisingly it always triggers Uvular Raising.

Since /ʃ/ differs from /q/ only in being [+high], this is clearly a case of assimilation to that feature of /ʃ/:

(132) Uvular Raising

\[
\begin{array}{c|c}
\text{RC} & \text{RV} \\
\hline
\text{Place} & \circ & \circ \\
\text{Dorsal} & \circ & \circ \\
& \circ & \circ \\
\end{array}
\]

The rule applies only to the feature [+high]. If spreading includes the Dorsal node, we make the prediction that the two segments must agree in [back]; this is incorrect, since [k] is [+back] but [ɾ] is [-back]. Notice that the primary motivation for prespecification in both /ʃ/ and /ɾ/ lies in the leftward spreading of the feature onto a uvular.

Not surprisingly, the rule has no visible effect if the preceding Dorsal consonant is already velar:

---

27 If [low] rather than [back] is used as the third feature in the vowel system, this issue does not arise: both /œ/ and /œ/ are [-low].
(133) qa-ndwuk-*iqic-i → qabuki-bicī ‘puff out your cheeks!’ [D]

So far we have seen that /qʰ/ becomes [ki]. The sequences /qʰi/ and /qʰe/, however, never undergo Uvular Raising; instead they can undergo Uvular Assimilation to [qo], or no change at all to surface as [qi] or [qe]:

(134) woqʰ-iqic-i → woqʰo-qi⁓bi⁓or woqʰ-bi⁓ ‘start to flow’ [71]
qašoqʰ-iqic-i → qašoqʰo-qi⁓bi⁓or qašoqʰ-bi⁓ ‘be getting better’ [2.81]
pʰaʔ-ʔsoqʰ-iqic-i → pʰaʔsoqʰo-qi⁓bi⁓or pʰaʔsoqʰ-bi⁓ ‘start mashing’ [2.80]
woqʰ-em → woqʰem or woqʰem ‘while flowing’ [272]

The factors determining this variation after /qʰ/ are not entirely clear. To some extent it is dialectal (Oswalt 1961), though there may be sound symbolic influences as well: Bunn Lucas accepts both woqʰo-qi⁓bi⁓and woqʰ-bi⁓for ‘start to flow’, but defines the latter as a smaller flow of water. Formally, the generalization is that for some speakers or in some circumstances Uvular Assimilation from /qʰ/ fails when the following vowel is specified [+high].

Similar data come from the Reflexive, including a shorter allomorph which, like the -išic/-iyic pair illustrated above, exists in two forms: -iṭ or -iś. When the initial vowel is unspecified for [high], it undergoes Uvular Assimilation; but when it is [+high], Uvular Assimilation fails to apply, as does Uvular Raising:

(135) mo-aqʰ-iśic-i → moqo-qiṭ ‘run out from here!’ [202]
kel-aloqʰ-iśic-i → kelqoqo-qiṭ ‘look up out!’ [202]
pʰaʔ-ʔsoqʰ-iśic-i → pʰaʔsoqʰ-yiṭ ‘hit oneself, beat one’s breast’ [2.103]

The root coqʰ- ‘shoot’ can take either a longer or shorter allomorph of the Reflexive, but in both cases it takes the one where the first vowel is specified [+high]:

(136) coqʰ-iśic-i → coqʰiṭ or coqo-qiṭ ‘shoot yourself!’ [2.102, 3.5]
coqʰ-iyiṭic-i → coqʰi-yiṭic ‘shoot yourself!’ [2.102]
Other obscure factors are involved in the (non)application of Uvular Assimilation in these forms. For Otis Parrish, the stem *coqi*- without Assimilation seems to require, at least in some cases, that the subject of the verb be the speaker of the utterance, and therefore makes little sense in the Imperative; *coqoq*- with Assimilation refers to a subject other than the speaker. I ignore the causes of this variability in formulating the phonological analysis.

Naturally, since /e/ is [-high], we would not expect it to trigger Uvular Raising. The real question is why /i/ fails to trigger Uvular Raising when the uvular is rounded. I attribute this fact to Structure Preservation: since there is no segment /kʷ/ in Kashaya, application of Uvular Raising to a rounded uvular would produce an ill-formed structure. A consonantal segment which is [+round] cannot also be [+high]: this predicts the nonexistence of /kʷ/ in the inventory, and prevents its creation by a rule such as Uvular Raising. This is further evidence for treating /qʷ/ as a segment of Kashaya, as argued in §3.3.2.

Surface [qi] comes only from underlying /qʷi/ as illustrated in (134) and (135), not from /qi/. This is because Uvular Raising is ordered before Uvular Assimilation: /qʷi/ must undergo Raising, and never has a chance to undergo Assimilation. Since Structure Preservation prevents the application of Raising to /qʷi/, that string is free to undergo Assimilation; whether it does or not depends on the dialect of the speaker or semantic factors. If it does not undergo the rule, it surfaces as [qi]. It appears that for those speakers who do not always apply Uvular Assimilation, it is optional only with /i/ and /e/, and is obligatory with the completely underspecified vowel /i/. Thus the examples in (108) and (111) with *-i and *-in never fail to be assimilated. Underlying /oqʷi/ surfaces as [oqi] rather than [oqʷi] due, I assume, to the nature of the phonetic rule implementing rounding on a consonant: it specifies a target no greater than the rounding on the adjacent /o/, so that the rounding on the consonant itself is not distinctive in this context.

---

28 A persistent rule deleting [+high] from a [+round] consonant would accomplish this.
There is an odd form which does not fit in the pattern. All data given so far confirm the
generalization that /qʷ/ → [qɨ] and /qɨ/ → [kɨ], attributable to Structure Preservation. With
just one verb that I have found, however, a stem-final /qʷ/ (as evidenced by the Imperative
below) changes to [k] before /l/:

\[(137)\]
\[p^{a-hq^q'q^{q^q}-i} \rightarrow pahq'q^q\hat{o}q\hat{o}\] ‘put the poles in the holes!’ [2.102]
\[p^{a-hq^q'q^{q^q}-ín\hat{í}c-?} \rightarrow pahq'q^qk'bi?\] ‘stand long objects up’ [3.5]
\[p^{a-hq^q'q^{q^q}-ýýč-?} \rightarrow pahq'q^qk'ýýi?\] ‘implant long objects on oneself (e.g.
feathers on garment)’ [199, 2.102]

The only way I can account for this is through stem allomorphy: an alternate form of
‘implant’ is \(-hq^q'q^{q^q}\), without the rounding — perhaps everywhere but the Imperative, or
simply before /l/. Since I know of no other verb which behaves in this manner, an
idiosyncratic solution such as this is adequate.

When the Assertive is added directly to a verb root ending in a uvular, Verb-Final
Debuccalization fails to apply. Instead we find another change which we can call Pre-
Assertive Raising, which applies also to /qʷ/:

\[(138)\]
\[p^{a-?sóq^{q^q}=-?} \rightarrow p^{a-?sók}\] ‘mashed’ [101]
\[qaśoq^{q^q}=-?e' \rightarrow qaśok'k'e'\] ‘got well (NPV)’ [2.81]
\[h'ca-aq=? \rightarrow cák\] ‘flew past’ [2.40]

Since it appears to occur only before the Assertive, it may be an idiosyncratic rule deleting
[-high]. See also §4.3.1. The loss of [+round] on the uvular is perhaps related to that
before /á/. The apparent attachment of the Assertive ‘clitic’ directly to a verb root suggests
that it is in fact a suffix, but I have not been able to pursue this notion (§7.2.4).

3.3.6. /e/ Raising

When an /e/ in a suffix is both preceded and followed by a consonant with a Dorsal node, it
raises to [i]. The simplest examples involve the First-Person Object -we followed by the
Visual Evidential -ýiť:

119
(139) mo-aq*-we-yā → mohwfy 'I saw him run out here’ [236]
    nu-ki*-we-yā → duki-wfy 'my finger got scratched' [150]
?ha-wala-we-yā-e → dawaliwey 'I’m starting to want (NfV)’ [235]
mu-pec-ce-c-we-yā-e → mucehecwiye 'I was detained repeatedly (NfV)’ [D]

The other suffixes which undergo /e/ Raising do so only when the rule of Palatalization
effects a change from /i/ to [ç] and supplies the necessary environment. This rule is
triggered by the Plural Agent morpheme (§3.5.2). As a result, the Durative -(ic)ɛn takes
the form -(iy)iç in the plural. The suffix -iyiç shows also the effect of Nonlocal
Sonorization, whereby /e/ becomes [y] (§3.5.1). In the examples below, I first give the
application of all rules (including Palatalization), except for Sonorization and /e/ Raising
which are shown in the final form:

(140) mo-ht-an-icɛn- → mohtaçicɛc- → mohtaçiyiç-
    mohtaçicɛcɛn- → mohtaçacacɛcɛ- → mohtaçacaci'yiyiç-
    'keep running along (pl)' [216]
    'keep running intermittently (pl)' [216]

(141) mo-ht-mac-ɛn- → mohtimaçɛc- → mohtimayiç-
    mohtimaçɛcɛn- → mohtibiyiç- 'run in from here (pl)' [216]
    mohtibiyiçɛn- → mohtaqayiç-
    mohtaqayiçɛn- → diçaqaceç- 'keep running up (pl)' [215]
    niç-qac-ɛn- → diçaqaceç- 'keep running up (pl)' [215]

The Defunctive suffix alternates between singular -ɛ Deer and plural -ɛciç; Sonorization does
not apply to this suffix, suggesting that the rule turns off before level 4 where the
Defunctive is added:

(142) ši-ciñ-ɛceñ- → šićicɛceç- → šiyiçic- ‘they used to do’ [233]
    nohp'ɔ-ciñ-ɛceñ- → nohp'ɔcitɛceç- → nohp'ɔyiçic- ‘they used to live’ [233]
    =ʔɛceñ- → =ʔɛceç- ‘they used to...’ [234]

Notice that in the examples given so far each /e/ which undergoes Raising is not only
followed by a palatal (only /y, ç/ are attested), but preceded by a small set of segments:
either another palatal (in this position /y, ç/ are found) or else the labiovelar /w/. When a
different segment such as /m/ precedes the vowel, or when no appropriate consonant follows, /e/ Raising fails to apply:

(143) a. mo-h-taq-qa-men- → mohtaqameč- ‘drive a car (pl)’ [212]
    mo-aq-qa-men- → mohqameč- ‘drive cars (pl)’ [212]
    mo-h-tala-men- → mohtalameč- ‘keep running down (pl)’ [213]
    ṭkulu- ṭkulu-men- → ṭkuluṭkulu-meč- ‘keep coughing (pl)’ [213]

b. niʔqa-we-iʔ → dihqawėʔ ‘give it here!’ [235]

Unfortunately, there are no other segments to help us in deciding what distinguishes the palatals and labiovelar from the labial /m/, but the most logical choice is the presence of a Dorsal node. Our formulation of /e/ Raising must include this information about the preceding consonant, in addition to the following palatal (also Dorsal).

A further constraint on the operation of the rule is that it applies only to vowels which are part of suffixes, and not those which belong to roots (in bold here), even when the /e/ is preceded by a palatal:

(144) ʔia-ceč- → daceč- ‘take what is handed to one’ [D]
    ma-ceč-ic- → maceč- ‘protect oneself’ [D]
    niʔ-ceč- → dihceč- ‘block by moving downward’ [D]

In all but one context where Raising occurs, an underlying /i/ in the same suffix undergoes Palatalization; obviously [č] is the only consonant that can follow /e/ in these cases. The other context involves the suffix -we, which can be followed only by two other suffixes: Imperative -i and Visual -yd. Since only the latter has a consonant with Dorsal features (§2.4), that is the only place where -we becomes [wi]. So although the Optative -iš, Speculative -še, Interrogative -wa, and Absolutive -w contain Dorsal consonants, they never follow an /e/ which is not part of a root. They are irrelevant to the rule, and we need not prevent them from triggering it; we can keep the rule simple by referring just to the presence of a Dorsal node. Further, since /e/ is ‘raised’ to the default vowel [i], deletion of the vowel’s Dorsal node accomplishes the Raising; the features [+high, -back, -round] are later filled in by redundancy rule:
(145) /e/ Raising

<table>
<thead>
<tr>
<th>RC</th>
<th>RV</th>
<th>RC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♦</td>
<td></td>
</tr>
<tr>
<td>Place</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Dorsal</td>
<td>o</td>
<td>♦</td>
</tr>
</tbody>
</table>

[-back]

CONDITION: does not apply to the verb root.

Notice also that by treating Raising as the deletion of Dorsal, there are no intervening features to block the subsequent application of Nonlocal Sonorization, which in my formulation relies on the underspecification of the vowel separating the two consonants involved in the rule (§3.5.1). It seems necessary to include [-back] in the rule to prevent application to /a/ (cf. (140)), but this is potentially problematic since that is the unspecified value of the feature (§2.2.4). The same difficulty arises if we use [-low] to distinguish the front vowels from /a/, and there seems to be no alternative to permitting early fill-in of the default feature.

Another case where we need to make reference to whether a segment is part of the root or not is in the allomorphy of the Durative suffix (§7.3.3). It cannot be simply a matter of lexical level, since the Durative -(ic)en in (140) and (141) which trigger the rule, and the Reflexive -ic in (144) which does not, are added in the same level, i.e. level 3.

This rule is restricted to derived environments, since it is not triggered in the following forms:\footnote{Words where the /e/ is preceded by a consonant which is not Dorsal also fail to undergo the rule (cehêy 'bumblebee', marêy 'doe'), but this is expected even in derived environments.}
(146) šiwyé  ‘new, young’
   ʁiʁéy  ‘dew’
yohwéy  ‘ready, let’s go’
kʰeya  ‘topknot (feathers)’
weya  ‘supernatural power’ [25]
-eyi  ‘Comitative’ [123]
yé’wa  ‘mare’ (Sp. yeguz)
ʔiyeʔ  (/ʔiye/)  ‘net for deer or rabbits’
hćeye  ‘son-in-law’
biye’ye  ‘sunflower’
duweʔ  (/duwec/)  ‘yesterday’

This is what we expect for a structure-changing rule. There is also no /e/ Raising in the following forms, where the environment is partly met by a following clitic:

(147) bihʃec=yac  →  bihʃeyáʔ  ‘deer person, that deer’ [Os91, 3.5]
wehʃke=yac  →  wehkeyáʔ  ‘that otter’ [3.6]

The simplest explanation is that the rule is not active postlexically, though in this case also nonapplication to the (noun) root could explain the facts.

3.4. Vowel Harmony

Kashaya has two rules of harmony between vowels. The first, Translaryngeal Harmony, operates as a morpheme structure condition and ensures that within a morpheme, the vowels on either side of a glottal consonant (/ʔ, h/) are identical (§3.4.1). The second, Height Harmony, lowers an underlying /u/ in an instrumental prefix to [o] when the vowel in the following syllable is /o/, regardless of the intervening consonant (§3.4.2).

3.4.1. Translaryngeal Harmony

Kashaya exhibits total translaryngeal harmony as a redundant lexical process: in all native morphemes containing the sequence VʔV or VhV, the two vowels on either side of the glottal segment are identical. Most often the consonant is a glottal stop:
(148) a. ściː ‘flesh’
b. ʃeʔeʔı́ ‘basket’
c’eʔeʔe- ‘leach’ [70]
c’eʔeʔet- ‘dip’ [192]
seʔe ‘chaparral’
heʔeʔn ‘how’
weʔeʔey ‘yonder’
nəʔeʔn ‘like this, thus’
heʔeʔey ‘where (not visible)’
heʔeʔel ‘which, which one’
c. ˈmaʔa ‘food; eat’
q’əʔa ‘overnight’
q’əʔaʔáy ‘raven’
wàʔali ‘cane’
haʔaʔánn ‘soaproot’
d. t’oʔoʔ ‘acorn mush’
moʔoʔ ‘close-woven burden basket’
t’oʔoʔ’koʔy ‘cricket’
q’oʔo ‘dance, song; sing’
moʔon- ‘hit’
moʔo’dá ‘fern’
hoʔo’jáya ‘gums (in mouth)’
soʔól ‘oozing from meat’
boʔoʔín ‘purse’
soʔoʔ ‘urine’
soʔo’m- ‘excrete’ [177]
cɔ’o ‘yellowjacket’
boʔo– ‘hunt’
e. huʔuʔ ‘a while ago’
huʔuʔy ‘eye’
ʃuʔuʔ ‘old (of inanimates)’

For more examples with /l/ see §2.1. In addition to these is a smaller number of words with /h/ as the intervening consonant:

(149) a. nihín ‘to oneself’
mihilá ‘west’
b. cehéy ‘bumblebee’
behe ‘bay nut’
beheʔ ‘bay tree’ [30]
yehe- ‘barely move’ [87]

30 Both behéʔ and boʔoʔm are no doubt derived by means of an old -m suffix denoting a tree or plant (cf. McLeod 1973).
c. ʔaha  
   ʔaháy  
   'mouth'
   'wood, stick, pole'

d. ʔoho  
   ʔohóʔi  
   sohóy  
   'fire, light, hot'
   'nettle'
   'seal'

e. cuhulá  
   yuhu  
   'north'
   'pinole'

Several apparent exceptions to Translaryngeal Harmony are actually borrowings from Spanish:

(150)  
   a. yihóʔi  
       kahóʔi  
       ʔispéʔho  
       nawahéra  
       'beans'
       'box'
       'mirror'
       'razor'
       (frijol)
       (cajón)
       (espejo)
       (navajera)

   b. lóʔho  
       naráʔha  
       nawáʔha  
       waráʔha  
       'weak'
       'orange'
       'pocket knife'
       'deck of cards'
       (flojo)
       (naranja)
       (navaja)
       (baraja)

In (b), the seeming existence of harmony is a coincidence from the Spanish form. I assume that nonnative vocabulary is exempt from the morpheme structure condition; most of these words also have irregular stress.

Other exceptions seem to consist of more than one morpheme, suggesting that the harmony rule applies only to single morphemes. The forms are shown here with hyphens for morpheme breaks:

(151)  
   a. maʔ-u  
       haʔ-u  
       bi-ʔámhui  
       'this (Subject), 'now, this time'
       'that (visible, Subject)'
       'tomorrow'

   b. maʔe  
       maʔóni  
       miyáʔ-ʔóni  
       miʔ-ʔóni  
       'his/her/their own father'
       'his/her/their own daughter-in-law'
       'your daughter-in-law'

   c. q'ó-hay  
       ku-hay  
       'eighty'
       'forty'

   d. martíʔ-ho  
       wale-ʔólyo  
       'poison oak'
       'seed beads'

   e. =yiʔe  
       'as if’ [317, 2.54]

125
I discuss each set of forms separately:

a. That *maɁa* and *haɁa* are morphologically complex can be seen from the related forms *maɁal* and *haɁai*, which are used for objects rather than subjects. The Objective suffix is normally -el; the presence of [a] here may be a frozen instance of rightward Translaryngeal Harmony. Other evidence: *maɁbi* and *bi* both meaning ‘here’; *maɁbəi* ‘another time’ compared with *beɁi* ‘next time’.

The word *biɁamhul* consists of *bi*- ‘here’ and *Ɂamhul* ‘the following day’, parallel to *bimäci* ‘today’ (with *mäci* ‘day’).

b. These kinship terms all include one of the possessive prefixes *ma*-, *mi*-, or *miya*- followed by a bound form -Ɂe or -Ɂon’ (see §8.6 for morphological discussion).

Interestingly, in the related form *me*-Ɂe ‘your father’ the prefix *mi*- has undergone harmony; I assume it to be idiosyncratic and lexicalized.

c. These compounds consist of *qɓo* ‘two’ or *ku* ‘one’ and *hay* ‘forty’; see §8.5 for a discussion of Final Shortening in compounds.

d. These words are less clearly parsable, though from their length they seem to be compounds as well. The last part of *maɁtʰo* ‘poison oak’ may be the aphetized *ho* ‘fire, hot’. There is also reason from the placement of stress to suspect that the underlying form contains a glide after the /Ɂ/ rather than a long /Ɂ/, in which case the harmony would be blocked anyway (McLendon 1973 reconstructs a glide in that position as well). I cannot parse *waleḥoɁyo*, but since Kashaya morphemes are typically no longer than two or three syllables, the word probably consists of *wale* and *hoɁyo*, and a morpheme boundary blocks the harmony.

e. This clitic appears to be monomorphic, but the fact that it is a clitic and not a lexical word may exempt it from the harmony rule. A similar case exists for Uvular Assimilation, which applies leftward in verbs but not in verb suffixes (§3.3.2).
While vowels are often identical across supralaryngeal consonants, the absolute prohibition against nonidentical vowels within native morphemes is true only across glottals. To take one example, notice that a number of words contain two tokens of /o/ on either side of a consonant:

(152) non6?  ‘acorns soaked whole’
     iolo’to  ‘dimple’
     ho?io  ‘Cooper’s hawk’
     coh’so  ‘hand’
     ?o’t’onó  ‘edible seaweed’
     p’o’ko  ‘spotted’

Many others, however, have /o/ and some other vowel:

(153) baco’  ‘boat’
     ?imo  ‘hole’
     šiyo  ‘shady forest’
     kowf’s  ‘mildewed’
     hoya  ‘scoring sticks’
     hop’uine  ‘white-footed mouse’

No native morpheme permits such sequences as /aʔo/. To account for these facts, the rule of Translaryngeal Harmony must be formulated to exclude an intervening consonant with place features. This is accomplished by spreading the Place node from one vowel to another in an adjacent syllable, so that a Place node on an intervening supralaryngeal consonant blocks the rule (cf. Steriade 1987a):

(154) Translaryngeal Harmony

\[
\begin{array}{c}
\sigma & \sigma \\
\mid \mid \\
RV & \ldots & RV \\
\ast & \ast \\
Place & \circ & \circ \\
\end{array}
\]

I have formulated the rule so that spreading is from right to left, but either direction would accomplish the same effect, and perhaps the best solution is to call it a mirror-image rule.

Note that Translaryngeal Harmony operates only as a redundancy rule on lexical entries,
and does not apply to morphologically complex forms: it turns off at the beginning of the derivation.

The maximally underspecified alveolar consonants are not transparent to harmony, as these forms illustrate:

\[(155)\]
\[
\begin{array}{ll}
\text{qali} & \text{‘above, in the air’} \\
\text{bi\textsuperscript{z}du} & \text{‘acorn’} \\
\text{hi\textsuperscript{u}} & \text{‘arrow’} \\
\text{c\textsuperscript{i}\textsuperscript{tu}} & \text{‘three-stick coiled basket’} \\
\text{bu\textsuperscript{a}qa\textsuperscript{\textalpha}} & \text{‘bear’} \\
\text{qo\textsuperscript{\textgamma}ti} & \text{‘bent, crooked’} \\
\text{bah\textsuperscript{r}e} & \text{‘big’} \\
\text{ka\textsuperscript{\textbeta}li} & \text{‘between’} \\
\text{p\textsuperscript{\textbeta}\textgamma\textsuperscript{\textgamma}je\textsuperscript{\textalpha}} & \text{‘burr’} \\
\text{bi\textsuperscript{\textgamma}\textgamma da} & \text{‘creek, river, stream’} \\
\text{ca\textsuperscript{\textepsilon}\textsuperscript{i}l} & \text{‘crooked’}
\end{array}
\]

Many more could be added to this list. They show that alveolar consonants must have a Place node, though it is not necessary for the Coronal node to be present at this point (as is the case for Coronal Debuccalization in §3.2.1). Since Translaryngeal Harmony applies to underlying representations, before any default rules could apply, the opacity of alveolars suggests that they have an underlying Place node, as assumed in §2.2.2.

3.4.2. Height Harmony

In a process of rounding-dependent height harmony, the vowel /u/ in an instrumental prefix is realized as [o] when the following syllable contains /o/. Below, the underlying form of each prefix is illustrated in (a) with the root -\textsuperscript{\texth\textalpha}\textsuperscript{\textgamma}z\textsuperscript{\textalpha} - ‘knock over’ and in (b) with various roots containing /o/:

\[(156)\]
\[
\begin{array}{ll}
\text{a. } \text{nu-\textsuperscript{\texth\textalpha}\textsuperscript{\textgamma}z\textsuperscript{\textalpha}-w} & \rightarrow \text{du\textsuperscript{\texth\textalpha}\textsuperscript{\textgamma}z\textsuperscript{\textalpha}-} \text{‘push over with the finger’ [139]} \\
\text{b. } \text{nu-\text\textgammaom-?} & \rightarrow \text{do\text\textgammaom-} \text{‘snap off’ [2.82]}
\end{array}
\]

\[(157)\]
\[
\begin{array}{ll}
\text{a. } \text{cu-\textsuperscript{\texth\textalpha}\textsuperscript{\textgamma}z\textsuperscript{\textalpha}-w} & \rightarrow \text{cu\textsuperscript{\texth\textalpha}\textsuperscript{\textgamma}z\textsuperscript{\textalpha}w} \text{‘knock over with round object’ [137]} \\
\text{b. } \text{cu-\text\textgammaol-?} & \rightarrow \text{coh\text\textgammaol} \text{‘shoot at an unseen object’ [138]} \\
\text{cu-\text\textgamma\textgammaol-\text\textgamma?} & \rightarrow \text{co\text\textgamma\textgammaol} \text{‘turn (box) upside down’ [D]}
\end{array}
\]
This Height Harmony occurs only between rounded vowels; /e/ does not trigger it for /u/, and /i/ does not undergo any such rule (only the peripheral vowels occur in prefixes, never /e/ or /o/ underlyingly):

These facts can be handled by spreading the value [-high] from the root vowel to the prefixal vowel, which are linked to adjacent moras.\(^{31}\)

\(^{31}\) Though it is inconvenient to represent in the rule, only the moras need be adjacent; the Place and Labial nodes of the two vowels are not necessarily adjacent.
(162) **Height Harmony**

This formulation is consistent with the specification of [−high] in underlying representations (§2.2.4).

Height Harmony applies only in derived environments, since some nonderived words contradict it:

(163)  
\[
\begin{align*}
\text{tuhśo} & \quad \text{‘five’} \\
\text{kutól} & \quad \text{‘together’}
\end{align*}
\]

The reason for the restriction to derived environments is not entirely clear in this case, since the lack of [+high] underlyingly in /u/ suggests that the rule is structure-building and not subject to the effect of the Strict Cycle Condition. On the other hand, since no value of [high] occurs underlyingly in prefixes, the spreading of that feature to a prefix vowel might be considered structure-changing.

Height Harmony appears to turn off early in the derivation; in fact, it is seen to apply only in level 1, where the instrumental prefixes are added to the root. When a sequence [uCo] arises later in the phonology, no change in height occurs:

(164)  
\[
\begin{align*}
\text{mā́cu-aqʷ-i} & \quad \rightarrow \quad \text{bacuqo} & \quad \text{‘jump out here!’} \quad [2.112]
\end{align*}
\]

This fact is easily accounted for by turning off the rule after level 1; since syllables are not present at that level (§6.4.3), I use moras in (162).
An intervening consonant with Dorsal features does not block the spreading, as these forms illustrate:

(165) a. ını-qot-? → doqṭ?  ‘tap with the finger’ [2.82]
       ını-q'oq-? → doqṭ'ọ?  ‘pull out by the root with the fingers’ [2.82]

       b. ını-k'ot-? → dolk'ọ?  ‘catch’ [2.82]
       ını-k'ọq-w → dọ[k'ọw  ‘tap lightly with the finger’ [73]

If /q/ is marked [-high], as I assume in §2.2.2, we might expect that feature to block spreading of the following [-high] feature from the vowel. However, since above in §3.3.2 I claimed that all vowels after /q/ have undergone Uvular Assimilation and the two segments share a single Place node, there is in fact no intervening feature on the [high] tier:

(166) /uqo/ → [oqo]

\[ \text{Place} \rightarrow \text{RC} \rightarrow \text{RV} \]

\[ \text{Labial} \rightarrow \text{RC} \rightarrow \text{RV} \]

\[ \text{Dorsal} \rightarrow \text{RC} \rightarrow \text{RV} \]

The [-high] feature of the vowel in the verb root, which happens also to be associated with the consonant via the Place node, simply spreads to the prefix vowel.32 The segment /k/ is unspecified for [+high], so it also does not block spreading on the [high] tier.

Looking at the rule in (162), there is no apparent reason that the common Labial node should be necessary for Height Harmony to occur: the feature they have in common might as well be unrelated to Place. Can we express the need for agreement in rounding in a more principled way? Consider the representations of vowels advocated by Selkirk

---

32 Under standard assumptions about the interpretation of geminates by phonological rules (Schein and Steriade 1986, Hayes 1986a), it might be thought that the partial geminate structure in (166) should block application of Height Harmony, since the rule targets a singly linked feature. As suggested in several other places in this dissertation, I assume the theory of Inkelas and Cho (1991), which does not prevent application of the rule here.
(1991). In this framework, there are no traditional place features such as [high] and [round]; instead, these distinctions are made with MAJOR ARTICULATORS which have the following equivalences:

(167) \begin{align*}
\text{Labial} & = [\text{+round}] \\
\text{Coronal} & = [\text{-back}] \\
\text{Dorsal} & = [\text{-low}] \\
\text{Pharyngeal} & = [\text{-high}]
\end{align*}

The five vowels of Kashaya are represented by the following articulators:

(168) \begin{align*}
/ɪ/ & \quad \text{Coronal, Dorsal} \\
/c/ & \quad \text{Coronal, Dorsal, Pharyngeal} \\
/a/ & \quad \text{Pharyngeal} \\
/o/ & \quad \text{Labial, Dorsal, Pharyngeal} \\
/u/ & \quad \text{Labial, Dorsal}
\end{align*}

It is clear from these specifications that Dorsal is redundant here: it can be predicted from the presence of either Coronal or Labial (just as with [low] in the traditional system). Consequently I ignore it in the discussion below.

The articulator features do not occupy fixed places in a feature geometry; rather, various language-specific dependencies among the articulators are possible. For example, suppose that in Kashaya, Pharyngeal is dependent on Labial:

(169) \begin{align*}
/ʊ/ & V \\
| & \text{Labial} \\
/ɔ/ & V \\
| & \text{Labial} \\
& \text{Pharyngeal}
\end{align*}

This is the same basic dependency that Selkirk claims for several Bantu languages, where the HEIGHT features (Dorsal, Pharyngeal) are dependent on the COLOR features (Labial, Coronal). Assuming these representations, the rule of Height Harmony takes the following form:
(170) *Height Harmony (in Major Articulator theory)*

\[
\begin{array}{c}
\mu \\
| \quad | \\
\text{RC} \\
| \quad | \\
\text{Labial} \\
| \\
\text{Pharyngeal}
\end{array}
\]

That is, a Pharyngeal feature dominated by Labial spreads leftward if the vowel in the preceding syllable is also dominated by Labial. In this formulation, the condition on the rule is expressed directly as a requirement that the feature spread only if the target is identical to the feature’s head. While the same is true of the rule in (162) — the Place node of the target must dominate the same features in that case as well — in (170) the head-dependent relationship is immediate and in this respect perhaps subject to a more constrained theory of conditions on rules. For example, the dependency of height on color in Kashaya makes the prediction that no rule in the language can spread a color feature without also spreading the height features; this appears to be true, since there is no process comparable to /iCo/ → [uCo]. For present purposes, however, I retain the more traditional feature representations.\(^{33}\)

3.5. Other Rules

Several rules affecting features, particularly in the palatal series, do not fall into the categories represented by the sections above, and are described here. Two rules of Sonorization, whereby /c/ becomes [y], are presented in §3.5.1. The rule of Palatalization, which changes /ń/ to [ć] as the indication of the Plural Agent morpheme, is given in §3.5.2. A process of Gemination, which also is most relevant to /c/, is outlined in §3.5.3.

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\(^{33}\) A similar point could be made in the framework of Mester (1986), where the traditional vowel features [round] and [high] can be in a dependent relationship.
3.5.1. Sonorization

We saw in (40) that /c/ undergoes Glottal Transfer when an appropriate suffix follows, and in (63) that when Glottal Transfer is not triggered, Coda Aspiration applies. The relevant forms are repeated here:

\[(171)\]
\[\begin{align*}
\text{a. } \ddot{s}u\text{wac-} & \rightarrow \ddot{s}u\text{wâcba} & \text{‘after drying’ [2.95]} \\
\text{yocjoc-} & \rightarrow yocjocb & \text{‘after keeping’ [99]} \\
\text{b. } \ddot{s}u\text{wac-} & \rightarrow \ddot{s}u\text{wâcme} & \text{‘dry it! (formal)’ [2.94]} \\
\end{align*}\]

There is an additional rule which is ordered between these two others and which targets only /c/. This rule, Sonorization, changes /c/ to [y] before another coronal; later the postlexical rule of Glide Deletion converts it to vowel length (§6.7):

\[(172)\]
\[\begin{align*}
\ddot{s}u\text{wac-} & \rightarrow \ddot{s}u\text{wâyt} & \rightarrow \ddot{s}u\text{wâyt} & \text{‘didn’t dry’ [2.93]} \\
ca^h\text{hoc-} & \rightarrow c\text{hno} & \rightarrow c\text{hnôti} & \text{‘intend to say’ [2.110]} \\
co^h\text{toc-} & \rightarrow c\text{htôti} & \rightarrow c\text{ho}tôti & \text{‘he’s about to leave’ [260]} \\
p^h\text{ile-} & \rightarrow p^h\text{ile-bôti} & \rightarrow p^h\text{ile-bôti} & \text{‘they’re about to leave’ [261]} \\
\ddot{s}u\text{wac-} & \rightarrow \ddot{s}u\text{wâsy} & \rightarrow \ddot{s}u\text{wâsy} & \text{‘I wonder if it dried’ [2.93]} \\
\ddot{s}u\text{wac-} & \rightarrow \ddot{s}u\text{wâcy} & \rightarrow \ddot{s}u\text{wâcy} & \text{‘if it dries’ [99]} \\
\ddot{s}u\text{wac-yâ} & \rightarrow \ddot{s}u\text{wâyy} & \rightarrow \ddot{s}u\text{wây} & \text{‘I saw it dry’ [2.93]} \\
co^h\text{toc-yâ} & \rightarrow c\text{htôyy} & \rightarrow c\text{htôy} & \text{‘I saw him leave’ [259]} \\
co^h\text{toc-yâ-em} & \rightarrow c\text{htôyyam} & \rightarrow c\text{htôyam} & \text{‘I saw him leave (Resp)’ [3.11]} \\
\end{align*}\]

We know that /c/ does not directly become vowel length, since while it must cease to be an obstruent in the lexicon (to bleed Coda Aspiration), it behaves for stress purposes like a consonant (just as underlying glides do: §2.4).

Sonorization seems to create a violation of the Obligatory Contour Principle in the case of /cy/ becoming [yy], where partially identical consonants become completely identical. Eventually, though, the violation is repaired by converting the glide to vowel length. Is this intermediate [yy] stage necessary? It is clear that the final conversion to vowel length by Glide Deletion is postlexical (§6.7). On the other hand, since the underlying /c/ does not become aspirated in this context, Sonorization must precede Coda Aspiration. We
know that the /c/ must become [y] without an intermediate stage [cʰ] because although /yʰ/ is a phoneme in Kashaya, the result of Sonorization is a simple [y]; the rule would have to remove the aspiration without motivation. In addition, glottalized /c/ does not undergo Sonorization (see examples in (175)); nor does /y/ or /yʰ/ undergo Glide Deletion. It would greatly complicate the derivation to say that we actually have /c/ → [cʰ] → [y]; therefore Sonorization should precede Coda Aspiration, which as we have seen is a lexical rule (§3.1.7). The conclusion is that the intermediate stages in (172) are real, and reflect the form of the words on exiting the lexical component.

But, in fact, must the [yy] sequence be an OCP violation? This is true only if the two [y]'s remain linked to separate feature matrixes; if the OCP is permitted to apply to the adjacent [y]'s and convert them into a true geminate structure, however, there is no violation:

(173) \[
\begin{array}{c}
\mu & \mu \\
\text{RC} & \text{RC} \\
\text{[y]} & \text{[y]} \\
\end{array}
\]

In standard approaches to geminate integrity (Schein and Steriade 1986, Hayes 1986a), Glide Deletion should not apply to a geminate, since the rule targets only one half of it; under that assumption, then, we must accept the OCP violation. In the theory developed by Inkelas and Cho (1991), on the other hand, a structure-changing rule such as Glide Deletion is not subject to geminate blocking. This approach permits us to create a geminate structure in accordance with the OCP, as in (173), to which Glide Deletion can still apply.

135
Formally, the rule of Sonorization must result in a change from the stop /c/ to the glide [y]. I claimed in §2.2.2 that these consonants have identical place features in the phonology: Coronal and Dorsal. The essential change, as the name of the rule implies, is from an obstruct to a sonorant. We see below that the same type of change occurs in a slightly different context, so I term the present rule Local Sonorization. This applies when the first of the two coronals is /c/:

\[\text{(174) Local Sonorization} \]
\[
\begin{array}{ccc}
\text{RC} & \rightarrow & \text{[+son]} / \_
\hline
\text{ Lar Place} & \rightarrow & \text{ Place} \\
\text{ Dors Cor} & \rightarrow & \text{ Cor}
\end{array}
\]

Sonorization does not apply to glottalized /č/, as these examples repeated from (70) show:

\[\text{(175) šumilič-t}^\text{-č} \rightarrow \text{šubiliřt}^\text{-č} \text{ 'didn’t blaze up’ [2.92]}\]
\[\text{šumilič-ř} \rightarrow \text{šubiliřdo} \text{ 'they say it blazed up’ [105]}\]
\[\text{šumilič-še} \rightarrow \text{šubiliřse} \text{ 'I wonder if it blazed up’ [2.93]}\]
\[\text{šumilič-čí} \rightarrow \text{šubiliřčí} \text{ 'if it blazes up’ [2.93]}\]
\[\text{šumilič-č} \rightarrow \text{šubilič} \text{ 'I saw it blaze up’ [2.93]}\]

Structure Preservation is of no help, since /ý/ exists, so it appears that the lack of a Laryngeal node must be specified in the rule.

The same basic process of Sonorization is seen when /c/ is followed by /i/ (the underspecified vowel) and another alveopalatal affricate /č/ (aspirated /čʰ/ does not occur in the appropriate context). This Sonorization is ‘nonlocal’:

\[\text{(176) qočić-č-i} \rightarrow \text{qočídiyįči} \text{ ‘better yourself!’ [127]}\]
\[\text{țihyac-č-i} \rightarrow \text{țihyayįči} \text{ ‘strengthen yourself!’ [127]}\]
\[\text{na-su-ic-č-i} \rightarrow \text{dasuyįči} \text{ ‘scratch yourself once!’ [198]}\]
\[\text{šišć-č} \rightarrow \text{šiyįč} \text{ ‘say about oneself’ [198]}\]
\[\text{tumic-č} \rightarrow \text{tubiųyįč} \text{ ‘get oneself up’ [D]}\]

136
An intervening vowel which bears features blocks the rule, and /c/ is unchanged:

(177) ma-ce-ič-i → maceči ‘wait!’ [197]
      na-ce-cč-i → daćeči ‘hold it tightly to yourself!’ [197]

An affricate with laryngeal features, namely /č, c'/, again fails to undergo Nonlocal Sonorization, even if Aspirate Dissimilation changes the latter to [č]:

(178) ha-luč-ič- → halučič- ‘pull over one’s head’ [2.111]
      ha-yec-ič- → dayečič- ‘push oneself up’ [2.111]

(179) cči-ce-w → cčicew ‘hold tightly with handled instrument’ [2.111]
      cči-cča-w → cčicčaw ‘grasp with handled instrument’ [2.111]
      cči-hča-w → cčhča-w ‘knock over with something dragged past’ [138]

These forms suggest that Sonorization precedes Aspirate Dissimilation, and no longer has a chance to apply after the initial stop loses its aspiration. If this is the case, both (178) and (179) fail to undergo Sonorization for the same reason as the Local forms in (175). That explanation is problematic, however, since in another context the operation of a previous phonological rule serves to create a derived environment for Sonorization to apply. Namely, when the rule of Palatalization (§3.5.2) changes /č/ to [č], that segment fulfills the environment for Nonlocal Sonorization:

(180) tšumucič-i → bumuciči → bumuyči ‘eat! (pl)’ [2.81]
      šu-jo-čiń- → šojočiće- → šojošyčiće- ‘keep peeling (pl)’ [212]
      maša-c-čiń- → mašačiće- → mašayyčiće- ‘be eating one bite (pl)’ [164]
      nũwá-c-čiń- → nũwáčiće- → nũwáiyčiće- ‘keep stringing beads (pl)’ [212]

In line with these facts, we might expect Aspirate Dissimilation in (179) to create a derived environment in which Nonlocal Sonorization applies. Since Palatalization is a morphologically triggered rule — it is the sole exponent of the Plural Agent — it may function differently with respect to the creation of derived environments. Another potential solution is that Sonorization cannot apply since there is no syllable structure in level 1, and the rule might be formulated to make crucial reference to that; but syllable structure is not

137
truly necessary in the rule. A third explanation is that Sonorization is not yet active in level 1 when the prefix is added. That entails a Strong Domain Hypothesis violation, however, since the rule must be active later when the Reflexive -ič is added (level 3). See §3.5.3 for further discussion.

Due to its structure-changing nature, Nonlocal Sonorization does not apply to nonderived words:

(181) cicarón → *yicarón
      cicáq → *yicáq
      ?núčic- → *2dú'ycic-

      'pork cracklings' (Span. chicharrón)
      'fishhook' (Alutiiq?)
      'think'

It does not appear that we can generate the nonlocal change from /c/ to [y] simply by the rule in (174), since only a following alveopalatal obstruent, and not just any coronal, triggers it. I propose a separate rule of Nonlocal Sonorization:

(182) Nonlocal Sonorization

\[
\begin{array}{c|c|c|c|c|c}
\text{RC} & \rightarrow & [+\text{son}] & / & _ & \cdots & \text{RC} \\
\text{Lab} & \neq \backslash & \text{Place} & & \text{Place} & & \\
\text{Dors} & \backslash & \text{Cor} & & \text{Dors} & \backslash & \text{Cor}
\end{array}
\]

I see no way (short perhaps of unprincipled notations such as angled brackets) to collapse the environments for Local and Nonlocal Sonorization. We see in chapter 4, however, a means of expressing the EFFECT of Sonorization just once. See §4.3.3 in particular for a discussion of how the simple change to [+son] can generate the needed segmental change.

3.5.2. Palatalization

The Plural Agent morpheme consists solely of changing all tokens of /ń/ in the verb to [č]. However, this change does not occur until level 3 of the lexicon and later. All instances of /ń/ which are syllabified as onsets before that point have already undergone Desonorization (§3.1.3) and become [d], bledding the 'Palatalization'. This means that the change applies
only to verb suffixes and the last consonant of the root (shown below in bold), which cannot be in onset position (and so is ineligible for Desonorization) until a suffix is added.

We see in the first two examples that a root-final /ń/ undergoes Palatalization.34

(183) ńu-hlni-an-an- → duhlucčač-‘keep picking while moving’ [153]
ńu-hlni-an- → duhlucč-‘keep picking’ [153]
p'iła-an-me=ʔ → p'iłačmeʔ‘come here!’ [186]
mo-hg-man-iwaʔ → mohtimačwiwač-‘run here and there at a place (pl)’ [189]
mo-aq-qa-men- → mohtamač-‘drive (a car)’ [212]
mo-hg-aq-qa-men- → mohtamaqameč-‘drive (cars)’ [212]
mo-hg-al-a-men- → mohtalamč-‘run down (pl)’ [213]
ʔkuluʔ-kulu-men- → kuluʔkulu̞meč-‘keep on coughing’ [213]
mo-hg-m-an- → mohtmač-‘keep running across (pl)’ [213]
qašotaq'-an- → qašotaqocoč-‘be getting well (pl)’ [213]
ca-hg-an-an-an-an- → cahtačačačač-‘flit along (pl)’ [210]
ńuʔ-qooni-waʔ → doʔqoʔdiwač-‘fix’ [3.17]

The actual rule must bring about two changes in the consonant. While it remains a coronal noncontinuant (phonologically), the feature [+nas] must be removed and a Dorsal node must be added. The value of [dist] is different for alveolars and palatals, but since [-dist] is unspecified, [+dist] can be provided by redundancy rule. I propose that Palatalization involves simple addition of Dorsal:

(184) Palatalization

\[ \emptyset \rightarrow \text{Dorsal} / / \text{RO} \]
\[ / \text{Lar} \quad [+\text{nas}] \]
\[ / [g] \]

The removal of [+nas] is accomplished by the same persistent rule given in §2.2.3 which rules out palatal nasals in the underlying inventory. The ill-formedness of a labio-dorsal obstruent in Kashaya, again expressed as a persistent rule, prevents Palatalization from affecting /m/, and makes it unnecessary to include Coronal in the rule.

34 Since all of these verbs encode Plural Agent, the notation ‘(pl)’ is not included in the glosses below unless a Plural Act or Movement suffix is also present.
I assume that Palatalization is a phonological rule triggered by the morphological feature (Plural Agent). This diacritic is not inserted into the representation until level 3, however, where most other plural markers are also located (§7.2.2). This explains why Palatalization does not apply earlier in the lexicon without requiring a violation of the Strong Domain Hypothesis: the phonological rule is available, but cannot be triggered until level 3. Similarly, the rule continues to be active and triggered in subsequent levels, so that it applies to suffixes which are added later. Naturally, it is ordered before Desonorization, so that the bleeding effect which occurs in levels 1 and 2 is not duplicated in later levels. Palatalization turns off before level 5, where the Evidential -nō is added, however, since it does not show the effect of the Plural Agent. The latest suffix which undergoes Palatalization is the Defunctive -tōnā, located in level 4. Note that this account relies on the fact that /n/ is the underlying form, and [d] is derived, as argued in §2.3.3.

The alternation in the Directional suffixes meaning ‘far away’ and ‘as far as a certain place, home’ shows vocalic changes as well. These suffixes take the form -(m)aduc in the singular but -(m)aćic with the Plural Agent. Not only does the consonant undergo the expected Palatalization, but the following vowel is different as well. This suggests that the underlying vowel is completely underspecified /i/, and it undergoes [+round] Insertion when the preceding consonant surfaces as [d]. In cases where the Plural Agent has applied, no change to /i/ occurs and the vowel surfaces as the default:

\[(185)\]  
\[\begin{array}{lll}
\text{a. } & \text{mo-anič-i} & \rightarrow \text{modurci} & \text{‘run away! (sg)’ \[187\]} \\
& \text{mo-anič-?} & \rightarrow \text{momá\'du?} & \text{‘arrive running (sg)’ \[189\]} \\
\text{b. } & \text{mo-hťanič-} & \rightarrow \text{mohtačíc-} & \text{‘run away (pl)’ \[187\]} \\
& \text{mo-hť-anič-} & \rightarrow \text{mohtimačíc-} & \text{‘run home (pl)’ \[189\]}
\end{array}\]

Naturally, Palatalization must precede [+round] Insertion; there is no rule which converts the sequence [ću] to [či], which would be necessary if there were an intermediate change of [nii] to [nu].

140
Although /iː/ eventually becomes [du] by Desonorization and [+round] Insertion, it appears that the latter rule must refer to underlying /iː/ rather than [d]. Otherwise we might expect all instances of /i/ after /iː/ to become [u] — even within roots, for example — since the change from /iː/ to [d] would create a derived environment for [+round] Insertion. If insertion occurs only after /iː/, however, it can be restricted to derived contexts. This still leaves the problem of why it occurs internal to a suffix in (185): I assume that there are really two suffixes, i.e. -(m)an'-ic. The independent existence of the Directionals -an' and -man' lends support to this idea, though the meaning of the complex Directional is not strictly predictable from their parts (§7.2.3).

Palatalization creates a derived environment for Sonorization (§3.5.1) and /e/ Raising (§3.3.6). With the Defunctive -ićen' (level 4) only Raising applies:

(186) ši-ciin-ićen'- → ši=yi-ci(ic)- ‘they used to do’ [233]
no=p'o-ciin-ićen'- → nohp'oyi-ci(ic)- ‘they used to live’ [233]

In the Durative allomorphs -ci'n' and -icen', as well as when the Semelfactive -c precedes the Durative -in', both Sonorization and Raising (where appropriate) apply:

(187) šu-ijo-ci'n'- → šo=yo-yi-ci(c)- ‘keep peeling’ [212]
maʔa-ci'n'- → maʔa=yi-ci(c)- ‘be eating one bite’ [164]
muwi-ci'n'- → buwi-yi-ci(c)- ‘keep stringing beads’ [212]
mo-ht-an'i-icen'- → mo̱htači-yi-ci(c)- ‘keep running along (pl)’ [216]
mo-ht-an'i-an'i-icen'- → mo̱htačači-yi-ci(c)- ‘keep running intermittently (pl)’ [216]

This difference suggests that when the Durative is added to the verb in level 3, both Sonorization and Raising are active; but later, in level 4 when the Defunctive is added, Sonorization has turned off.
3.5.3. Gemination

While geminate consonants are not common in Kashaya, they do occur in some forms, both among sonorants (a) and obstruents (b), including a few grammatical morphemes:

(a) (188) a. tuyyu 'serves you right'
mülla 'mule' (Spanish mula)
-innä Aural Evidential [242]
=yya Plural [317]
b. sattén 'frying pan' (Spanish sartén)
sirójo 'robin'
kulucöca 'mustard (plant)' (Russian gorčitsa)
nosčica 'scissors' (Russian nožnitsy)
šinčica 'wheat' (Russian pšenitsa)
šukkén 'type of dance'
molókko 'milk' (Russian moloko)
-ccić Retractive [200]

There are at least two words with a geminate [d'] on the surface (§3.1.3):

(b) (189) hikaddedu 'main, chief'
żešėddu 'feather skirt'

This underlying /h/ is the only case I have seen where a geminate has distinctive laryngeal features. There are no geminate aspirates or ejectives.

Derived geminates also exist. The Semelfactive and Terrestrial suffixes are both -c and are both added at level 2, where as discussed in §3.2.1 Coronal Debuccalization is not yet active. When a /c/-final stem takes one of these suffixes, the two tokens of /c/ join to form a geminate [ć], written ‘cc’ here. Unlike the coronals illustrated in §3.2.1, we do not find Local Sonorization to produce [yc], nor Coda Aspiration and Coronal Debuccalization to produce [hc]:

(c) (190) Ṽu-qac-c-i → duqácci 'give it a turn!' [2.101]
Ṽuqa'c-c-w → duqacciw 'get lost one by one' [2.111]
cōhuc-c-w → cohócciw 'leave for good' [2.98]
muna'c-c-w → munacciw 'not say (words)' [2.98]
The question of the precise nature of the gemination in (190) remains, along with its relation to Coda Aspiration. At first it seems simplest to posit a rule of Gemination\textsuperscript{35} which precedes, and bleeds, Coda Aspiration; otherwise it is necessary to apply some type of gemination to the nonidentical sequence [c\comb{c}]. In fact, if a special rule converting two /c\comb{c}'s into a geminate applies before Sonorization and Coda Aspiration (and therefore Coronal Debuccalization as well), we have an explanation for why those rules fail to apply in (190). On the other hand, that still leaves unexplained the failure of Debuccalization in (87), and requires a Gemination rule which arbitrarily targets only /c/. It is preferable to derive the effect of gemination from the OCP applying at the end of the level to repair this violation (McCarthy 1986), the same process we see in (173). The failure of gemination to affect other coronals follows then from the fact that all other sequences of identical coronal obstruents occur in level 3 and later, so that Coronal Debuccalization applies:

\[
\begin{align*}
(191) \quad \text{i} &\text{ali-t-c}^* \quad \rightarrow \quad \text{daliht}^* \quad \text{‘isn’t waving his hands’ [103]} \\
\text{lir} &\text{nut-ti} \quad \rightarrow \quad \text{libuhti} \quad \text{‘in order to whistle’ [103]}
\end{align*}
\]

When it is able to apply, Coronal Debuccalization precedes and bleeds gemination. When these later suffixes -t\textsuperscript{c} and -n\textsuperscript{t} are added (levels 4 and 5), the rule is active.

I propose that the OCP creates a geminate structure if no other process, such as Coronal Debuccalization, eliminates the OCP violation, probably at the end of the lexical level. This entails that other rules should take priority over the effect of gemination, and in fact it is necessary that Debuccalization bleed it as shown in (191). Since Coda Aspiration precedes Debuccalization, it also precedes gemination (this is true even if gemination were a regular ordered rule). That means, then, that there should be an intermediate stage where the first of the two /c\comb{c}'s is aspirated, but after gemination the aspiration is lost:

\[
(192) \quad \text{c} \quad \rightarrow \quad \text{c}^\text{c} \quad \rightarrow \quad \text{c}^*
\]

\footnote{35 I use this term here to refer to the fusion of two singletons in a geminate structure, rather than the lengthening of a single segment.}
This loss of [asp] is not surprising, given that there are no geminates in Kashaya with that feature. Suppose that the Gemination is actually at the Place node, since in the case of [c'c] that is where the OCP violation exists:

\[
(193) \quad \begin{array}{c}
\text{RC} \quad \text{RC} \\
\text{Place}_i \quad \text{Place}_i
\end{array} \quad \rightarrow \quad \begin{array}{c}
\text{RC} \quad \text{RC} \\
\text{Place}_i
\end{array}
\]

If the first of the consonants is [asp], the output is the following:

\[
(194) \quad \begin{array}{c}
\text{RC} \quad \text{RC} \\
\text{Lar} \quad \text{Place} \quad [\text{asp}]
\end{array}
\]

Assuming that (194) must be repaired to remove [asp], the restriction on aspirated geminates could be expressed as a persistent rule:

\[
(195) \quad \begin{array}{c}
\text{RC} \quad \text{RC} \\
\text{Lar} \quad \text{Place} \\
\text{[asp]}
\end{array}
\]

This rule is problematic, however, since it does not target normal geminates: I assume that length is marked by linking one Root node to two moras, rather than the double linking of a Place node advocated by Selkirk (1990). The rule would also require a new analysis of the verb root \(-m'\text{mi}\) - 'do perfectly', discussed in §6.4.3, which has the structure in (194) but retains its laryngeal feature. I suggest that we do not need a repair rule of the type in (195) at all. Rather, since the Laryngeal node in (194) is linked only to the first of the two Root nodes, it is never realized. The feature [asp] must be realized on the release of the consonant, and the single Place node indicates that there is no release until after the second Root node, which bears no [asp]. In other words, /c'c/ with doubly linked Place is pronounced simply [c']. The [asp] in \(-m'\text{mi}\) - does get realized because in a complex
sonorant the laryngeal feature is not tied to release: it represents voicelessness late in the first half of the sonorant, without a change in the supralaryngeal articulation. That is, /m̥m/ is pronounced [mmm] regardless of whether the Place node is doubly linked (which I assume that it is).

We must also explain why Local Sonorization does not take effect in (190), since this rule would normally be expected to bleed Coronal Debuccalization anyway (§3.5.1). Again, it is possible to say that Sonorization does not turn on until level 3. Not only is Sonorization unnecessary in level 1, it fails to apply there when it might be expected to, as discussed for the examples in (179). Here again, ignoring the Strong Domain Hypothesis leads to a straightforward solution: Sonorization is not active until level 3, and naturally cannot apply in either level 1 or 2. Recall also from §3.1.6 that the Semelfactive irregularly fails to trigger Cluster Deaspiration; rather than attributing this irregularity to the morpheme, if we abandon the Strong Domain Hypothesis we can say that Cluster Deaspiration is not active until level 3. Notice that all violations of the Strong Domain Hypothesis that I have proposed in this chapter — Coronal Debuccalization, Uvular Debuccalization, Sonorization, and Cluster Deaspiration — turn on in level 3. This shared property suggests that it may be possible to limit such violations by permitting only one place in the lexicon where rules can turn on.36

3.6. Summary

The following list gives all the rules discussed in this chapter, along with the orderings which are necessary among them and restrictions for those which do not apply throughout the lexicon.

---

36 I assume that Syllabification turns on in level 2, but as a rule creating basic prosodic structure it may be subject to different principles, as in languages where stress feet are built only at the word or phrase level.
/e/ Raising (145)
    precedes Nonlocal Sonorization (or triggers new cycle)
[+back] Insertion (125)
[+round] Insertion (128)
    precedes Desonorization
[-round] Spreading (122)
    precedes Uvular Assimilation and /a/ Deletion
Aspirate Dissimilation (48): level 1 only
Cluster Deaspiration (60)
Coda Aspiration (64)
    precedes Debuccalization
Coronal Debuccalization (85): levels 3 to 5
    precedes Glottal Merger
Desonorization (36)
    applies in conjunction with Onset Simplification
    precedes Cluster Deaspiration
Fricative Aspiration (9)
Glottal Merger (15)
Glottal Transfer (41)
    precedes Debuccalization and Coda Aspiration
Height Harmony (162): level 1 only
Local Sonorization (174): levels 3 to 5
Nonlocal Sonorization (182): levels 3 to 5
Onset Simplification (35)
Palatalization (184)
    precedes Desonorization and [+round] Insertion
Pre-Assertive Raising (138)
Translaryngeal Harmony (154): underlying representations only
Uvular Assimilation (110): underlying representations and levels 1 to 5
Uvular Debuccalization (89): levels 3 to 5
    precedes /a/ Deletion
Uvular Raising (132)
    precedes Uvular Assimilation
Verb-Final Debuccalization (100): postlexical
    precedes /a/ Deletion
Word-Final Debuccalization (97): postlexical

Reformalization of certain of these rules is considered in §4.3, and a list of all rules proposed in the dissertation is given in §7.3. It has not been possible for me to explore the nature of rules which seem to apply only in derived environments, and whether this fact can be derived from the nature of the rule and representation.
Chapter 4

Constraint-Triggered Rules

In the wide range of phonological rules discussed in chapter 3, there is a great deal of overlap. This overlap takes two forms: first, numerous rules appear to conspire to correct the same ill-formed configuration; and second, the same processes often recur in different rules. When each of these rules is formulated independently of the others, a great deal of redundancy results, and significant generalizations are missed. One solution to this problem is to incorporate into the analysis an explicit set of constraints, and independently formulated rules which act to repair those constraints. In this chapter we explore the advantages of this approach, as well as some of the issues it brings up. §4.1 repeats the rules from chapter 3 which benefit from reanalysis. §4.2 discusses previous work on constraints and outlines the basic assumptions of this chapter. §4.3 gives the reanalysis of the Kashaya facts. §4.4. points out problems and questions the overall usefulness of constraints for Kashaya.

4.1. Review of Rules

Some rules do not appear to have any strong formal relationship to other rules in the phonology; these are not be discussed here except in general terms. Some, however, show similarities with one or more other rules, and I repeat here all the rules from chapter 3 which fall into this category. They are arranged so as to highlight the similarities.
(1) **Coronal Debuccalization** (§3.2.1)

```
RC       RC
/\       /\  \\
[-cont]  Place  Place
  \        \        
   Cor     Cor
```

(2) **Uvular Debuccalization** (§3.2.2)

```
RC   \sigma
  \  \  \\
Place
  \  \  
Dorsal
  \  
[-high]
```

(3) **Word-Final Debuccalization** (§3.2.3)

```
RO   \_w
/  \\
Lar  Pl  [-cont]
```

(4) **Verb-Final Debuccalization** (§3.2.3)

```
RO   \_verb
   \  \  \\
Place\  [-cont]
```

(5) **Aspirate Dissimilation** (§3.1.5)

```
[  RC ... RC
  \  \  \  \  \\
Lar  Lar
  \  
[asp]  [asp]
```

(6) **Onset Simplification** (§3.1.2)

```
[\sigma RS
  \  \  \\
Lar
```

(7) **Desonorization** (§3.1.3)

```
[\sigma RC
  [+son] \rightarrow [-son]
  /  \\
  Lar  [+nas]
  \  
  [gl]
```

148
(8) **Cluster Deaspiration** (§3.1.6)

\[
\begin{array}{c}
\text{RS} \\
\text{RO} \\
\text{\_} \\
\text{\_} \\
\text{[asp]}
\end{array}
\]

(9) **Coda Aspiration** (§3.1.7)

\[
\begin{array}{c}
\text{RO} \\
\text{\_} \\
\emptyset \to [\text{asp}] / \\
\text{\_}
\end{array}
\]

(10) **Glottal Transfer** (§3.1.4)

\[
\begin{array}{c}
\text{RO} \\
\text{RS} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_}
\end{array}
\]

(11) **Local Sonorization** (§3.5.1)

\[
\begin{array}{c}
\text{RC} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_}
\end{array}
\]

(12) **Nonlocal Sonorization** (§3.5.1)

\[
\begin{array}{c}
\text{RC} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_} \\
\text{\_}
\end{array}
\]

We will return to these rules after discussing some background.
4.2. Background

In what kind of framework can we capture these similarities? We need some way of separating the effects of rules from their triggers. The natural way to do this is in a system where triggering environments are formalized as constraints, and the rules which repair constraint violations are given independently. In §4.2.1 I briefly discuss some previous approaches to constraints, and in §4.2.2 present my own assumptions in dealing with the Kashaya data.

4.2.1. Previous Approaches

The notion of a rule conspiracy — where several rules ‘conspire’ to achieve a similar effect — was first discussed in a generative context by Kisseberth (1970), and the idea that different rules can serve the same function figures in a number of works in the following years (e.g. Shibatani 1973, Sommerstein 1974, 1977, Kenstowicz and Kisseberth 1977).

Kiparsky (1981, 1985) uses a filter on the cooccurrence of features in Finnish vowels to express the underlying inventory of vowels (a morpheme structure condition), and also to block vowel harmony which would create such vowels in the course of the derivation. Archangeli and Pulleyblank (1986) also make use of constraints to block application of rules which would violate them. Calabrese (1987) proposes that while a feature-filling rule such as vowel harmony is blocked by a filter, a feature-changing rule can create a violation of a filter, which then triggers a rule to repair the violation. Singh (1985, 1987) argues for the complete elimination of phonological rules: true phonological processes are expressed as well-formedness conditions which can block rules or trigger repair strategies, while other processes are relegated to morphology or stylistics.

McCarthy (1986) focuses on a single universal constraint, the Obligatory Contour Principle, and shows how it functions in many languages as a condition on the output of
phonological rules: it blocks the application of rules which would violate it. Yip (1988) argues that the OCP can be used also as a rule trigger, thereby simplifying the expression of numerous phonological rules and capturing their common motivation in a formal manner. To take one case: in Seri, a rule deletes the second of two glottal stops in the same syllable:

(13) ʔiʔ-aʔaʔ-kašni → ʔiʔaʔ kaš ni ‘my being bitten’

Yip interprets this as an effect of the OCP applying on the Laryngeal tier. Since the OCP exists independently of the language-specific rule, there ought to be a way in which it can act as the trigger of the rule without being explicitly stated within the rule. The rule itself should only state its effect, which is to delete the second of two Laryngeal nodes. Yip gives the rule in a parametric model as follows:

(14) Glottal Degemination

Domain: Syllable
Tier: Laryngeal
Trigger:
Change: Delete second

Notice that the space for the trigger of the rule is left blank, so Glottal Degemination cannot apply unless some independent constraint exists to fill the ‘Trigger’ slot. In this case, it is the OCP. (Yip does not discuss what other filters might trigger the rule.)

Paradis (1988) proposes a theory in which not only universal principles such as the OCP but also language-specific constraints (described as ‘parameters’) serve this triggering function. For instance, in Guere vocalic sequences are permitted only if one of the two adjacent vowels is [+high]. In effect:

(15) * V V
    |    |
[-high] [-high]

151
This is a language-specific constraint since there are languages, such as French and Japanese, which permit the configuration in (15). In Guere, however, when by a morphological process two mid vowels become adjacent, the first of the two vowels is raised:

(16) \[ \text{plee-ε} \rightarrow \text{plee} \rightarrow \text{pie} \quad \text{‘make run’} \]
\[ \text{zroe-ε} \rightarrow \text{zroe} \rightarrow \text{zue} \quad \text{‘make beg’} \]

The violation of (15) is repaired here by changing the first [-high] to [+high]. A separate rule which simply changes a [-high] vowel to [+high] can then be stated in a maximally simple way, without any reference to the environment in which the rule applies: that information is provided by the constraint in (15). Since it is the leftmost of the two vowels which undergoes the change, the rule must operate from left to right.

4.2.2. Assumptions

My own assumptions in analyzing the Kashaya data give a modest role to constraints. I assume a distinction between CONSTRAINT-TRIGGERED rules, which apply only to repair a constraint violation,¹ and UNTRIGGERED rules, which have no need of a trigger and apply to any form which feature cooccurrence restrictions permit.

Rules with no triggering environment have some precedent in phonology, but with a different function: context-free default rules. For example, in an analysis where [+nas] is given underlyingly and [-nas] is inserted on all other segments at the end of the lexicon, the rule inserting [-nas] does not require any environment: it simply applies to all segments which are not already specified for the feature. On the other hand, I argue below for a rule of Aspiration which simply inserts [asp]; it is triggered by a separate constraint, so no trigger is included in the rule itself. How are such constraint-triggered rules to be distinguished from context-free default rules?

¹ These rules are similar to Sommerstein’s (1974) ‘phonotactically motivated rules’.

152
In a parametric model of rules (as in (14)), a constraint-triggered rule has in effect a blank line where the trigger should be, and for the rule to apply the trigger must be filled from the inventory of language-specific and universal constraints. An untriggered rule, on the other hand, simply has no line for a trigger and requires none: no blank needs to be filled to complete the structural description of the rule. For example, in minimal form:

(17)  \textit{Default [nas]}
\begin{itemize}
  \item Change:  Insert [-nas]
\end{itemize}

(18)  \textit{Aspiration}
\begin{itemize}
  \item Trigger:
  \item Change:  Insert [asp]
\end{itemize}

Untriggered rules, then, are even less marked than constraint-triggered rules; this is not surprising since the theory of underspecification predicts that every language has such rules to insert default features, and the theory of markedness ought to capture this fact. Universal default rules, of course, are maximally unmarked, since they require no language-specific information.

In this framework, constraint-triggered rules are ordered relative to each other and to normal rules. This fact has consequences for cases where more than one rule could serve to correct a particular constraint violation: the rule which is ordered first (‘A’) is the one which will apply. The later rule (‘B’) cannot correct that constraint except potentially at some later point in the derivation when rule A has turned off. Rule B can, however, correct a violation of some other constraint if rule A is unable to do so. In a cycle of rules, one or more constraints may be violated by a form. In proceeding through the list of ordered rules, if a constraint-triggered rule is found which could correct one of the constraint violations, that rule applies. If another violated constraint is also satisfied by the change, that constraint does not trigger anything; if it is not satisfied, it continues to be available as a trigger for later rules in the cycle.
We have the following hierarchy of rule types according to their relative markedness within the theory:

(19) least marked
    
    ↓

most marked

universal untriggered rule
language-specific untriggered rule
constraint-triggered rule
‘normal’ rule with specified trigger

The relative markedness of rules within each category is a separate matter which I do not consider here. Constraints, too, vary in markedness; the most obvious distinction is that universal constraints such as the OCP are less marked than language-specific ones. The overall markedness of a given grammar decreases to the extent that constraints are shared by various rules, since this reduces the number of rules whose triggers must be individually specified. We should expect constraint-triggered rules to be favored, e.g. that a language will tend to exploit the (normal) rules it has for repairing as many constraints as possible. A rule trigger which does not quite fit an existing constraint should tend to become more similar (eventually identical) to that constraint.

Many of Paradis’ (1988) parameters are so specific as to make the use of the term questionable in the absence of an articulated theory of what sorts of parameters are possible cross-linguistically. That is, there is no evidence for anything other than language-specific constraints which could in principle mark as ill-formed any structure that is expressible using the elements of the phonology. Consequently, in this study I make no claims about parameters or the markedness of individual constraints, but simply represent them as ill-formed structures. In the analysis that I give for Kashaya, the constraints serve as generalizations over rule triggers, so that a rule whose trigger is not instantiated in any other rule has its trigger specified in the rule itself and not as a separate constraint. Such a rule is for that reason more highly marked than a rule which shares a trigger with one or more other rules, where the shared trigger is expressed as a constraint, and the individual rules are correspondingly simpler. On the other hand, if the same process occurs more
than once in different rules, it should be expressed as a constraint-triggered rule, even though it is possible that the constraints which trigger the rule may not trigger any others; it is still appropriate to separate the rule and trigger, since in this case the rule serves as a generalization over more than one constraint violation. The important point is that the decomposition of processes into constraints and rules should be pursued only when there is some reason for the independent existence of either the constraint or the rule it triggers. Without this motivation from economy, there is no justification for the decomposition. A prediction of this approach is that separately triggered applications of the same rule will share characteristics such as lexical exceptionality, special restrictions, and domain.

Myers' (1991a) claims about persistent rules (§2.2) apply only to language-specific restrictions on the INTERNAL STRUCTURE of phonological constituents: segments, syllables, and feet. Restrictions on the DISTRIBUTION of phonological elements across constituents are of two types. The first is universal filters such as the OCP, which do in fact block the creation of ill-formed sequences of elements. The second is language-specific rules which are ordered relative to each other but which actively correct ill-formed sequences. The typology of rules and triggers which I propose is concerned primarily with this latter category of ordered phonological rules: I suggest a means of capturing generalizations across these rules within a particular language. The constraint-triggered rules are simply ordered rules triggered by language-specific constraints or universal filters; they do not serve the function of persistent rules. If filters and constraints are equivalent in their ability to trigger rules, it seems that that language-specific constraints should also block phonological rules. Universal filters are relevant insofar as they serve as triggers for the ordered rules. In addition, I assume language-specific constraints, but not of the type that Myers argues against; rather, these constraints are on a par with universal filters in triggering ordered rules, and do not serve the function of persistent rules — in fact, all of the language-specific constraints that I propose for Kashaya are distributional in nature and therefore could not be expressed as persistent rules in Myers' framework.
4.3. Application to the Kashaya Data

As noted in §4.1, a number of processes conspire to correct the same ill-formed configuration, and the same effects recur in different processes. In this section I reformulate these rules as constraints and constraint-triggered rules. Since I use a nonparametric formalism (i.e. there is no “Trigger” line to leave blank), I simply note where appropriate that a trigger is unspecified.

4.3.1. Place Delinking

The delinking of a Place node recurs in four rules: Coronal Debuccalization, Uvular Debuccalization, Word-Final Debuccalization, and Verb-Final Debuccalization. In no case does a fricative undero the rule, a fact which must be explicitly stated in three of these rules. If we separate the triggers of the rules from their effect — Place Delinking — the restriction to [−cont] is stated just once:

(20) Place Delinking [unspeified trigger; left to right]

\[
\begin{array}{c}
\text{RC} \\
\# \\
\text{Place \ [−cont]} \\
\end{array}
\]

This single rule is then triggered by four different constraints. The first refers to a sequence of coronal consonants:

(21) Coronal Constraint

\[
\begin{array}{c}
* \text{RC} \quad \text{RC} \\
| \\
\text{Place} \quad \text{Place} \\
| \\
\text{Cor} \quad \text{Cor} \\
\end{array}
\]

This constraint could be related to the OCP applying on the Coronal tier; for discussion see §4.4.

156
The means of fixing the constraint is not included in the constraint. Only if some appropriate constraint-triggered rule exists, such as (20), will action be taken. Place Delinking is not triggered by, for example, an intervocalic coronal since that does not violate any constraint. Not all coronal-coronal sequences trigger a correction. Since Place Delinking is restricted to noncontinuants, it does not apply to fricatives and the sequence /st/ is unaffected. Similarly, due to the principle of Segmental Licensing discussed in §3.2, a plain sonorant is also immune to Place Delinking, and /nt/ is allowed. From this perspective, the constraints act as ‘better-formedness conditions’. Whenever possible, the constraint is repaired, but if there is no means of doing so the violation remains, though the word containing the violation could be considered less favored by the grammar. This flexibility is in line with the notions of ‘harmony’ and ‘optimality’ pursued, for example, by Smolensky (1986), Prince (1990), and Goldsmith (1990).

The application of Place Delinking when a uvular occurs in coda position requires an additional constraint:

\[
(22) \quad \textit{Uvular Constraint} \\
\begin{array}{l}
* \quad \text{RC } \sigma \\
\quad \mid \\
\quad \text{Place} \\
\quad \mid \\
\quad \text{Dorsal} \\
\quad \mid \\
\quad [-\text{high}] \\
\end{array}
\]

Since there is no rule which simply deletes [high] or Dorsal, only Place Delinking can repair this violation. This constraint is motivated by general tendencies toward neutralization in coda position (Cho 1990) and the more specific tendency for uvulars to be reduced in this position (Elorrieta 1991). It may also be possible to construe the change from /q/ to [k] before the Assertive (§3.3.5) as an effect of the Uvular Constraint which is restricted to word-final position, e.g. a rule of Final Raising.
We must now account for the difference in application of Place Delinking to word-final stops in verbs and other parts of speech. The more general constraint requires all stops in coda position to have a Laryngeal node. This is relevant to all word classes, and triggers Place Delinking of plain stops in both nouns and verbs:

(23)  * RO \  l\r
       \  /  \r
      Lar  Place

For verbs in particular a broader constraint is necessary:

(24)  * RC \  l\verb
       \           \r
      Place

This simply outlaws all final supralaryngeal stops in verbs, so that while a verb-final ejective passes muster with the filter in (23), it violates (24) and triggers Debuccalization.

By itself the separation of trigger and rule is not a simplification, and in fact might be considered a complication. In the overall phonology of the language, however, the separate rule of Place Delinking is part of a simpler system, since it is triggered by four constraints. The ability to state the effect of the rule just once, rather than four times, justifies the separation of the rule and triggers.

4.3.2. Laryngeal Delinking

Another process which recurs several times is the delinking of the Laryngeal node:

(25)  * RO \  l\verb
       \  \r
      Lar

158
There are three rules which show the effect of Laryngeal Delinking. One is Aspirate Dissimilation, is surely related to the OCP, since adjacent features on the [asp] tier are what trigger the delinking. A somewhat particularized version is required for Kashaya, however, due to the fact that it triggers the rule only at the left word edge:

(26) \textit{OCP on the [asp] tier}

\[
\begin{array}{c}
* \\
| RC RV RC \\
Lar Lar \\
| [asp] [asp]
\end{array}
\]

Laryngeal Delinking must apply from left to right so that it will delete the first token of [asp] rather than the second. This constraint appears to turn off after level 1, since no Aspirate Dissimilation is seen in later levels, even though the rule of Laryngeal Delinking is still active.

Onset Simplification is due to the general constraint in Kashaya against complex sonorants (i.e. those with distinctive laryngeal features) in that position:

(27) \textit{Complex Sonorant Constraint}

\[
\begin{array}{c}
* \\
| \sigma RS \\
Lar
\end{array}
\]

We know from simple distributional facts that this constraint is surface-true, and it is necessary to express that generalization (§2.3). Laryngeal Delinking serves as a straightforward correction of the constraint violation.

When a particular kind of complex sonorant — namely, a glottalized nasal — violates the Complex Sonorant Constraint, it is corrected in a specific way: it ceases to be a sonorant:
(28) Desonorization [unspecified trigger]

```
  RC  [+son] → [-son]
      / \
     Lar  [+nas]
      \   [gl]
```

This rule retains much of the complication necessary for its expression in §3.1.3. It also must still apply in conjunction with Laryngeal Delinking (Onset Simplification), but if both are triggered by the same constraint this fact may be easier to capture. If we propose an additional constraint such as *n] we can account for the data given in §2.3.3 without needing an additional rule: Desonorization applies to create the output [nd].

The third constraint which triggers Laryngeal Delinking prohibits an aspirated sonorant before an obstruent:

(29) Aspirated Sonorant Constraint

```
  *  RS   RO
       \   
      Lar  [asp]
```

This has the effect of Cluster Deaspiration.

4.3.3. Sonorization

In Local and Nonlocal Sonorization, the effect of /c/ → [y] is the same; it is simply the triggering environment which differs. The restriction to palatals without laryngeal features is included in this rule, so that it needs to be stated just once (similar to the one-time statement in Place Delinking that continuants are immune):

(30) Sonorization [unspecified trigger, left to right]

```
  RC  [-son] → [+son]
         +
        Lar
```
Two separate constraints are necessary to trigger the rule:

\[(31) \quad \textit{Local Palatal Constraint} \]

\[
\begin{array}{c}
\ast \quad \text{RO} \quad \text{RO} \\
\text{Place} \quad \text{Place} \\
\text{Dors} \quad \text{Cor} \quad \text{Cor}
\end{array}
\]

\[(32) \quad \textit{Nonlocal Palatal Constraint} \]

\[
\begin{array}{c}
\ast \quad \text{RO} \quad \ldots \quad \text{RO} \\
\text{Place} \quad \text{Place} \\
\text{Dors} \quad \text{Cor} \quad \text{Dors} \quad \text{Cor}
\end{array}
\]

These are the only constraints which trigger the rule of Sonorization, so the only possible input is a palatal. Application to /$\delta$/ is blocked by the presence of [asp] on all plain fricatives (§3.1.1). This leaves /c/ as the only palatal obstruent which can undergo the rule, and it differs from /y/ only in its value for [son].

4.3.4. Addition of Laryngeal Features

The Coda Constraint in (23) also triggers a rule of Aspiration:

\[(33) \quad \textit{Aspiration [unspecified trigger]} \]

\[
\emptyset \rightarrow \text{[asp]}
\]

The trigger must be supplied by some constraint; Aspiration will not apply to stops in onset position, since there is no constraint against plain onsets. There is no other constraint which triggers Aspiration, but that is not a requirement for separating the rule and trigger: it is sufficient that the Coda Constraint serves as a generalization over triggers for the rules of Aspiration and Place Delinking. Aspiration precedes Place Delinking, but is blocked for final stops by extraprosodicity; postlexically, when the final stop is visible, Aspiration has turned off and Place Delinking applies.
The rule of Glottal Transfer can also be considered an effect of the Coda Constraint, since as I suggest in §3.1.4 it applies only to obstruents in coda position. I assume that the rule it triggers is not even a language-specific rule, but rather a general process of Stray Linking, which links a stray element to a node which requires it. When a constraint triggers the rule, the element is linked rather than being stray erased.

4.4. Conclusion

I have suggested that a number of the rules in chapter 3 can be decomposed into constraints and rules which are triggered by them. These are summarized here:

(34) CONSTRAINT + EFFECT RULE FROM CHAPTER 3

Coda Constraint + Aspiration = Coda Aspiration
+ Place Delinking = Word-Final Debuccalization
+ Stray Linking = Glottal Transfer
Coronal Constraint (OCP?) + Place Delinking = Coronal Debuccalization
Uvular Constraint + Place Delinking = Uvular Debuccalization
+ Final Raising = Pre-Assertive Raising
Verb-Final Obstruent Constraint + Place Delinking = Verb-Final Debuccalization
OCP on [asp] tier
+ Laryngeal Delinking = Aspirate Dissimilation
Complex Sonorant Constraint + Laryngeal Delinking = Onset Simplification
+ Desonorization = Desonorization (normal rule)
Aspirated Sonorant Constraint + Laryngeal Delinking = Cluster Deaspiration
Local Palatal Constraint + Sonorization = Local Sonorization
Nonlocal Palatal Constraint + Sonorization = Nonlocal Sonorization

Myers (1991a) and others assume that universal filters such as the OCP act to block the creation of an ill-formed representation by a phonological rule (morphological and syntactic
rules are not subject to this effect). I have assumed that both universal filters and language-specific constraints can function as rule triggers. If these filters and constraints are equivalent in this ability to trigger rules, must we assume that they are equivalent in their blocking effects as well? If so, then neither can block, or both block. The first possibility is unlikely, since a considerable literature exists which argues for exactly this effect of the OCP (see especially McCarthy 1986). To maximize their similarity to universal filters, then, we must assume that language-specific constraints also block phonological rules. It appears that this is at least largely acceptable for Kashaya, since the violations of the constraints which result in the application of a constraint-triggered rule are generally brought about by morphological operations.

I use the word ‘generally’ because there are several cases where it seems that phonological rules create constraint violations which are then corrected by a rule triggered by the same constraint. In other words, the language-specific constraint appears not to block the phonological rule, as universal filters appear to do. All of these cases might, however, be given explanations consistent with the blocking character of constraints. For example, resyllabification (§3.1.1, §6.3.5) appears to violate the Complex Sonorant Constraint, since it can result in a glottalized sonorant in onset position (which is then corrected by Laryngeal Delinking). The rule of Palatalization creates violations of the Palatal Constraint, yet is not blocked (§3.5.1). This case, however, may not be problematic, due to the nature of Palatalization: this rule is phonological insofar as it must be ordered relative to other phonological rules, but it is clearly morphologically triggered, since it applies only when the ‘Plural Agent’ feature is present in the verb (§3.5.2). It could be that morphologically triggered rules — i.e. those that make crucial reference to some morphological feature — are, like true morphological rules, not subject to blocking by a constraint.

Myers claims that all cooccurrence restrictions which refer to ‘internal structure’ are formalized as persistent rules, which other ‘distributional’ rules are normal ordered
phonological rules. This predicts that the language-specific constraints I propose should not refer solely to internal structure, since that is the purview of persistent rules rather than the ordered rules of which these constraints are one aspect. Although Myers does not define ‘internal structure’ with any rigor, his prediction appears to be true for Kashaya. Two cases are not obvious. The Coda Constraint can be considered distributional, since it is a featural/segmental rule which makes reference to syllable structure (which is outside the segment). The same is true of the Complex Sonorant Constraint and the Uvular Constraint: they have a segmental focus but make crucial reference to onset or coda position.

An important issue which arises is how we determine the pairing of constraints with the rules that are triggered by them. One mechanism available to us is rule ordering. For example, Place Delinking could correct either of the Palatal Constraints, but if Sonorization is ordered before Place Delinking, the violation will already be corrected and no ‘Palatal Debuccalization’ will occur. This ordering is confirmed by other evidence: Sonorization must bleed Aspiration, which must feed Place Delinking (§3.5.1).

Other ambiguities are more difficult to resolve. For example, Sonorization should be able to correct at least some violations of the Coda Constraint (where Structure Preservation permits it), since the constraint refers specifically to obstruents. But in fact Aspiration, which is ordered after Sonorization, applies instead. One solution is to include in the rule of Sonorization the fact that it applies only to palatals, but then we are duplicating information in the constraints and defeating the purpose of stating them separately. Another option is to extend Paradis’ (1988) notion of a constraint ‘focus’: for example, if the Coda Constraint has a different focus from the Palatal Constraints (perhaps Laryngeal versus Root node), each will trigger rules that have a similar focus in their effect. This is stipulatory, however, and is a small step from simply placing constraints and triggers in groups. For example, Place Delinking and the constraints in §4.3.1 might be grouped together, so that Place Delinking is more directly a generalization over the effect of the Debuccalization rules from §3.2, and not really a constraint at all.
A similar problem arises in the attempt to relate Coronal Debuccalization and Aspirate Dissimilation to the OCP. Both rules make crucial reference to identical elements on the same tier, and are in some sense at least due to the OCP. But simply saying that they are examples of the universal OCP applying on the Coronal and [asp] tiers is problematic. Coronal Debuccalization applies only to a subset of consonants, though this can be encoded in the language-specific rule of Place Delinking (which therefore cannot be treated as a general process ‘delink’). It is more difficult to deal with Aspirate Dissimilation, since it applies only in word-initial position: this is neither a property of the universal OCP, nor can it be encoded in the language-specific rule of Laryngeal Delinking, since in most other cases it applies word-internally.

While constraints have some appeal in formalizing simple processes with clear motivation, they create significant difficulties when applied to a complex phonology such as that in Kashaya. The ability to express formal generalizations across rules is desirable, but it is unclear whether ‘constraints’ in Kashaya can serve any more fundamental function without causing more problems than they solve.
Chapter 5
Metrical Phonology

Although in a logical progression from the feature to the highest levels of prosody, we ought to discuss moras and syllables before turning to feet and stress, for expository purposes it is much better to deal with stress first. The reason for this is that stress placement in Kashaya has definite implications for mora and syllable structure, and it is impossible to understand those arguments without having first covered the complicated nature of stress in the language. Conversely, the core stress facts can be understood with minimal exposure to lower level prosody. In this chapter, then, I present Kashaya stress ‘out of order’. §5.1 gives my assumptions about mora, syllable, and foot structure, along with the basics of stress placement. §5.2 shows that certain initial syllables are extrametrical, and that they remain so until the postlexical component, where stress is assigned. §5.4 describes the special status of long vowels, and §5.5 argues that the best account for the facts involves the extrametricality of a foot, cumulative with the extrametrical syllable. §5.6 pursues the implications of cumulative extrametricality and supports the analysis with data from other languages. Finally, §5.7 explores further issues in Kashaya metrical phonology.

5.1. Basic Prosody

In Kashaya, there are three basic types of syllables. Since every syllable must have an onset, the smallest syllable is CV. It bears one mora and is light. There are two types of syllables with two moras: CVV and CVC. Both syllables are heavy, though as we see in §5.3, CVV syllables exhibit special behavior in the stress system.
(1) \[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\mu & \mu & \mu \\
C & V & C
\end{array}
\]

In addition, there are superheavy syllables CVVC and CVCC restricted to word-final position. They are not important for the stress system, and are discussed in §6.3.2.

Following Itô (1986), I assume that during much of the lexical derivation, stem-final consonants are extraprosodic and not incorporated into mora or syllable structure. This means that a stem of the shape CVVCV behaves like one of the shape CVCV.

(2) \[
\begin{array}{ccc}
\sigma & \sigma \\
\mu & \mu \\
C & V & <C>
\end{array}
\]

The exclusion of a constituent from prosodic structure is represented by angled brackets. In level 5, the last level of the lexicon, all final consonants become visible, and are so represented in illustrations of stress placement here. Extraprosodicity is discussed in more detail in §6.3.

I represent foot structure using the bracketed grid formalism of Hayes (1987, 1991a). In this system, ‘x’ represents the strong branch of a foot, and ‘.’ the weak branch. Parentheses mark the boundaries of the foot. Kashaya has an iambic stress pattern which includes the following possible instantiations of the foot:

(3) \[
\begin{array}{ccc}
\text{BRANCHING IAMB} & (, x) & (, x) & (, x) \\
& CV & CV & CV & CV
\end{array}
\]

\[
\begin{array}{ccc}
\text{NONBRANCHING IAMB} & (x) & (x) \\
& CVV & CV
\end{array}
\]

\[
\begin{array}{ccc}
\text{DEGENERATE IAMB} & (x) \\
& CV
\end{array}
\]

As illustrated by the data below, Foot Construction in Kashaya is iterative and proceeds from the left edge of the domain.
Following Kager (1989) and Hayes (1991a), I assume that a CV sequence is too short to receive any foot structure under normal circumstances, and degenerate feet are avoided. However, there are cases where the entire stressable domain consists of a CV syllable, and in precisely this context a degenerate iamb is permitted. In the terminology of Hayes (1991a), this means that Kashaya selects the ‘weak prohibition’ value of the degenerate foot parameter: such feet are permitted when a higher grid mark is placed over an unfooted CV syllable (see (24)). The source of this grid mark in Kashaya is End Rule Left, as proposed by Prince (1983) and Hayes (1991a):

(5)  **End Rule Left:**
   a. Create a new metrical constituent at the top of the existing structure.
   b. Place the grid mark forming the head of this constituent in the leftmost available position.

This rule effects the actual placement of stress by picking out the leftmost foot in the domain.

The basic observation about the Kashaya system is that stress can fall on any of the first five syllables (out of a phrasal domain with no fixed limit). The iamb is constructed from left to right, and End Rule Left picks out the leftmost of these feet. In the representations below I show morpheme breaks with hyphens, with the base in bold (this morphological constituent is explained below); beneath the foot structure I indicate syllable breaks with spaces:

(6)  kel-mul-t³  ‘didn’t peer around’ [2.97]
    (x )
    (x) (x)
    kéli mult³

(7)  mo-mac-t³-ela  ‘I didn’t come in’ [247]
    ( x   )
    ( . x) ( . x)
    mo mà’ t³e la
A short vowel in an open syllable is lengthened in strong metrical position:

(8) \( \text{mo-mul-ič-en-iceni-i} \) ‘keep running all the way around (sg)’ [220]

\[
\begin{array}{c}
\text{x} \\
\text{σ} \\
\text{Ø} \rightarrow \mu / \mu \_ \\
\end{array}
\]

While the final syllable /du/ is not footed, it is included in the domain to which End Rule Left applies.

This process of IAMBIC LENGTHENING (Hayes 1985, Prince 1990) can be formalized as the insertion of a mora when a syllable is in strong position in a foot:

(9) \( Iambic \ Lengthening \)

\[
\begin{array}{c}
\text{x} \\
\text{σ} \\
\text{Ø} \rightarrow \mu / \mu \_ \\
\end{array}
\]

In (9) I assume that the vowel dominated by the original mora automatically spreads its features to the inserted mora to create a long vowel.\(^1\) The rule is blocked from applying to a heavy syllable by the upper limit of two moras in Kashaya. Further examples:

(10) \( \text{kel-mul-ič-en-iceni-i} \) ‘keep peering all the way around (sg)’ [220]

\[
\begin{array}{c}
(x) \\
(x) \ (x) \ (x) \ (x) \ (x) \\
\text{kēl\, m̪u\, l̪i\, če\, du\, ce\, du} \\
\end{array}
\]

(11) \( \text{mo-hut-mul-ič-wač-wač-iyič-?} \) ‘keep running all the way around (pl)’ [221]

\[
\begin{array}{c}
(x) \\
(x) \ (x) \ (x) \ (x) \ (x) \ (x) \\
\text{m̪oh\, ti\, mu\, l̪ič\, wač\, wa\, či\, yi?} \\
\end{array}
\]

\(^1\) In Kashaya the operation of Iambic Lengthening is ‘neutralizing’ in the sense that it creates vowels identical in length to underlying long vowels. In this respect it differs from the iambic lengthening found in certain other languages such as Western Muskogean (Choctaw and Chickasaw) and Siberian Yupik, which introduce a third degree of vowel length (Hayes 1991a:226). Since the Kashaya rule is clearly lexical, it is not surprising that it should be structure preserving.
The failure of iambic lengthening to apply in the final syllable of (10) is explained below.

5.2. Persistence

In this section I show that initial syllables become extrametrical only when the base of the word is at least two syllables long, which is accounted for if the rule applies early in the lexicon (§2.1). Since, however, stress is assigned to the phrase, this extrametricality must persist to the postlexical component (§2.2). While some have claimed that such persistence is impossible, evidence from other languages supports the Kashaya analysis, and a relatively minor change in the theory can accommodate it (§2.3).

5.2.1. Extrametricality of Initial Syllables

The words whose stress is given in §5.2 are verbs with unprefixed monosyllabic roots, e.g. kel- ‘peer’ and mo- ‘run’. When we look at verbs with longer roots, we find extrametricality (or invisibility) of the initial syllable:

(12)  ni-a-mac-qa-wač-iyič-meʔ  ‘keep coming in here! (pl)’ [226]

\[
\begin{array}{c}
  (\cdot\ x) \\
  (\cdot\ x) (\cdot\ x) (\cdot\ x) (x)
\end{array}
\]

\[da\ mäc'\ qa\ wa'\ ci\ yič\ meʔ\]

(13)  liňut-an-i  ‘keep whistling’ [3.12]

\[
\begin{array}{c}
  (\cdot\ x) \\
  (\cdot\ x)
\end{array}
\]

\[<li>\ bu\ tā'\ du\]

(14)  caq'am-ala-w-ńnicʔ  ‘start to cut downward’ [194]

\[
\begin{array}{c}
  (\cdot\ x) \\
  (\cdot\ x) (\cdot\ x) (x)
\end{array}
\]

\[<ca>\ q'a\ má'\ la\ wi'\ bi?\]

(15)  piňmoy-an-an-i  ‘smile while walking along’ [208]

\[
\begin{array}{c}
  (\cdot\ x) \\
  (\cdot\ x) (\cdot\ x)
\end{array}
\]

\[<pi>\ h\ mo\ yá'\ da\ du\]

170
Notice that both stress and the effect of Iambic Lengthening are displaced one syllable to the right, a result of extrametricality. The /h/ or /ɦ/ after the invisible syllable in some words is a laryngeal increment; it is moraically licensed and not syllabified in the lexicon (§6.2), so it is generally irrelevant to foot structure (but see §5.7.1).

In the verbs seen so far, the root is the same as the base to which suffixes are added. In many verbs, however, a (single) instrumental prefix is present: here the BASE is the prefix plus the ROOT. It is actually the base to which extrametricality applies. All prefixed forms have bases of at least two syllables, so they always undergo extrametricality:

(16)  ē-hlu-ē-an-an-i  ‘keep trying to pick fruit while moving’ [221]

(  x  

( .  x) (.  x)

<ē> h lu ē da ē du

(17)  ē-hu-kil-ic-i  ‘point at yourself!’ [230]

(  x  

( .  x)

<ē> ki li  ē di

(18)  c-i-ēh-í-m-an-em  ‘while dragging across’ [159]

(  x  

( .  x) (x)

<ē> ? di mā  dem

The visible domain for stress and lengthening is the same: both require that the initial syllable be extrametrical. This confirms Iambic Lengthening as a metrical phenomenon.

The rule which marks the initial syllable of the base extrametrical can be formulated as shown:

(19)  Syllable Extrametricality

σ → <σ> / [ _

2 I use STEM to refer more generally to any form which can take a suffix (stem ≥ base ≥ root).

3 It is unclear whether Syllable Extrametricality applies to CVV syllables, since as described in §5.3 they are subject to other processes. Due to the lack of conclusive evidence I assume the simpler formulation of the rule in (19). See also §5.5.4.

171
It has been well demonstrated that an extrametricality rule cannot exhaust the domain to which it applies (Hayes 1982, 1991a, Prince 1983, Inkelas 1989, and others). This principle is termed the NON-EXHAUSTIVENESS CONDITION by Franks (1989), and predicts that the rule in (19) will fail to apply to a monosyllabic domain. We can account for the distribution of extrametrical syllables in Kashaya by making two assumptions. First, Syllable Extrametricality applies to the base, BEFORE suffixation, and does not reapply; this explains its nonapplication to monosyllabic bases such as *kel-, no matter how many suffixes are added. Second, the rule applies AFTER prefixation; this explains its application to prefixed roots such as *niu-*\textsuperscript{h}\textsuperscript{mun-}.

Up to this point we have looked only at verbs. Extrametricality applies to all parts of speech, however, as shown by the following examples. Here each word is shown in bold to represent the fact that it is the base to which Syllable Extrametricality applies:

(20) \textbf{buṭaqá} ‘bear’
\[
\begin{array}{c}
\text{( x )} \\
\text{( . x )} \\
\text{<bu> t\text{\textfrak{a}} q\text{\textfrak{a}}} \\
\end{array}
\]

(21) \textbf{baʔáp\textsuperscript{t}e} ‘woman chief’
\[
\begin{array}{c}
\text{<ba> t\textsuperscript{p\textfrak{b}} t\textsuperscript{b\textfrak{e}}} \\
\end{array}
\]

(22) \textbf{konhóm\textsuperscript{t}u\textsuperscript{nu}} ‘mountain lizard’
\[
\begin{array}{c}
\text{( x )} \\
\text{( x ) ( x )} \\
\text{<kon> h\textfrak{m} t\textsuperscript{b\textfrak{u}} nu} \\
\end{array}
\]

\footnote{Since they are always extrametrical, it is possible to treat the instrumental prefixes as underlyingly invisible, but this is redundant: the rule of Syllable Extrametricality is already necessary for roots of more than one syllable such as *l\textsuperscript{h}\textsuperscript{hut-} which have no prefix, so we can use the same rule to make the prefix in *niu-*\textsuperscript{h}\textsuperscript{mun-} invisible. Because the prefixes are all monosyllabic, and occur without another prefix, the result is the same. The simplest analysis derives the extrametricality of the prefixes from the general rule in (19).}
(23) píškudú 'bad, ugly'

\[
\begin{array}{c}
\text{(x)} \\
\text{(<piš>)} \\
\text{ku dů}
\end{array}
\]

It should be noted that when a word is too short to receive a stress by the normal rules, it is stressed on the final syllable:

(24) šimá 'ear'

\[
\begin{array}{c}
\text{(x)} \\
\text{(x)} \\
\text{(<ši>)} \\
\text{má}
\end{array}
\]

Syllable Extrametricality applies here because the base is disyllabic. This leaves only a short open syllable, which normally receives no foot structure. But since it is the only syllable visible to End Rule Left, that rule places a grid mark over it. A degenerate foot is created to prevent a violation of the Continuous Column Constraint, which requires that a higher level grid mark dominate one on all lower levels of the grid (Prince 1983, Hayes 1991a).

While Hayes (1982) gives an analysis of Winnebago stress which involves left-edge extrametricality, Hayes (1991a) argues that a better analysis, which incorporates a rightward tone-shift rule, has no need of extrametricality, thereby eliminating the major example of left-edge extrametricality in the literature. Kashaya provides new evidence for left-edge extrametricality, consistent with languages like Tonga where extratonality can be assigned at the left edge of the domain as well (Pulleyblank 1986). Hayes’ suggestion that extrametricality is at the right edge only must be modified to a claim about relative markedness. In addition, the claim by Davis (1988) that extrametricality should exist at only one edge of a domain is falsified by the cooccurrence in Kashaya of invisibility of the initial syllable and final consonant.

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5 For clear evidence that the extrametricality rule applies even to short words where the result is the lack of a stressed foot (and therefore that šimá is not footed as a branching lamb), see §5.2.2.
5.2.2. Persistence to the Postlexical Component

When an utterance consists of a single word, the foot structure used for Iambic Lengthening and that used for End Rule Left are identical. In a longer phrase, however, we see that there are actually two instances of foot construction in the derivation. First, within a word, iterative feet are constructed and Iambic Lengthening applies based on these feet. This is what we have seen up to now. Then, when words are put together by the syntax, Deforestation applies to remove all foot structure, and new feet are constructed. The phrasal stress is placed based on these feet.\(^6\)

We can illustrate the need for distinct lexical and postlexical foot structures by contrasting words in isolation with those in phrases. For example, consider the following two words:

\[(25)\] p'ala ‘again’ \hspace{.5cm} mo-mul-ič-en-ičen-i ‘keep running around’

\[\langle p'a\rangle 1a\]

\[.\ x\) (\ x\ (\ x\ mo\ mu'\ li\ ce'\ du\ ce'\ du\]

Syllable Extrametricality applies to p'ala since the base (equal to the whole word) is disyllabic. As seen in (8), the verb root mo- ‘run’ is too short to undergo the rule. When placed together in a phrase, we see that the foot structure is different. In particular, the syllable /mo/ is weak lexically but strong (and stressed) postlexically:

\[(26)\]

\[\langle p'a\rangle 1a\ mō\ mu'\ li\ ce'\ du\ ce'\ du\]

Notice that the vowel lengths in (25) and (26) are the same, even though the footing is different. This is because the verb in both cases is the same, and goes through the same lexical rules, including Iambic Lengthening (according to the foot structure shown in (25));

---

\(^6\) As Oswald (1961) shows, the determination of which words group together in phrases depends on such factors as emphasis and rate of speech; it cannot be predicted solely from the syntax. I deal here only with single phrases.
but since stress is assigned postlexically, the additional word before the verb in (26) affects its placement. Naturally, the extrametricality must persist to the postlexical component to have its effect on the stress there.

It is not possible simply to reassign extrametricality in the postlexical component, because the Non-Exhaustiveness Condition would fail to block application of Syllable Extrametricality at the phrasal level in the verbs given in §5.1 where the base is monosyllabic but the entire word is considerably longer. Under standard assumptions about Lexical Phonology (e.g. Kiparsky 1982, 1985), morphological information such as the size of the base is not accessible to rules operating in the postlexical component. This extrametricality must be assigned early in the lexicon, before suffixation. Specifically, Syllable Extrametricality applies in level 2, but turns off after that point. It is blocked from applying in level 1 by the lack of syllable structure there (§6.4.3).

The following examples are similar to (26), since the verb shows the effect of Iambic Lengthening, but the postlexical foot structure puts the stress on a syllable that is weak lexically. Two words with their lexical foot structures: 7

(27)  ḷoʔni ‘good’  ḷi-cen-i ‘be!’

<メディァ>  di  ḷi  ce'  du

The same words placed together in a phrase, with postlexical foot structure and the effect of End Rule Left:

(28)  (x)  (x)

<メディァ>  di  ḷi  ce'  du  ‘be good!’ [311]

These two words are similar in the lexicon to those in (27):

7 Although the /ʔ/ in this word could be an increment, I have no positive evidence bearing on the question and treat it as a normal consonant. As a result it is included in the extrametrical syllable, and is not simply moraically licensed. The same is true of the /h/ in qahca ‘knife’ in (33).
(29) caⁿo 'language'  lo-waᶜ-æ-el 'that (we're) speaking (Obj')

<ca> h no  lo waᶜ cal

And again the stress falls on a syllable which is weak lexically:

(30) ( x )
( . x ) (x) (x)
<ca> h no lē waᶜ cal 'the language (we're) speaking' [30]

The stress can also fall on a syllable which is extrametrical in the lexicon, but becomes visible postlexically where it is nonperipheral. Lexically:

(31) haʔa 'horn'  bane-ma⁻iᶜ⁻i⁻y=ʔ 'let me put it on'

<ha> ?a  <ba> ne maᶜ ḷiy

And postlexically with the two words together:

(32) ( x )
( . x ) ( . x ) (x)
<ha> ?a bā ne maᶜ ḷiy 'let me put the horns on' [257]

There are also cases where the syllable structure changes postlexically, so naturally the foot structure must be different as well. This can occur with a word-initial laryngeal increment.

In the lexicon it is unsyllabified but moraically licensed (§6.4):

(33) qahca 'knife'  ṭe⁻w-ay⁻ʔ 'hold against'

<qah> ca  ṭe way

Postlexically, the increment syllabifies as a coda with the final vowel of the preceding word:

(34) ( x )
( . x )
<qah> cáʔ be way 'hold a knife against (someone's throat)' [D]

The following examples show the same word, maʔa, with different postlexical foot structure depending on the following word. First, consider the lexical representations:
(35) maʔa ‘food’  hcoma ‘feast’  maʔ trimming ‘a lot’
     <ma> ?a  (· x)  h co ma  <ba> t\textsuperscript{h}e

Now notice that the initial foot of the domain depends on whether the following word provides a coda consonant:

(36) (x ) (x )
     <ma> ?āh co ma  ‘feast, picnic’ [D]

(37) (· x )
     <ma> ?a bā t\textsuperscript{e}  ‘a lot of food’ [3.12]

These forms show that postlexical foot structure is distinct from lexical foot structure. Prince (1985) and Steriade (1988b) have argued that the creation of metrical constituents is a structure-building operation, which would prevent postlexical Foot Construction from simply readjusting the lexical feet. I follow Steriade in assuming that a rule of Deforestation removes all foot structure, and then Foot Construction reapplies (in structure-building fashion) to the entire domain. Crucially, this postlexical reapplication of Foot Construction respects the extrametricality of initial syllables which is assigned early in the lexicon, and must persist to the postlexical component. Further data relevant to Deforestation are presented in §5.5.

5.2.3. Theoretical Considerations

In its earliest instantiations, for example Hayes (1981, 1982), the diacritic marking of extrametricality is permitted to remain in the representation indefinitely except when the constituent bearing that marking is nonperipheral, in which case the Peripherality Condition removes the extrametricality. Pulleyblank (1986) specifically claims that extratonality is not

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8 Words with an initial increment regularly fail to undergo Syllable Extrametricality. See §5.7.2 for discussion.
removed until the phonetic component, at which time toneless syllables are provided with a default tone. In the alternative approach of Archangeli (1984b) and Halle and Vergnaud (1987), where the Peripherality Condition exists as a condition on the interpretation of the diacritic, even nonperipherality will not cause removal of the extrametricality: it persists, but is not interpreted and has no effect.

In some later work, proposals are made to remove the extrametricality at a particular point in the derivation. For example, in the lexical phonology model of Kiparsky (1985) all extraprosodicity is lost at the end of the lexical component; Borowsky (1986) takes the same position. In the theory of prosodic syllabification developed by Itō (1986), the extraprosodicity of final consonants can be removed at two different places in the grammar, depending on the value of a parameter. In some languages, extraprosodicity is lost lexically at the word level, but Itō claims that in all languages extraprosodicity is absent from the postlexical component. The theory of Inkelas (1989) incorporates the claim that invisibility is automatically lost at the end of each cycle. This mechanism restricts the power of the grammar in that it makes global effects more difficult to achieve: any instantiation of invisibility can be determined only by information present in the representation on the same cycle. If a particular instance of extrametricality appears to require persistence across cycles or levels, the rule assigning the extrametricality can simply be reapplied each time.

Rice (1990) argues against Itō and claims that final-consonant extraprosodicity, while present universally, is like other phonological rules and principles and can be turned off at various places in the grammar. Specifically, in some languages it can persist into the postlexical component. In Inkelas' theory, Rice's arguments can be accommodated by applying the rule of final-consonant invisibility postlexically, and the appearance of persistence is really the reapplication of the same rule. We have seen that in Kashaya, however, that extrametricality assigned according to the size of a stem early in the lexicon must persist to the postlexical component, where it cannot be the result of simple
reapplication of a rule: the presence of invisibility in a particular form depends crucially on its derivational history. A similar case is presented for Macedonian stress by Franks (1989): in this language the extrametricality of a final syllable is blocked in monosyllabic words, even though stress is phrasal. Just as in Kashaya, to take advantage of the Non-Exhaustiveness Condition the extrametricality must be assigned lexically, and persist to the postlexical component where stress is actually assigned. The Kashaya case is even stronger, since while words are visible postlexically and could conceivably be referred to in the Macedonian rule, the base is a morphological category which is not accessible at the phrasal level.

Under any analysis in which extrametricality persists, it is a property of representations and can therefore persist beyond the scope of a single rule. The representational nature of extrametricality is consistent with most work in the area, the main exception being Poser (1984, 1986), for whom invisibility is a property of individual phonological rules. His position cannot be reconciled with the present analysis, and it is difficult to imagine how the apparent persistent effects of extrametricality in Kashaya and other languages could be captured in a rule-based approach to invisibility. Although ideas about persistence vary, once it is admitted that extrametricality is a property of the representation, it is a small step to permit persistence even into the postlexical component, at least on a language-specific basis, particularly since there is generally no principled reason given for the removal of invisibility.10

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9 Inkelas (1989) argues that the apparent postlexical persistence of extrametricality in Yawelmani (Archangeli 1984b) can be accounted for by assigning stress to content words in the lexicon, and to function words in the postlexical component. This reanalysis of Yawelmani cannot be transferred to Kashaya: in disyllables, after the application of extrametricality there is not enough visible material left for any stress to be assigned in the lexicon.

10 Inkelas (1989) is an exception, since she formalizes invisibility as exclusion from the prosodic domain, and the cyclic loss of invisibility as the creation of new prosodic structure on each cycle. Persistence as I have proposed it can be incorporated into Inkelas' theory by a relatively minor change, specifically by making the new prosodic structure partly dependent on the structure remaining from the previous cycle.
5.3. The Special Status of Long Vowels

The data considered in §5.2 submit to relatively straightforward analysis: left-to-right assignment of iambic feet, End Rule Left, and Syllable Extrametricality which persists to the postlexical component. The next set of data presents more complex problems, so I give the facts without an analysis first. §5.3.1 describes the special treatment of CVV.CV sequences, and §5.3.2 gives the similar facts for other cases of CVV.

5.3.1. Foot Flipping and Stress Shift

There are cases where an initial sequence CVV.CV — what could be parsed as a canonical quantity-sensitive trochee, or ‘anti-iamb’ (Prince 1990) — essentially flips its weak and strong branches to form CV.CV.CV, a perfect iamb. For example, consider some forms of the verb hca₅ ‘fly (along)’:

(38) hca₅-i → ca’du ‘fly!’ [3.12]  
hca₅-iʔnas → ca’duʔba ‘could fly’ [3.12]  
hca₅-icen-i → cadu’cedu ‘always flies’ [Os88]

In the Habitual cadu’cedu, the vowel length is in the second syllable, even though the stem hca₅ ‘fly’ contrasts with short ca₅ ‘see’ (the laryngeal increment has no effect here). In fact, in the Habitual both verbs have the same segmental form, but different stresses:

(39) ca₅-icen-i → cadu’cedu ‘always sees’ [Os88]  
hca₅-icen-i → cadu’cedu ‘always flies’

The long vowel in cadu’cedu ‘always sees’ is from Iambic Lengthening. The alternations in length and the displaced stress in cadu’cedu ‘always flies’ are the subject of this section.

There are two unusual aspects of cadu’cedu: FOOT FLIPPING, the reversal of vowel lengths; and STRESS SHIFT, the appearance of stress on the foot following the one which undergoes the flip. Both of these effects are seen in the following examples, where the
flipped foot is italicized. The initial CVV syllable can be underlying or the result of Root Elision (§6.6), which changes a sequence of two vowels to a single long vowel; for example /oa/ becomes [o']. Long vowels later in the word (i.e. not italicized) are from Iambic Lengthening:

\[(40) \text{ cvv.cv.cv.σ → cv.cv.vv.cv.σ} \]
\[\text{nirč-aq'-ic-i → dičaqaq-ci → dičaqaq-ci 'take a message out!' [202]}\]
\[\text{mo-alq'-ic-i → moqtoq-ci → moloq-ci 'run up out here!' [200]}\]
\[\text{mo-anan-an-icn-i → modadaducedu → modadaducedu 'keep running intermittently' [216]}\]
\[\text{mo-al-ananan-an-i → molawadadadu → molawadadu 'run downward intermittently' [208]}\]
\[\text{mo-al-mec-en-i → molamecedu → molamecedu 'keep running down off' [215]}\]

\[(41) \text{ cvv.cv.cvc → cv.cv.vc} \]
\[\text{nič-imic-q → dicibicq' → dicibicq' 'must have started to tell' [2.101]}\]
\[\text{te-t-imic-? → teqbi? → teqbi? 'stand up' [193]}\]
\[\text{mo-al-tu? → molatu? → moltu? 'don't run down!' [193]}\]

\[(42) \text{ cvv.cv.cv# → cv.cv.vc#} \]
\[\text{nirmic-i → dobici → dobici 'raise your hand!' [193]}\]
\[\text{mo-an-ic-i → moduci → moduci 'run away!' [187]}\]

Foot Flipping and Stress Shift also take effect when Syllable Extrametricality has applied, whether the long vowel is underlying or produced by rule:

\[(43) \text{ <σ>cvv.cv.cvv.σ → <σ>cvv.cv.vc#} \]
\[\text{ma?anni-i → <ma>äänici → <ma>äänici 'be eating one' [164]}\]
\[\text{qašq-an-i → <qa>šqqoddu → <qa>šqqoddu 'be getting well' [213]}\]

---

11 In fact, *hca*ni- 'fly (along)' is derived by Root Elision from the root *hca*- 'fly' plus -ani- 'along'. Calling *hca*ni- the base is incorrect but does not change the inapplicability of Syllable Extrametricality.
(44) \(<\sigma>\text{cvv.cv.cvc} \rightarrow <\sigma>\text{cvv.cv.cvc}\)

\[
muna'c-iini\text{-}i?na \rightarrow <\mu>\text{na'cidedu?ba} \rightarrow <\mu>\text{naci'dulu?ba}
\]

'would be too shy' [2.100]

\[
ye'he-ala-me?\text{-}r?u=? \rightarrow <\mu>\text{he'lame?r?u?} \rightarrow <\mu>\text{helame?r?u?}
\]

'don't drag yourself down!' [88]

(45) \(<\sigma>\text{cvv.cv.cv.\sigma} \rightarrow <\sigma>\text{cvv.cv.cv.\sigma}\)

\[
\text{šu-}o\text{-}yi'c-\text{e}n-i \rightarrow <\sigma>\text{yo yi'cedu} \rightarrow <\sigma>\text{yo yi'cedu}
\]

'keep peeling' [212]

\[
c'hi\text{-}nie-ananani-i \rightarrow <c'\text{i}>\text{de'radadu} \rightarrow <c'\text{i}>\text{de'radadu}
\]

'carry in stages' [208]

Similar to (44), when the CVV.CV sequence is followed by CVV the stress lands on that syllable (which forms a nonbranching iamb). This shows that the effect of Stress Shift in not iterative (cf. §5.3.2):

(46) \(<\sigma>\text{cvv.cv cvv} \rightarrow <\sigma>\text{cvv.cv cvv}\)

\[
muna'c-iini\text{-}li \rightarrow <\mu>\text{na'cildu'li} \rightarrow <\mu>\text{naci'dulu'li}
\]

'after having been too shy' [88]

\[
miku't-an'e\text{-}mu \rightarrow <\mu>\text{kuda'mu} \rightarrow <\mu>\text{kuda'mu}
\]

'he keeps humming' [283]

Another minimal pair parallels the case in (39), with the addition of extrametricality:

(47) \(\text{munac-ini-iceni-i} \rightarrow <\mu>\text{naciducedu} \rightarrow <\mu>\text{naci'duc'edu}\)

'always gather' [Os88]

\[
muna'c-iini-iceni-i \rightarrow <\mu>\text{na'cidedu} \rightarrow <\mu>\text{naci'duc'edu}
\]

'always be too shy' [Os88]

Foot Flipping and Stress Shift apply only when the CVV.CV sequence is at the left of the unfooted domain. Preceded by a short syllable, the CVV syllable forms the strong branch of a normal iamb:

(48) \(\text{šu-}lo\text{-}o\text{-}i'c\text{-}iwa\text{-}c? \rightarrow <\sigma>\text{lojo'ciwa?}
\]

'keep peeling from oneself (pl)' [214]

This word has the following foot structure:
(49)  \( (\, x \, ) \)  \\
     \( (.\, x\, )\, (.\, x\, ) \)  \\
\(<\texttt{o}>\)  lo t'ôr či wa?

Foot Flipping never occurs without Stress Shift, but as we see in the next section Stress Shift does occur without Flipping.

5.3.2. Stress Shift Alone

There are two cases in which an initial CVV syllable fails to participate in Foot Flipping. The first of these is when the following syllable is not CV. For example, when CVV is followed by a closed CVC syllable, only Stress Shift is found. The stress surfaces on the heavy syllable immediately following the CVV (italicized):

(50)  \( \text{cvv.cvc} \)

\( qâ\text{-muč-ma} \rightarrow qâ\text{mučba} \)  ‘after leaving each other’ [1.204]
\( nî\text{-čaq-qa-w} \rightarrow di\text{čâhqa-w} \)  ‘cause to bring a message out here’ [1.191]
\( mo\text{-čmič-ina} \rightarrow mo\text{bičba} \)  ‘after running away’ [3.12]
\( mo\text{-aqac-qa-w} \rightarrow mo\text{qâčqaw} \)  ‘make run up from here’ [205]
\( mo\text{-an-irmâ} \rightarrow mo\text{dûrba} \)  ‘would run along’ [2.100]

Stress Shift without Foot Flipping applies after an extrametrical initial syllable as well:

(51)  \( <\texttt{o}>\text{cvv.cvc} \)

\( p\text{iša\text{-čič-qá} \rightarrow <p\text{-lačc\text{-qá}} \)  ‘they must have gone away’ [2.97]
\( m\text{wuwi\text{-č-ič-t\text{-u}=}} \rightarrow <b\text{-wirč\text{-t\text{-u}=}} \)  ‘don’t keep stringing beads!’ [214]
\( š\text{u\text{-qa-č-t\text{-u}=}} \rightarrow <š\text{u\text{-č\text{-t\text{-u}=}} \)  ‘don’t cut it off!’ [3.12]

Stress Shift also applies when the CVV syllable is word-final, and the foot which receives the stress is contained entirely in the following word:

(52)  \( \text{řič\text{-ča\text{-čil\text{-ala-w}}} \rightarrow <ř\text{-č\text{-čič\text{-lá\text{-law}} \)  ‘the spider is hanging down’ [2.100]
\( h\text{ĩšu\text{-čaq\text{-lây}} \rightarrow <hi\text{-šu\text{-čaq\text{-lây}} \)  ‘long arrows’ [3.12]
\( c\text{iba\text{-maq\text{-wa}}} \rightarrow <ci\text{-ba\text{-mahwa \)  ‘who came in?’ [32]
\( m\text{ię\text{-nöhp\text{-o\text{-we-y}}} \rightarrow m\text{ię\text{-nöhp\text{-owiy \)  ‘lived there long ago’ [236]}

183
This fact illustrates that Stress Shift must be active postlexically, in order to apply across a word boundary.

Similarly, when the initial CVV syllable is followed by another CVV, only Stress Shift occurs, and only once:

(53)  \( cvv.c\acute{v}v \)

\[
\begin{align*}
\text{mo-azi-e' mu} & \quad \rightarrow \quad \text{mo'de' mu} \quad \text{‘he is running’ [2.100]} \\
\text{qa'-yaa-e' man} & \quad \rightarrow \quad \text{qa'ye' man} \quad \text{‘she left’ [3.12]}
\end{align*}
\]

(54)  \( <\sigma>cvv.c\acute{v}v \)

\[
\begin{align*}
\text{tit'a=le' mu} & \quad \rightarrow \quad \text{<ti>c'a' le' mu} \quad \text{‘that’s a spider’ [Os88]} \\
\text{tit'a' sul'le} & \quad \rightarrow \quad \text{<ti>c'a' sul'le} \quad \text{‘spider web’ [86]} \\
\text{kulu'ca-qa-w} & \quad \rightarrow \quad \text{<ki>lu'ca'qaw} \quad \text{‘a lock’ [128]} \\
\text{mikur'c-e' mu} & \quad \rightarrow \quad \text{<mi>ku'rc'e' mu} \quad \text{‘he is humming’ [282]}
\end{align*}
\]

This parallels the case in (46), but without Foot Flipping, confirming the noniterativity of Stress Shift.

The second case where initial CVV fails to participate in Foot Flipping is when it is followed by CV which is final in the word. Here there is only Stress Shift. If the word is in isolation, stress falls on the final CV:

(55)  \( cvv.cv\# \)

\[
\begin{align*}
\text{mo-an-i} & \quad \rightarrow \quad \text{mo'du} \quad \text{‘run’ [3.12]} \\
\text{qa'-ti} & \quad \rightarrow \quad \text{qa'ti} \quad \text{‘about to leave’ [3.13]}
\end{align*}
\]

(56)  \( <\sigma>cvv.cv\# \)

\[
\begin{align*}
\text{nimata} & \quad \rightarrow \quad \text{<ni>mat'a} \quad \text{‘woman’} \\
\text{hna-na-mi} & \quad \rightarrow \quad \text{<ha>nam'a} \quad \text{‘cover it!’ [158]} \\
\text{hi-\~sa-ti} & \quad \rightarrow \quad \text{<hi>sa'ti} \quad \text{‘about to break’ [3.13]}
\end{align*}
\]

Longer phrasal examples demonstrate that the Stress Shift is actually to the following foot, not the following syllable: where sufficient material exists, the CV syllable serves as the weak branch of the stressed iamb:
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(57) \textit{cvv.cv.\textcircled{6}}

\begin{align*}
\text{mo-\texttt{ani}}=\texttt{e}\text{\texttt{e}}\text{\texttt{e}}\texttt{e} & \quad \rightarrow \quad \text{mo-t\texttt{e}\texttt{e}}\texttt{e} \texttt{mu} \quad \text{‘he has run’ [2.100]} \\
\text{ma\texttt{e}-\texttt{al}}=\texttt{e}\text{\texttt{e}}\texttt{e} & \quad \rightarrow \quad \text{ma-tal\texttt{e}\texttt{e}}\texttt{e} \texttt{mu} \quad \text{‘she’s the one’ [3.13]}
\end{align*}

(58) \textit{<\textcircled{5}cvv.cv.\textcircled{6}}

\begin{align*}
\text{\texttt{ti\texttt{a}}-\text{\texttt{ma}}=\texttt{a}n\text{\texttt{i}}} & \quad \rightarrow \quad <\text{\texttt{ti}}><\text{\texttt{ma}}\text{\texttt{a}}\text{\texttt{w}}\text{\texttt{a}}\text{\texttt{i}} \quad \text{‘the woman is going’ [2.68]} \\
\text{\texttt{ti\texttt{a}}-\text{\texttt{ma}}=\texttt{e}m} & \quad \rightarrow \quad <\text{\texttt{ti}}><\text{\texttt{ma}}\text{\texttt{a}}\text{\texttt{e}m} \quad \text{‘the woman (Subj)’ [2.100]} \\
\text{mo\texttt{e}}-\text{\texttt{o}n\texttt{i}}=\texttt{e}\text{\texttt{e}}\texttt{e} & \quad \rightarrow \quad <\text{mo}>\text{\texttt{a}d\texttt{a}}\text{\texttt{r\texttt{u}}}\text{\texttt{e}}\text{\texttt{e}}\texttt{e} \texttt{mu} \quad \text{‘that is not a fern’ [3.13]}
\end{align*}

Here the stressed iamb bridges a word or clitic boundary. It is an important generalization that Foot Flipping does not apply to a CVV.CV anti-iamb which is final in a word, but Stress Shift does apply. We will refine this observation in §5.5.1.

The underlying distinction in vowel length for the minimal pairs in (39) and (47) surfaces unchanged by Foot Flipping when a closed syllable follows the underlying long vowel, or when a following CV syllable is word-final. Stress Shift still applies, however, as expected from the other examples given in this section:

(59) \textit{can\texttt{-i}}

\begin{align*}
\text{\texttt{bc\texttt{a}a\texttt{-ani}}} & \quad \rightarrow \quad \text{cad\texttt{u}} \quad \text{‘look!’} \\
\text{\texttt{bc\texttt{a}a\texttt{-ani}}} & \quad \rightarrow \quad \text{card\texttt{u}} \quad \text{‘fly!’}
\end{align*}

(60) \textit{can\texttt{-i\texttt{enha}}}

\begin{align*}
\text{\texttt{bc\texttt{a}a\texttt{-ani\texttt{enha}}}} & \quad \rightarrow \quad \text{cad\texttt{u}\texttt{ba}} \quad \text{‘could see’ [3.13]} \\
\text{\texttt{bc\texttt{a}a\texttt{-ani\texttt{enha}}}} & \quad \rightarrow \quad \text{card\texttt{u}\texttt{ba}} \quad \text{‘could fly’ [3.12]}
\end{align*}

(61) \textit{muna\texttt{-e\texttt{-inha}}}

\begin{align*}
\text{\texttt{muna\texttt{-e\texttt{-inha}}}} & \quad \rightarrow \quad <\text{mu}>\text{\texttt{a}c\texttt{-u\texttt{ba}}} \quad \text{‘having gathered’ [Os88]} \\
\text{\texttt{muna\texttt{-e\texttt{-inha}}}} & \quad \rightarrow \quad <\text{mu}>\text{\texttt{a}c\texttt{-u\texttt{ba}}} \quad \text{‘having been too shy’ [Os88]}
\end{align*}

The stress falls on the same syllable in these pairs of words, but for different reasons: in the first of each pair, the first visible CV syllable is the weak branch of a foot, while in the second of each pair the CVV syllable is a nonbranching foot which undergoes Stress Shift. The data of (57) and (58) show that CVV does not serve as the weak branch of an iamb.

We have seen that Stress Shift applies to any CVV syllable at the left edge of the visible domain, regardless of the location of that syllable with respect to any word or clitic boundaries, indicating that it is (minimally) a postlexical process. Foot Flipping, on the
other hand, imposes further conditions: the CVV syllable must be followed by a CV syllable, and that CV syllable must not be final in the word. Foot Flipping does not apply across word or clitic boundaries, suggesting that it is a lexical process.

### 5.4. Summary

As stated at the outset, stress in Kashaya can fall on any of the first five syllables of the domain. There are three factors which combine to produce this variation. First, the iamb can be branching or nonbranching. Second, the initial syllable can be visible or invisible. Third, Stress Shift can apply or not (descriptively speaking, Foot Flipping is not directly relevant to the location of stress). The following table lays out all the possible locations of stress and their sources:

<table>
<thead>
<tr>
<th>(62)</th>
<th>Stress</th>
<th>Syllable Structure</th>
<th>Rules</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cvc...</td>
<td>none</td>
<td></td>
<td>(6)</td>
</tr>
<tr>
<td>2</td>
<td>cv c...</td>
<td>none</td>
<td></td>
<td>(7)</td>
</tr>
<tr>
<td></td>
<td>cvc...</td>
<td>extrametricality</td>
<td>(21)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cvv cv...</td>
<td>stress shift</td>
<td>(53)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cvv cvc...</td>
<td>stress shift</td>
<td>(50)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>&lt;σ&gt; cv c...</td>
<td>extrametricality</td>
<td>(13)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cvv cv c...</td>
<td>stress shift</td>
<td>(57)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;σ&gt; cvv cvc...</td>
<td>extrametricality, stress shift</td>
<td>(54)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;σ&gt; cvv cvc...</td>
<td>extrametricality, stress shift</td>
<td>(51)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cv cvv cvc...</td>
<td>flipping and shift</td>
<td>(41)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>cv cvv cv c...</td>
<td>flipping and shift</td>
<td>(40)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;σ&gt; cvv cv c...</td>
<td>extrametricality, stress shift</td>
<td>(58)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;σ&gt; cvv cvv c...</td>
<td>extrametricality, flipping and shift</td>
<td>(46)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;σ&gt; cvv cvv cvc...</td>
<td>extrametricality, flipping and shift</td>
<td>(44)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&lt;σ&gt; cv cvv cv c...</td>
<td>extrametricality, flipping and shift</td>
<td>(45)</td>
<td></td>
</tr>
</tbody>
</table>

In examples exhibiting Syllable Extrametricality, the first word in the phrase necessarily has a base of at least two syllables; those where it does not apply have a monosyllabic base and the rule is blocked in the lexicon.

186
5.5. Analysis

I now turn to an analysis of Stress Shift and Foot Flipping. §5.5.1 shows that Foot Flipping applies only to the part of the word generated by level 3 of the lexicon, but also depends on material added in later levels. §5.5.2 accounts for this situation by creating an anti-iamb over the CVV.CV sequence in level 3 and postponing the rule which makes reference to this foot until level 5. §5.5.3 analyzes Stress Shift as a rule of Foot Extrametricality. §5.5.4 formulates the rule of Foot Flipping, which converts the anti-iamb into a canonical iamb. §5.5.5 considers, and rejects as inadequate, an analysis of Stress Shift as a rule which moves the grid mark placed by End Rule Left one foot to the right.

5.5.1. Level Ordering

In the analysis of Kashaya metrical phonology, it is important to distinguish between the various levels of the lexicon. In level 1, there is no syllable structure and no metrical rules apply (§6.4.3). In level 2, Syllable Extrametricality takes effect (§5.1). Iambic Lengthening applies in levels 2 and 3; this is what we have seen so far in this chapter. Level 3 suffixes are also the latest ones which undergo Foot Flipping. Neither Iambic Lengthening nor Foot Flipping applies to the suffixes of levels 4 and 5. In the following examples, level 4 suffixes are italicized, and those which follow them are level 5:

\[\begin{align*}
\text{noh}^\text{p}\text{h}^\text{o}\text{-i}^\text{t}^\text{-mi}^\text{-mi}-y\ddot{a}-e & \rightarrow \text{<no>hp\text{-imimiye}} & \text{‘did not live long ago’ [236]} \\
\text{nia}-w\text{-ala-wi}-y\ddot{a}-e & \rightarrow \text{dawa-lawiye} & \text{‘I am starting to want’ [235]}
\end{align*}\]

Notice that the stressed syllables have not undergone Iambic Lengthening \(*noh^p\text{h}^o\text{mimi}\text{ye}\); this is because they are level 4 suffixes, and the rule is not active there. At the same time, a level 4 suffix such as the Negative -\text{i} or -\text{hu} can make Foot Flipping possible in preceding material by ensuring that the CVV.CV sequence does not take a coda consonant:
(64) mo-ala-t'u-i=i? → mola'tú? ‘don’t run down!’ [193]

While the level 4 suffixes do not participate in these metrical rules, they are taken into account in determining whether the syllable structure is appropriate for Foot Flipping to occur.

The next examples have no level 4 suffixes, so the level 5 suffixes are italicized. They do not undergo Foot Flipping with a preceding long vowel:

(65) simaq-eti → <si>maqatí ‘although he’s asleep’ [2.96]
mo-ag"-eti → mo'qatí ‘even though he ran out’ [2.91]
mo-ag-ela → mo'qalá ‘I’m running’ [2.96]
p'í-yaq-ela → <p'í>yaqalá ‘I recognize it’ [2.96]

For example, *simaqati. They also do not show Iambic Lengthening, even when the stress shows them to be in strong metrical position:

(66) miwil-ela → <ba>wiléla ‘I am putting it in’ [247]
miwu-wela-e' → <bu>wiwéla ‘I was stringing beads’ [248]
þ'a'ina-m-o-p'ila → <þ'a>þáncip'ila ‘if it happened’ [279]

For example, *bawiléla. These same level 5 suffixes make possible Foot Flipping in a preceding sequence:

(67) mo-šinic-eti → mobí'cetí ‘although he ran away’ [280]
mo-ala-weti → mola'wetí ‘although he ran down’ [280]
miwu-wela-e' → <bu>wiwéla ‘I was stringing beads’ [248]
miši-c-iin-em → <mi>tičidéom ‘while lying down’ [272]

They also preserve Iambic Lengthening which has applied in an earlier level:

(68) mo-maq"-eti → momá'qoti ‘although he ran in here’ [280]
mo-maq"-ela → momá'qola ‘I am running in’ [71]
þiuwe-cini-em → <du>vec'idem ‘while night was falling’ [273]
We can account for the Iambic Lengthening facts in a straightforward way: Iambic Lengthening applies through level 3, and the stem-final consonant is extraprosodic so that it does not block application of the rule:

\[(69) \quad (\_ x ) \quad \text{mo ma} \_ \text{<q>}\]

It cannot apply to suffixes added in levels 4 and 5, since it has turned off. If a stem-final lengthened vowel ends up in a closed syllable, it simply undergoes Closed-Syllable Shortening (§6.2):

\[(70) \quad \text{mo-maq}^\_ \text{-\text{r}u-i=7} \rightarrow \text{momáh\text{r}u7} \quad \text{‘don’t run in here!’ [190]}\]

The length of this vowel cannot have any effect on the placement of stress, since any vowel which can undergo Iambic Lengthening is necessarily in the strong branch of a normal foot and will take the stress regardless of the nature of the syllable in strong position. This distinguishes them from certain other vowels which undergo Closed-Syllable Shortening, as discussed in §6.2.\footnote{Hayes (1991a:226) notes that ‘A mysterious property of iambic lengthening rules is their tendency not to apply to syllables in word-final position... We have incorporated this restriction in various ad hoc ways into the individual analyses, but find this unsatisfactory. If the avoidance of final iambic lengthening is truly general, it deserves theoretical explanation.’ The Kashaya data present an interesting case where no vowel which ends up in word-final position can undergo Iambic Lengthening, but still the rule must apply to vowels which are stem-final at the time when the rule is active. Underlying vowels which occur word-finally undergo separate Final Shortening (§6.8). In this case a language-specific (though not ad hoc) account for the lack of long vowels in word-final position (in verbs) is necessary, and suggests that the apparent failure of iambic lengthening to apply in many languages is related to the frequent lack of long vowels in that position, rather than to a property of iambics.}

The treatment of Foot Flipping is more complex, since if the later suffix creates a closed syllable, there is no flipping at all:

\[(71) \quad \text{mo-\text{t}m\text{ic}-\text{ma} \rightarrow mo\text{-bičba} \quad \text{‘after running away’ [3.12]}\]

It is not possible to apply Foot Flipping in level 3 and then undo it by some process comparable to Closed-Syllable Shortening, since Foot Flipping has several effects — not
just lengthening of the second syllable, but also shortening of the first syllable and concomitant Stress Shift. This means that the conditions for Foot Flipping must be set up in level 3, but the rule must be able to take effect in a later level only if the necessary conditions are present. These conditions are that the final syllable of the anti-iamb must be short and nonfinal in the word. The effect of Foot Flipping must occur by the end of level 5; after that point the word enters the postlexical component, where the presence of subsequent syllables is of no use in enabling Flipping, and different foot structure is required anyway (§5.2.2).

5.5.2. Creation of an Anti-Iamb

How should the two stages of Foot Flipping be separated? I suggest that a CVV.CV sequence is parsed as an anti-iamb when it is first available. This anti-iamb eventually triggers a rule of Foot Flipping, but only if appropriate suffixal material has been added (in level 3, 4, or 5).

The following words consist of the root mo- ‘run’, the level 3 suffix -iñic ‘up’, and a level 5 suffix: either the Imperative -i or the Subordinative -ña ‘after’. Only in the first case does Foot Flipping occur:

(72)  mo-iñic-i → mobici ‘run away!’ [3.13]
     mo-iñic-ña → mobičba ‘after running away’ [3.12]

Obviously, both words exit level 3 with the same structure. This structure must encode the potential for Foot Flipping, contingent on the following suffix. This encoding is accomplished by an anti-iamb:

(73)  (x . .) mo bi <e>

This anti-iamb has no effect on vowel length in level 3: it cannot trigger Iambic Lengthening since the strong branch of the foot already dominates a long vowel. Upon
sufficxation in level 5, the two words have different syllable and foot structures:

(74) \( \underline{x} \) \( \underline{..} \) \( \underline{m} \underline{o} \underline{c} \underline{i} \underline{c} \) \( \underline{x} \) \( \underline{x} \) \( \underline{m} \underline{o} \underline{b} \underline{i} \underline{c} \underline{b} \underline{a} \)

Since the resyllabification of the previously extraprosodic consonant changes the syllable weight, we must change the foot structure as well. Hayes (1989b) proposes a process of Parasitic Delinking, which removes syllable structure when the vowel which heads the syllable is deleted. I suggest that this process also applies to feet. That is, a foot is erased when a syllable dominated by the foot undergoes a change in its weight.\(^\text{13}\) In (74), Parasitic Delinking causes removal of the anti-iamb when the second syllable of \textit{mo\'bic\'ba} changes from CV to CVC; as a result, that word cannot undergo Foot Flipping. No such change happens in \textit{mobi\'ci}, since the previous syllable structure is left intact. Once this suffixation has taken place, Foot Flipping can apply:

(75) \( \underline{x} \) \( \underline{..} \) \( \underline{m} \underline{o} \underline{b} \underline{i} \underline{c} \underline{i} \) \( \rightarrow \) \( \underline{.} \) \( \underline{x} \) \( \underline{m} \underline{o} \underline{b} \underline{i} \underline{c} \underline{i} \)

That is, the length of the vowels in the anti-iamb are switched to reflect an iambic pattern. The exact formulation of Foot Flipping is discussed in §5.5.4.

The creation of an anti-iamb is contrary to the normal iambic pattern of Kashaya. At the same time, it must interact with regular Foot Construction: in some derivations, a CVV foot must be expanded to include a CV syllable which is added on a later cycle or level. For example, the following word undergoes Foot Flipping:

(76) \textit{div\'o\-n\'imic\'i} \rightarrow \textit{di\'ci\'bi?} ‘start to tell’ [194]

\(^{13}\) Parasitic Delinking, in its application to both syllables and feet, expresses the notion that unusual prosodic structure — such as the anti-iamb created by CV Adjunction — is fragile, and is lost when any fundamental change occurs in the elements dominated by that structure. The loss of syllable structure upon deletion of a head vowel, as suggested by Hayes, makes sense in that the vowel ‘forms the core to which other segments are syllabified by adjunction’ (1989:268). A change in the composition of the syllables dominated by a foot is also sufficient to cause Delinking, since a foot is defined crucially by the weight of the syllables it dominates. Moras are not subject to Parasitic Delinking because, as the lowest members of the prosodic hierarchy, they are atomic units and are not prosodically dependent on the segments they dominate.
The initial foot structure built over the root is a nonbranching iamb, which is replaced by an anti-iamb upon suffixation:

(77) \( \{x\} \)
\( \text{di}^* \langle \text{c} \rangle \)
\( \{x \ .\} \)
\( \text{di}^* \text{ci} \text{bi} \langle \text{c} \rangle \)

I treat the creation of the anti-iamb, not as the direct construction of this unusual foot, but as adjunction of a short CV syllable to a preceding CVV foot (where \( \sigma \mu \) is a monomoraic syllable, following McCarthy and Prince 1986):

(78) \( CV \text{ Adjunction} \)

\( F \)
\( f \) \text{\textbackslash} \text{\textbackslash} \)
\( \sigma \text{\textmu} \)
\( / \text{\textbackslash} \)
\( \mu \text{\textmu} \text{\textmu} \)

The rule must be restricted to a syllable containing a long nucleus (rather than just two moras) to prevent the creation of CVC.CV feet. Informally, the change is as shown below in grid notation:

(79) \( \{x\} \) \( \rightarrow \) \( \{x \ .\} \)
\( \text{CVV} \text{ CV} \) \( \rightarrow \) \( \text{CVVCV} \)

By the Elsewhere Condition, CV Adjunction bleeds the more general rules which would be expected to make the CV syllable part of a new foot. It is also fed by these rules, since the CVV foot is a necessary part of its structural description.

5.5.3. Stress Shift as Extrametricality

A natural way to formalize Stress Shift — the failure of accent to fall on a CVV or CVV.CV foot — is to mark these feet extrametrical. The obvious generalization about them is that they both begin with a CVV syllable. Stress Shift, then, can be formalized as a rule making such a foot invisible when it begins with a long nucleus:
Foot Extrametricality

\[ F \rightarrow <F> \quad / \quad \left[ ___ \right] \quad \sigma (\sigma) \quad / \quad \mu_+ \mu_+ \]

This covers both CVV and CVV.CV, by the optionality of the second syllable in the foot.\(^{14}\)

We look first at the application of Foot Extrametricality to those cases where Foot Flipping is not involved. For example, in the type of word from (50):

(81) Level 3: Footing
\[(x)\]
\[\text{çe} \text{mu} <\text{ce}>\]

Level 5: Footing
\[(x) (x)\]
\[\text{çe} \text{muć ba}\]

Foot Extrametricality
\[<x> (x)\]
\[\text{çe} \text{muć ba}\]

Postlexical: End Rule Left
\[(x)\]
\[<x> (x)\]
\[\text{çe} \text{muć ba}\]

As shown in \(\S\)5.3, even where the first syllable of the word is already extrametrical, a following CVV-initial foot is also ignored. For example, in the type of word from (54):

(82) Level 2: Syllable Extrametricality
\[<\text{šu}> \text{qe}^\text{a}^r\]

Level 3: Footing
\[(x)\]
\[<\text{šu}> \text{qe}^\text{a}^r \text{te}^\text{u}\]

Level 5: Footing
\[(x)\]
\[<\text{šu}> \text{qe}^\text{a}^r \text{te}^\text{u}\]

Foot Extrametricality
\[<x>\]
\[<\text{šu}> \text{qe}^\text{a}^r \text{te}^\text{u}\]

\(^{14}\) The optional syllable in this foot is always the result of CV Adjunction, suggesting that perhaps Foot Extrametricality should apply to a simple CVV foot, and CV Adjunction should then adjoin the light syllable to the invisible foot. The problem with this analysis is that CV Adjunction must apply to stem-final syllables in level 3, which would exhaust the domain. That ought to prevent the rule from applying in level 3, but we have seen in \(\S\)5.5.1 that CV Adjunction cannot apply in later levels. I assume, therefore, that CV Adjunction precedes Foot Extrametricality, and the latter rule must include reference to the optional syllable. Foot Extrametricality is prevented from applying to a stem-final anti-iamb in level 3, but can apply in level 4 or 5 if additional suffixal material makes it possible.

193
Postlexical: End Rule Left

The existence of two extrametrical constituents at the same edge of a domain is not permitted under the standard interpretation of the Peripherality Condition. It is permitted, however, if peripherality is determined independently for each type of constituent: we can term this the HIERARCHICAL approach. In Kashaya, the extrametrical foot is peripheral at the foot level: the initial syllable is marked invisible before Foot Construction applies, and therefore never receives foot structure. Since both the syllable and foot are peripheral on their own levels, under a hierarchical interpretation the Peripherality Condition permits this cumulative extrametricality. The general issue of cumulativity is discussed further in §5.6.

The Non-Exhaustiveness Condition is not hierarchical in the way that I have proposed for the Peripherality Condition, and is not blocked from applying to a foot in a word that has no other feet (as in (82)): there is no requirement that every word have foot structure, only that invisibility be at the edge of a domain (with the edge defined hierarchically). The Non-Exhaustiveness Condition cares only about whether there is a minimal amount of material left in a word (apparently a syllable in Kashaya: see §5.7.1).

Since Foot Extrametricality is active postlexically and applies to a phrasal domain, it is not blocked the Non-Exhaustiveness Condition when a word-final CVV foot is internal to a phrase:

(83) 

\[
\begin{array}{c}
\langle x \rangle \\
\langle x \rangle \\
\langle ?i \rangle c^b a \cdot c^b i \ lâ \cdot \ law
\end{array}
\]

This explains the facts of (52). The Peripherality Condition, even under the hierarchical interpretation proposed here, prevents the reapplication of Foot Extrametricality to the same domain, in accordance with (53):

(84) 

\[
\begin{array}{c}
\langle x \rangle \\
\langle x \rangle \\
\langle mi \rangle ku \ 'të \ 'mu
\end{array}
\]
While the syllable and first foot in (84) are both peripheral on their own levels, the next CVV foot, /te/, is not peripheral and cannot be marked extrametrical, so it takes the stress. This is true even though Foot Extrametricality can apply to /kur/ in level 5 of the lexicon (the Non-Exhaustiveness Condition does not prevent it, since the word is miku-te'), and is still active postlexically where it should otherwise target /te/.

5.5.4. Foot Flipping as a Rule

Because Foot Extrametricality is sensitive to the presence of a long vowel in the first syllable of the foot, the change in vowel lengths in the anti-iamb must follow the assignment of extrametricality. One possible formalization of Foot Flipping is simply to change the anti-iamb into a true iamb, and derive the changes in vowel length from other rules. For example, we might derive the lengthening of the vowel in the second syllable from its metrically strong position, but we have already seen that Iambic Lengthening is no longer active after level 3, and Flipping must often be delayed until level 4 or 5. In addition, this solution would still require another rule ("Iambic Shortening") which applies to a vowel in metrically weak position. While motivated by the nature of iambics, such a rule is otherwise unnecessary in Kashaya. I suggest a more ad hoc rule, ordered after Foot Extrametricality, which simply corrects the anti-iamb all at once:

(85) Foot Flipping

\[
\begin{array}{c c}
\sigma & \sigma \\
\mu & \mu \\
\end{array}
\Rightarrow
\begin{array}{c c}
\sigma & \sigma \\
\mu & \mu \\
\end{array}
\]

Since it makes no reference to boundaries, Foot Flipping is not respectful of extrametricality (Poser 1984, 1986, Selkirk 1984). It happens, in fact, that the only feet which undergo Foot Flipping are invisible. To prevent application to intermediate forms in level 3, where it is not yet certain whether the next suffix will preserve the anti-iamb, Foot
Flipping must apply only at the word level. It would be possible to accomplish the same ordering restriction by applying Foot Flipping only to extrametrical feet (including such feet at level 3, where enough suffixal material already exists to ensure preservation of the ant-iamb), but that seems an unusual condition to put on a metrical rule. On the other hand, one could suggest that the Free Element Condition, which requires metrical rules to be structure-building only (Prince 1985), is a condition on visible feet only: it blocks the rule for visible feet, but permits it when the foot is outside the visible domain. This way Foot Flipping itself makes no specific reference to extrametricality, but can affect only invisible feet. The alternative (which I tentatively adopt) is to ignore the Strong Domain Hypothesis and restrict the rule to level 5.

We are now in a position to give the complete derivation of some of the words from §5.3. A word such as cadu'cedu ‘always flies’ from (39) proceeds as follows:

(86) Level 3: Footing, CV Adjunction
     \[(x .)\]
     \[h \text{ ca' du ce } \langle n \rangle\]

Level 5: Footing
     \[(x .)(. x)\]
     \[h \text{ ca' du ce du}\]

Foot Extrametricality
     \[< x >(. x)\]
     \[h \text{ ca' du ce du}\]

Foot Flipping
     \[< . x >(. x)\]
     \[h \text{ ca du' ce du}\]

Postlexical: End Rule Left
     \[< . x >(. x)\]
     \[\text{ca du' ce du}\]

Contrast this with the more straightforward derivation of cadu'cedu ‘always sees’:

(87) Level 3: Footing
     \[(. x)\]
     \[\text{ca du ce } \langle n \rangle\]

Iambic Lengthening
     \[(. x)\]
     \[\text{ca du' ce } \langle n \rangle\]

Level 5: Footing
     \[(. x)(. x)\]
     \[\text{ca du' ce du}\]
Postlexical:  End Rule Left

\[
( \ x \ )
(. \ x)(. \ x)
ca \ dü' \ ce \ du
\]

Since the first foot is visible, the stress falls on the second syllable.

As mentioned above, Parasitic Delinking applies to remove the anti-iamb when a consonant which is extraprosodic in level 3 — thereby permitting CV Adjunction to apply — becomes visible in a later level and syllabifies as the coda of the second syllable in the anti-iamb. This bleeds Foot Flipping:

(88)  Level 2:  Syllable Extrametricality  \(<p^i> \ la<.\>

Level 3:  Footing, CV Adjunction  \(<p^i> \ la' \ ci \ <c>

Level 5:  Delinking, Footing  \(<p^i> \ la' \ ci{c}q^h\)

Foot Extrametricality  \(<p^i> \ la' \ ci{c}q^h\)

Postlexical:  End Rule Left  \(<p^i> \ la' \ ci{c}q^h\)

After Parasitic Delinking applies, there is no indication that CV Adjunction ever applied. This is exactly the result we need, since Flipping cannot occur in this word.

It is not possible to show that the invisibility assigned by Foot Extrametricality to a CVV foot persists to the postlexical component, since the rule is necessarily postlexical as well and can apply there to the CVV foot — this instance of Foot Extrametricality does not depend on morphological information the way that Syllable Extrametricality does. Still, we might expect it to persist like Syllable Extrametricality, and the source should have no effect on the later fate of the invisibility. Real evidence for the persistence of lexically assigned Foot Extrametricality comes from cases where Foot Flipping occurs. This lexical operation removes the initial long nucleus which triggers Foot Extrametricality, so it is not possible to reapply the Extrametricality rule postlexically to the same effect.
We can demonstrate the need for persistence of Foot Extrametricality by examining phrases which begin in a word that undergoes Foot Extrametricality and Foot Flipping, but the remaining visible material is insufficient for the construction of a foot. When another word follows in the phrase, a branching iamb is formed and the stress falls on the first syllable of that following word. This happens regardless of the way the stressed syllable was footed in the lexicon. The stressed syllable might have been invisible:

(89)  \text{mo-ala-\text{\`a}ma} \ ‘after running down’ \quad \text{ca-hci-w} \ ‘sit down’

\begin{align*}
\text{<. } x> & \quad (x) \\
\text{mo la' ba} & \quad <\text{ca}h> \text{ ciw}
\end{align*}

But since it is nonperipheral postlexically it loses its extrametricality and is stressed:

(90)  \text{<. } x> (x) (x) \\
\text{mo la’ ba cáh ciw} \quad \text{‘he ran down and then sat down’ [3.13]}

Naturally, as a metrical rule Deforestation does not apply to an extrametrical foot. This is consistent with the position that only rules which refer to domain edges are sensitive to invisibility, in the sense that Deforestation removes all foot structure from the beginning to the end of the domain. The invisible foot is excluded from this domain, and is immune to the effect of the rule. This behavior contrasts with a rule such as Foot Flipping, which looks only at the internal structure of a foot, without regard for the location of that foot in or out of the visible domain.

The following words have a similar structure to those in (89):

(91)  \text{wa-ala-\text{\`a}ma} \ ‘after going down’ \quad \text{mi\text{\`i}-c-?} \ ‘lie down’

\begin{align*}
\text{<. } x> & \quad (x) \\
\text{wa la’ ba} & \quad <\text{mi}> \text{ ti?}
\end{align*}

The stressed syllable is open in this case, showing more clearly that it is part of a branching iamb which bridges the word boundary:
(92) \( (x) \)
\(<. \ x>(. \ x) (x)\)
\(\text{wa la' ba mi ti}\?\) "he went down and then lay down" [3.17]

In the following case, there is no Syllable Extrametricality in the lexicon:

(93) \(\text{mo-ala-p'i} \) ‘after running down (Fut)’ \(\text{ca'i} \) ‘look!’
\(<. \ x>\)
\(\text{mo la' p'i} \)
\(\text{ca du} \)

In the phrasal representation, the lexical foot has clearly been replaced by a new postlexical foot:

(94) \( (x) \)
\(<. \ x>(. \ x)\)
\(\text{mo la' p'i ca du} \) ‘look at yourself running down!’ [3.17]

These data follow naturally from my claim that postlexical Deforestation clears the way for new foot structure within the visible domain. Obviously, the stress cannot be assigned lexically in these cases (even if one were to propose the otherwise unnecessary assignment of stress in the lexicon). Instead, the lexically assigned extrametricality must persist to the phrasal level, where stress is actually assigned to a domain which bridges words.

A slightly different situation holds when it is the second word which undergoes Foot Flipping:

(95) \(\text{cuhni} \) ‘bread’ \(\text{mu-ino-k-iinic}? \) ‘start to rise’
\(<\text{cuh}> \text{ni' }\)
\(<. \ x> (x) \)
\(<\text{mo} > \text{bo ki' bi}?\)

Phrasally, the invisible syllable and foot in the verb are not peripheral and lose their extrametricality, while the CVV foot of ‘bread’ is no longer prevented from undergoing Foot Extrametricality by the Non-Exhaustiveness Condition:

(96) \( (x) \)
\(<\text{cuh}>(. \ x) (x) (x)\)
\(<\text{cuh}> \text{ni' mo bo ki' bi}?\)
The stress falls on what was lexically the weak syllable of an extrametrical foot. Postlexically, that fact is obliterated by Deforestation and has no influence on the new foot structure. Application of Deforestation follows the concatenation of words into phrases, so that the nonperipherality of [boki'] renders it visible and susceptible to the loss of foot structure.

The following examples are given without all the foot structure, though both Syllable and Foot Extrametricality are indicated in the output:

(97)  \[ \begin{align*}
\text{baco} & \rightarrow <\text{ba}>&<\text{co}> & \text{sibó} & \text{du} & \text{a fleet of boats is sailing along'} [D] \\
\text{mo-alal} & \rightarrow <\text{mo}>&<\text{la}> & \text{sp} & \text{á} & \text{ma} & \text{run down and just stand there!'} [3.17]
\end{align*} \]

They can be analyzed in the same way as the forms considered above.

Foot Extrametricality always applies postlexically to a CVV.CV word such as \textit{mo du} 'run'. When material follows it in the phrase, as in (57), nothing remarkable happens:

(98)  \[ \begin{align*}
\text{x} & \rightarrow <\text{x}> & \text{du} & \text{2é} & \text{mu}
\end{align*} \]

When, on the other hand, the word is in isolation, Foot Extrametricality still applies, and application of End Ruie Left causes the formation of a degenerate foot over the stressed syllable:

(99)  \[ \begin{align*}
\text{x} & \rightarrow <\text{x}> & \text{du}
\end{align*} \]

This is the same use of the degenerate foot as seen in (24), though in this case the invisibility is from Foot Extrametricality rather than Syllable Extrametricality.

Words with the surface shape CVV.CV never undergo Foot Flipping. In most cases we can explain this fact easily: the word is too short in level 3 to undergo CV Adjunction. One example of such a word is \textit{cardu} 'fly!' from (59).
By the time the Imperative -i is added in level 5, CV Adjunction is no longer active. The same derivation holds for the words in (55). In another sort of case, however, there is enough material present in level 3 for CV Adjunction to apply. An example is mo'la 'run down!' [3.13]. Segmentally, its level 3 form is the same as its surface form.

In level 5, however, it also takes the Imperative, but that suffix elides and is lost (§6.6). There are two potential explanations for why Foot Flipping does not apply to the word in level 5. One is that the rule applies only to invisible feet, as mentioned above; since the anti-rhyme in mo'la- constitutes the entire domain, it cannot undergo Foot Extrametricality and the Free Element Condition prevents Foot Flipping from applying to the visible anti-rhyme. Postlexically, Deforestation removes the foot and creates new, regular structure, giving us the same output as in (100).

Another possibility, if the limitation of Foot Flipping to invisible feet is unacceptable, is that Mora Elision entails resyllabification and therefore Parasitic Delinking. As mentioned in §6.6, it is reasonable to say that Elision targets two vowels in the same syllable. If this is the case, the Imperative -i must first syllabify with the final vowel of mo'la-, creating a heavy syllable. That triggers Delinking, so that after Elision applies new foot structure is created — again, without the option of CV Adjunction since this is level 5 — and Foot Flipping is inapplicable.
(102) Level 5: Syllabification

\[ (\times \ldots) \]
\[
| mo' \ l\text{ai} |
\]

Refooting\(^{15}\)

\[ (\times) (\times) \]
\[
| mo' \ l\text{ai} |
\]

Foot Extrametricality

\[ <\times> (\times) \]
\[
| mo' \ l\text{ai} |
\]

Elision

\[ <\times> (\times) \]
\[
| mo' \ l\text{a} |
\]

Parasitic Delinking

\[ <\times> \]
\[
| mo' \ l\text{a} |
\]

Postlexical: End Rule Left

\[ (\times) \]
\[
| <\times> (\times) \]
\[
| mo' \ l\text{a} |
\]

The ordering of Elision and Refooting is not crucial, but I assume that Foot Construction and Parasitic Delinking are persistent rules which apply whenever their structural descriptions are met (Myers 1991a).

In all the cases of Foot Flipping illustrated above, the sequence CVV.CV spans a morpheme boundary. Forms with morpheme-internal CVV.CV fail to undergo Flipping:

(103) \[ ?a\text{ca}\dot{c}am\text{-at-aii} \rightarrow <\text{?a}>\text{ca}\dot{c}am\dot{a}\text{radu} \text{ ‘embryo start to develop (pl)’ [D]} \]
\[ ?\text{ya\text{y}ar\dot{q}a}\text{-w} \rightarrow <\text{?a}>\text{ya\text{y}oh\text{q}aw} \text{ ‘baptize’ [128]} \]

Since rules building prosodic structure normally apply freely to nonderived forms, these data support the position that CV Adjunction is a normal phonological rule, subject to derived-environment effects, which interacts with regular Foot Construction. This restriction on CV Adjunction also explains the following forms:

(104) \[ \text{ca\dot{h}ac-i} \rightarrow \text{ca\dot{h}ac\text{f}} \text{ ‘get married!’ [2.35]} \]
\[ \text{ma\text{r}ku\text{-c-\text{\acute{a}}nic-i}} \rightarrow \text{ma\text{r}ku\text{c\text{-\acute{i}bi}}} \text{ ‘start to grow deaf’ [127]} \]

\(^{15}\) For simplicity in the derivations, I refer to Foot Construction as ‘Footing’ and the joint application of Parasitic Delinking and Foot Construction as ‘Refooting’.

\(^{16}\) As shown in §6.4.3, a derived sequence of the form CVV.CV does undergo Flipping before the Causative suffix \(\text{h}\text{q}a\).
While the lack of Foot Flipping in these words might be taken as evidence that Syllable Extrametricality applies to CVV syllables, the fact that the CVV.CV sequence in nonderived also prevents it. The placement of stress can be explained by either Syllable or Foot Extrametricality. The best test for whether Syllable Extrametricality can apply to a CVV syllable would be a word which has a base of at least two syllables and begins with two CVV syllables. If the entire CVV.CV sequence were invisible, we would know that both Syllable and Foot Extrametricality had applied. I am not aware of any such word in Kashaya. The best evidence that Syllable Extrametricality does NOT apply to initial CVV is still marginal. This comes from *qo'la- ‘stand in a group’, the only root I have seen which begins in a CVV syllable, is at least disyllabic, and does not have irregular stress properties. Notice in the following word from Otis Parrish that Foot Flipping applies:

(105) qo'la-ani → qoladu ‘be standing together’ [3.13]

This is a clear indication that the initial syllable is visible in level 3 so that CV Adjunction can apply. Bun Lucas, on the other hand, gives words with this root where Foot Flipping does not apply:

(106) qo'la-ani → qoladu ‘a place to stand’ [2.101] 17
     qo'la-imic-ʔ → qolabiʔ ‘stand up together’ [2.101]

The initial syllable must still be visible, however, because the output of Elision is a short vowel rather than a long one (*qo'la-du); the same is actually true of (105). (See §6.6 for a discussion of Elision.) So while the application of Foot Flipping differs for the two speakers, 18 they agree in the point relevant to the present discussion: the initial CVV

17 This is simply a different way of defining the Absolutive form of the verb, which can serve a nominal function. The word is morphologically the same as that in (105).

18 The essential difference seems to lie in the application of CV Adjunction, which as illustrated in (103) requires a derived environment. It may be that for Otis Parrish the operation of Elision between the final vowel of qo'la- and the following suffix creates a derived environment for the rule to apply, but for Bun Lucas this is not sufficient — especially considering that the string /qo'la/ is unchanged after application of Elision. Perhaps in the latter case Elision does not require syllabification.
syllable does not undergo Syllable Extrametricality. Does this follow naturally from the formulation of Syllable Extrametricality, or is the root simply an exception? Since there is no conclusive evidence bearing on whether Syllable Extrametricality must be restricted to a short nucleus, I prefer to treat qo'la- as an exception, exactly parallel to the cases in §5.7.2, and keep the rule of Syllable Extrametricality simple.

5.5.5. Stress Shift, Literally?

The use of both Syllable and Foot Extrametricality requires a change in the interpretation of the Peripherality Condition, a change that many would be hesitant to make since it expands the power of the model. It is worth considering here why I have rejected an obvious alternative, which is that the effect of Stress Shift is due not to a rule of Foot Extrametricality but, literally, to a rule which shifts the stress one foot to the right. The rule can be formalized as the rightward movement of the ‘x’ grid mark placed by End Rule Left:

\[
(107) \quad \text{Move } X
\]

\[
\begin{array}{c}
x \\
\ \ \\
\sigma \ (\sigma ) \\
\mu \ \mu \\
\end{array}
\]

It is sensitive to the same CVV-initial foot as Foot Extrametricality in (80). The movement of the grid mark is constrained by independent principles, so that its ‘destination’ need not be specified. For example, the Continuous Column Constraint ensures that it will move to a position over a grid mark on the foot layer. Locality prevents it from moving past the first such grid mark. See Prince (1983) and Hayes (1991a) for discussion of these principles.
When End Rule Left results in a grid mark over a foot beginning in CVV, Move X applies, and stress is realized on the next foot to the right:

(108)  
\[
(\text{x} \quad \text{x}) \quad \text{qā' mūc ba} \quad \rightarrow \quad (\text{x} \quad \text{x}) \quad \text{qā' mūc ba}
\]

(109)  
\[
(\text{x} \quad \text{x}) \quad \text{<bú> wi' ci? t'u?} \quad \rightarrow \quad (\text{x} \quad \text{x}) \quad \text{<bú> wi' ci? t'u?}
\]

(110)  
\[
(\text{x} \quad \text{x}) \quad \text{<ʔi> má' ta ?em} \quad \rightarrow \quad (\text{x} \quad \text{x}) \quad \text{<ʔi> ma' ta ?ém}
\]

When there is no footed material in the rest of the domain, Move X must still apply to generate the correct results. We could assume that a degenerate foot is created in this situation, similar to when End Rule Left places the grid mark over an unfooted syllable:

(111)  
\[
(\text{x} \quad \text{x}) \quad \text{<ʔi> má' ta} \quad \rightarrow \quad (\text{x} \quad \text{x}) \quad \text{<ʔi> ma' tá}
\]

(112)  
\[
(\text{x} \quad \text{x}) \quad \text{mó' dú} \quad \rightarrow \quad (\text{x} \quad \text{x}) \quad \text{mo' dú}
\]

What is strange about this analysis is that the rule of Move X, when in its typical role of resolving a stress clash, normally fails to apply when there is no appropriate landing site for the grid mark (Prince 1983, Hayes 1991a). Under the Foot Extrametricality analysis I have proposed, the creation of a degenerate foot makes more sense, since every phrase requires a stress and the End Rule cannot fail to apply. In (111) and (112) the input to Move X includes a stress and there is less compelling reason for the rule to apply despite the need for a degenerate foot in the output.

Another, more serious problem comes with the use of the same rule of Move X with an anti-amb:
It is crucial that, when Move X applies, the anti-amb be distinct from the true iamb that it eventually becomes; otherwise the contrast illustrated by the minimal pairs in (39) and (47) will be neutralized. If the anti-amb still begins with a CVV syllable postlexically, however, it is easy to capture the phenomenon of Stress Shift in its two manifestations by means of the single rule Move X.

There is a fatal flaw in this analysis, however, which arises when a word which undergoes Foot Flipping is too short to receive foot structure after the flipped foot. Consider the verb *molo qoči* ‘run up out here!’ from (40). For proper vowel length in the final output, we need the following lexical derivation:

(115) Level 3: Footing, CV Adjunction

\[
\begin{align*}
(x .) & \rightarrow (x .) \langle \text{c} \rangle \\
\text{mo' lo qo } & \langle \text{c} \rangle
\end{align*}
\]

Level 5: Footing, CV Adjunction

\[
\begin{align*}
(x .) & \rightarrow (x .) \langle \text{c} \rangle \\
\text{mo' lo qo } & \langle \text{c} \rangle \\
\text{Foot Flipping} & \\
\langle . \rangle & \rightarrow \langle . \rangle \langle \text{c} \rangle \\
\text{mo' lo' qo } & \langle \text{c} \rangle
\end{align*}
\]

But the anti-amb must remain intact long enough to trigger Move X:

(116) Postlexical: End Rule Left

\[
\begin{align*}
(x .) & \rightarrow (x .) \langle \text{c} \rangle \\
\text{mo' lo qo } & \langle \text{c} \rangle
\end{align*}
\]

Move X

\[
\begin{align*}
(x .) & \rightarrow (x .) \langle \text{c} \rangle \\
\text{mo' lo qo } & \langle \text{c} \rangle
\end{align*}
\]

That is, lexical Foot Flipping must follow postlexical Move X — an impossibility, unless End Rule Left and Move X apply in the lexicon as well. Under such an analysis, (116) is not postlexical but represents a stage in level 5 before Foot Flipping applies. In turn, the lexically assigned stress must not be erased by Deforestation, since Move X will not be
able to reapply postlexically after the anti-iamb has been flipped. This, of course, causes problems for the type of phrase illustrated by (94). Under an analysis where End Rule Left and Move X are lexical, the words from (93) have the following representations at the end of the lexicon:

(117)  mo-alap'i  ‘after running down (Fut)’  ca-ni-i  ‘look!’

\[
\begin{align*}
( \times) \\
( . \times)(\times) \\
mo \ la' \ p^{3}i \\
\end{align*} \quad \begin{align*}
( \times) \\
( . \times) \\
ca \ d\ddot{u} \\
\end{align*}
\]

Somehow we must effect the following transformation after phrasal concatenation:

(118)  \[
\begin{align*}
( \times)( \times) \\
( . \times)(\times) \\
mo \ la' \ p^{3}i \ ca \ d\ddot{u} \quad \rightarrow \quad moo \ la' \ p^{3}i \ ca \ d\ddot{u} \\
\end{align*}
\]

Of course, Deforestation is ruled out by forms such as (116), where the lexical application of Foot Flipping makes postlexical re-creation of the anti-iamb impossible. Here too, the fact that the first foot of molap'i must be skipped by reapplication of End Rule Left could not be derived from Move X, since Foot Flipping has already occurred. Similar problems exist for all cases where a foot spans a word boundary, and I see no principled means of deriving the result in (118). Under the extrametricality analysis, Deforestation applies freely and these forms present no problem at all.

5.6. Cumulativity and Peripherality

As mentioned above, in the traditional interpretation of the Peripherality Condition, a constituent can be extrametrical only if it ‘begins or ends the phonological string’ (Halle and Vergnaud 1987:50). Some assume that if any phonological material separates the constituent from the edge of the domain, the diacritic [+ex] which marks it as invisible is removed from the representation (Hayes 1981, 1982, Harris 1983, Pulleyblank 1986), while others assume that the diacritic is simply uninterpretable when it is nonperipheral.
(Archangeli 1984b, Halle and Vergnaud 1987). Under both of these approaches, however, any material which separates the extrametrical constituent from the edge of the domain is sufficient for it to be considered nonperipheral, regardless of the prosodic level on which the invisibility is marked. I term this LINEAR peripherality.

The analysis of Kashaya proposed above requires what I called the HIERARCHICAL interpretation of peripherality, where the extrametricality of an initial syllable does not block the extrametricality of a foot as well. Steriade (1991a:3) makes the same assumption, namely that ‘every level of structure (segments, moras, syllables, feet) is separately scanned to determine whether a potentially extrametrical constituent is peripheral.’ Inkelas (1989) goes even further and permits cumulative invisibility regardless of the level on which the constituents are located; I will not argue for this position here, since it appears to make the wrong prediction for blocking of Foot Extrametricality in Kashaya. We can state these two interpretations as follows:

(119) Linear Peripherality: A constituent is peripheral if no phonological material on any level of structure separates it from the edge of the domain.

(120) Hierarchical Peripherality: A constituent is peripheral if no phonological material on the same level of structure separates it from the edge of the domain.

In this section I discuss evidence from several languages which supports the existence of cumulative extrametricality as permitted by hierarchical peripherality.

Hayes (1991a) presents an analysis of Cairene Arabic which relies crucially on a linear interpretation of peripherality. In his analysis, Cairene has two extrametricality rules. One applies to a final consonant, accounting for final superheavy syllables and the light status of final CVC (the feet here are moraic trochees constructed left to right, with End Rule Right; all forms are Classical):

(121) (x) (x) 
\[ \text{dæ rdb } \langle > \] ‘I/you beat’

208
(122)  (x )
      (x . )
    ká ta <b>  ‘he wrote (pausal)’

The second rule applies to the second mora of a word-final long vowel, since these count as light also:

(123)  (x )
      (x . ) (x . ) (x . )
   ša já  ra tu  hú ma <a>  ‘their (dual) tree (nominative)’

A word-final VVC rime counts as heavy, however, suggesting it undergoes the consonant rule to create VV<C> but not also the mora rule to make a light syllable *V<VC>:

(124)  (x)
      (x) (x)
   haj jáa <t>  ‘pilgrimages’

If both the final consonant and mora were invisible, we predict a light final syllable which in this word would be unfooted:

(125)  (x )
      (x)
  *haj j’a <a><t>

Hayes accounts for this blocking by an appeal to peripherality: the final mora dominates a vocalic melody which is not peripheral, since there is an unsyllabified consonant after it:

(126)  * σ
      /
     / \<μ>
     / \<C>
    C V <C>

If peripherality is defined linearly, the final mora in (126) cannot be extrametrical.

There is, however, a means of generating the same result without linear peripherality: simply order the mora rule before the consonant rule, so that the still-visible consonant
blocks the mora rule from applying to the nonperipheral vocalic mora.\footnote{Assuming that the final consonant which eventually undergoes Consonant Extrametricality never receives a mora, under the analysis in (127) Vocalic Mora Extrametricality must target the second mora of a word-final vowel, rather than a word-final mora which is linked to the same vocalic features as the preceding mora. That is, the edge of the domain must be indicated at the Root level rather than the moraic level, or else the presence of the final consonant will not block the rule.}

\begin{center}
(127) \textit{Underlying Form} \quad \text{hajjaat}
\textit{Vocalic Mora Extrametricality} \quad \text{does not apply}
\textit{Consonant Extrametricality} \quad \text{hajjaat}\texttt{t}>
\end{center}

This ordering is not surprising, since the mora rule is restricted to Classical words and the consonant rule applies to all forms. (Note the final stress on the colloquial word \textit{gat\'o} ‘cake’.) That is, while the differing targets of the rules prevent the ordering from being predicted by the Elsewhere Condition (e.g. Kiparsky 1973), more restricted or idiosyncratic rules do tend to apply earlier in the phonology. Due to this alternate solution, Cairene does not strongly support linear peripherality. In addition, Hayes notes that the sources give conflicting information on final long vowels; Harrell (1960) ‘claims that no vowel length distinctions are maintained in final position in the pronunciation of Classical forms’ (Hayes 1991a:58). In other words, the final-mora rule may be superfluous, and the point moot.

Hayes’ treatment of Palestinian Arabic also requires a blocking effect under linear peripherality. In his analysis, all final consonants are extrametrical, but only those which complete a superheavy syllable are unsyllabified at the relevant stage of the derivation. Assuming linear peripherality along with the provision that ‘Extrametrical higher-level constituents may dominate extrametrical lower-level constituents’ (p. 90), the rule of foot extrametricality fails to apply when the final syllable is CVCC or CVVC, but not when it is CVC. The foot structure consists of moraic trochees constructed from left to right (i.e. left-strong, maximally two moras), with End Rule Right:
In (128a), the final /h/ is outside the syllable and therefore outside the final foot, so that the foot is nonperipheral. In (128b), on the other hand, the /h/ is syllabifiable according to the syllable structure of the language; but it is still extrametrical, so it does not contribute to the weight of the final syllable, which counts as light. Its presence in the syllable makes it part of the final foot, which is then peripheral and can undergo the extrametricality rule. The idea of a syllabified extrametrical segment is an odd one in light of Itô’s (1986) claims, but something like it is necessary to make this analysis work; an equivalent notion would be to stipulate that final VC rimes count as light.

Steriade (1991a) shows that it is possible to give an analysis of Palestinian in terms of mora extrametricality, which replaces both consonant and foot extrametricality. This requires the stipulation that final VC rimes are light, and the final C of a superheavy syllable is nonsyllabic but bears a mora (Itô 1990, Zec 1988). The two words in (128) receive the following structures:

Assumptions about foot construction remain identical. In both analyses the treatment of final VC rimes leaves something to be desired: in (128) because an extrametrical segment must be syllabified, and in (129) because the syllable is stipulated to be light. This idiosyncrasy could be implemented by a rule removing the consonantal mora that we would expect by general morification.
(130) \[ \mu \mu \rightarrow \varepsilon \mu \\text{w} \]

\[ \begin{array}{c}
\mu \mu \\
\varepsilon \\
\mathcal{C}
\end{array}\]

In its word-final environment and effect of deleting a mora, this rule resembles the word-final vowel shortening found in numerous languages, including Luganda (Hyman and Katamba, to appear), Hidatsa (Kenstowicz and Kisseberth 1977), and Kashaya (§6.8). In addition, it fits with recent research suggesting that the weight of CVC syllables is sensitive to contextual factors (Hayes 1991b). The syllable structure in (128b), by contrast, requires a significant rethinking of what it means for a segment to be extrametrical. Another advantage of Steriade’s approach is that there is just one extrametricality rule, surely a simplification from the two rules that Hayes uses.20 And most importantly for the present paper, under Steriade’s account we can maintain hierarchical peripherality.

Steriade gives similar evidence that an extrametrical consonant does not block the extrametricality of a syllable. For example, English nouns such as gldary, rélevancy, and Áristotle can be fit into the regular trochaic stress pattern if the final sonorant is underlyingly nonsyllabic (as proposed by Liberman and Prince 1977) and additionally the final syllable is extrametrical by the regular rule applying to nouns (Hayes 1981, 1982):

(131) \[\begin{array}{c}
\sigma \sigma <\sigma> \\
\mu \mu \mu \mu \\
\alpha \text{ri} \text{sto} \text{t} <1>
\end{array}\]

By permitting the final syllable to be extrametrical despite the extrasyllabic consonant, the stress can be treated as regular.21 Since the /l/ in (131) does not belong to a syllable, it has

---

20 Hayes’ analysis of Cairo Radio Arabic is identical to that of Palestinian except that the foot extrametricality rule is optional. We can adapt Steriade’s Palestinian analysis to Cairo Radio Arabic simply by making the mora extrametricality rule optional; the final consonant of a superheavy syllable is then unsyllabicated but moraically licensed (as in Kashaya: §6.1.1).

21 A complication in this example is that for some speakers the stress pattern is Áristotle, and it is not clear how the extrametrical syllable receives secondary stress. In general the English examples here present a less convincing for cumulativity than, for instance, the Latin case.
no effect on peripherality on the syllabic level. Similarly, in Latin a coda of the type /ks/ is permitted only word-finally; this fact can be captured by making the /s/ extrasyllabic. But in words ending /ks/, the normal rule of final-syllable extrametricality is not blocked from applying, so we get antepenultimate stress in such forms as *multiplex* 'with many folds' and *aurifex* 'goldsmith', and penultimate stress in *haruspex* 'diviner' where the final visible syllable is heavy. These stresses follow from the regular moraic trochee if final-syllable extrametricality is not blocked by the extrasyllabic /s/:

\[
\begin{array}{cccccccc}
\chi & \chi & \sigma & \sigma & <\sigma> \\
\mu & \mu & \mu & \mu & \mu \\
/\mu / \mu / \mu / \mu & /\mu / \mu / \mu \\
mùl tí plé k <s>
\end{array}
\]

Once again, hierarchical peripherality makes it possible to incorporate these facts into the regular stress pattern.

Another example of simultaneous extrametricality on two levels comes from Yawelmani. Archangeli (1984b) shows that stress in Yawelmani is penultimate except when the last syllable of the word contains the Durative suffix -xoo, which shortens to -xo in a closed syllable:

---

22 The final consonants in these words could be treated as subject to CONTINGENT extrasyllabicity (Goldsmith 1990); they are unsyllabifiable according to the syllable structure of the language, rather than unsyllabified by a general rule of final-consonant extraprosodicity (Itô 1986). This contingent extrametricality seems a different sort of phenomenon from rule-generated LICENSED invisibility, which applies regardless of whether a segment is syllabifiable, and in fact could be thought of as stray consonants which are syllabified before Stray Erasure occurs. As such they need not be subject to the Peripherality Condition themselves, and in a word such as *gálaxy* both segments /sy/ could be considered stray; but they still occupy positions on the segmental tier, and under a theory where peripherality is not hierarchical these segments would prevent extrametricality of the final syllable. In my approach, it does not matter for the syllabic level whether these final consonants are marked by licensed or contingent extrametricality, or simply stray; in none of these cases are they dominated by syllable structure, so they have no effect on peripherality at that level. Of course, if we permit unsyllabified clusters such as /sy/, they cannot both be invisible in the normal sense since they are two constituents at the same level; for present purposes I assume that they are stray.

23 There is one other case of extrametricality in a morphologically determined Yawelmani template, the 'A-induced plural', which can also result in antepenultimate stress; see Archangeli (1984b).
(133) ħōyeehánaʔ?  
ʔohyōʔohin  
hiwtnay  
‘messenger-SUBJ’  
‘searched for’  
‘while walking’

(134) hóoyexot  
ʔōhyoxoʔ?  
manééʔaxoʔ?  
‘is being sent’  
‘is searching’  
‘is increasing’

(135) hoynílxoʔ?  
ʔoyoowfíxxot  
‘rallies’  
‘was being pitied’

Assuming final-consonant extraprosodicity, the stress can be treated as in Latin, with moraic trochees constructed from the right edge of the word and End Rule Right:24

(136) (x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(x)  
(hōo yee há na <it>  
hoó ye <xot>  
hoyní <xot>

I assume that -xoo triggers an idiosyncratic rule of final-syllable extrametricality on the cycle where it is affixed:25

(137) σ → <σ> / _ _ _

In all the examples given, however, notice that -xoo is never actually final in the word: it is followed by the Future -ʔ or Passive -t. In my analysis, final consonants are already extrametrical; this follows the universal predictions of Itô (1986) and permits us to use moraic trochees to generate the stress pattern.26 With hierarchical peripherality, we also

24 In her analysis, Archangeli essentially uses syllabic trochees and includes reference to a preceding light syllable in the extrametricality rule. By using the moraic trochee in Yawelmani, we account automatically for the fact that stress is penultimate when the syllable preceding -xoo is heavy. My reanalysis predicts that a long vowel directly preceding -xoo will take the stress, but since long vowels are always shortened before -xoo, the situation never arises. Also, a final syllable with a long vowel is predicted to be stressed, but I could find no examples of this in Archangeli (1984b) or Newman (1944).

25 Archangeli (1984b) has a rule which apparently assigns extrametricality to the segmental content of the suffix -xoo (the peripherality of which is dubious). The extrametricality is then transferred to the dominating syllable by the Percolation Convention: a feature of a syllable head (vowel) percolates up to the syllable itself. This invisibility is preserved when a consonantal suffix follows -xoo, since it has percolated up to the syllable and the consonant suffix becomes part of that syllable. My account does not require the Percolation Convention, nor the assignment of extrametricality to a morphological (rather than phonological) constituent.

26 Since the long vowel in -xoo shortens before the word-final consonant, that consonant must dominate a mora at some point in the derivation to cause closed-syllable shortening. It may be that this
explain why -xoo remains extrametrical. When the final consonant suffix is added and marked extraprosodic by general rule, the two invisible constituents are on different levels and the Peripherality Condition is satisfied:

\[
\begin{align*}
\sigma & \quad \sigma \quad <\sigma> \\
\wedge & \quad \wedge \quad \wedge \\
\mu\mu & \quad \mu & \quad \mu\mu \\
\wedge/ & \quad \wedge & \quad \wedge/ \\
\text{h o y e x o} & \quad <t>
\end{align*}
\]

Construction of a moraic trochee yields initial stress (as in (136)). Of course, when the following suffixal material contains a vowel, it projects a syllable node; -xoo is no longer peripheral on the syllable level, and its extrametricality is lost (or uninterpreted). Regular penultimate stress results, as in maawoxoohin ‘was playing the harp’.

Given a hierarchical interpretation of peripherality, and a hierarchical representation which consists of perhaps four word-internal levels, we predict that the following cumulative extrametricality is possible among prosodic constituents:

\[
\begin{align*}
\text{Word} & \quad \wedge \\
\text{Foot} & \quad \wedge \quad <F> \\
\text{Syllable} & \quad \sigma \quad \sigma \quad \sigma \quad \sigma \quad <\sigma> \\
\text{Mora} & \quad \mu \quad \mu \quad \mu \quad \mu \quad \mu \quad <\mu> \\
\text{Segment} & \quad \text{CV CV CV CV CV} \quad <\circ>
\end{align*}
\]

We could add to this the invisibility of tones (Pulleyblank 1986). Naturally it would be quite surprising to find a language which simultaneously takes advantage of all these possibilities, but I attribute this gap to the overwhelming markedness of such a hypothetical system rather than to its formal impossibility. It is already rare for a language to have more than one extrametricality rule, since each rule adds to the opaqueness of the stress pattern and there would be strong diachronic pressure to simplify one which becomes too cumbersome; as Janda (1984) argues in a different context, we must distinguish impossible shortening is ordered after postlexical stress placement, as in Kashaya (§6.2).
grammars from those unlikely to arise historically. The extrametricality of each of these constituents is attested in individual cases,27 and I have suggested here that there are languages which take limited advantage of the combinatorial possibilities by marking both consonants and syllables extrametrical. Kashaya exploits another potential combination with extrametricality rules that apply cumulatively to a syllable and a foot. Some combinations may be unlikely since they overlap empirically: as illustrated in (129), a mora is very often the equivalent of a syllable or a segment. Whether other predictions are borne out, such as the cumulative invisibility of a mora and a foot, is a matter for future research.

5.7. Further Issues

In this section I address two remaining matters relevant to Kashaya metrical phonology: the lengthening of certain vowels before level 2 suffixes (§5.7.1), and the apparent blocking of Syllable Extrametricality in words that begin with a laryngeal increment (§5.7.2).

5.7.1. Presuffixal Lengthening

A process I call Presuffixal Lengthening occurs in level 2. There are three level 2 suffixes which are normally single consonants: the Essive -m, Terrestrial -c, and Semelfactive -c.28 When one of these suffixes is added to a stem of the shape CVCV, the presuffixal vowel lengthens, to produce an output (after suffixation) of CVCVVC:

---

27 For example, final consonants in English (Hayes 1982) and perhaps universally (Itô 1986); the vowel in Vata (Kiparsky 1985) and Tonga (Pulleyblank 1986); the mora in Japanese (Poser 1984); the rime or syllable in English and many other languages (Hayes 1982); the foot in Palestinian Arabic (Hayes 1987); even the final word in English compounds (Prince 1983). Following Myers (1987), Poser (1984), Selkirk (1984), and others, I assume that extrametricality is a property of phonological constituents, not morphemes, although a morpheme can trigger a rule which makes a phonological constituent extrametrical.

28 The other level 2 suffix, the Plural Movement -h, does not induce this lengthening since it creates a closed syllable before it. The limited allomorph -cc of the Semelfactive also fails to induce it, for the same reason. See below on the Semelfactive -hci.
(140) ˈna-na-m- → ˈdana-r- ‘cover with the hand’ [158]  
maʔa-c- → maʔa-c- ‘eat one (bite)’ [163]  
miʔi-c → miʔi-c- ‘lie down on the ground (sg)’ [161]  
mimə-c → mimə-c- ‘lie down on a bed (sg)’ [161]

When, on the other hand, the stem is of some other shape, no such lengthening occurs. This includes cases where the initial syllable is closed, i.e. CVCCV:

(141) cʰiʔi-m- → cʰʔdim- ‘hold in the air’ [159]  
naʔi-c- → daʔdic- ‘pick up’ [163]  
hiʔko-m- → hiʔkom- ‘be sitting on a chair (pl)’ [161]  
hiʔko-c- → hiʔkoc- ‘be sitting on the ground (pl)’ [161]

Note that the laryngeal increment counts as a coda consonant in this description. There is also no lengthening when the stem is monosyllabic:

(142) ʔno-m- → ʔdom- ‘hold the hand extended’ [159]  
hcʰe-c- → hcʰe-c- ‘pry once’ [163]

It is not possible to say that the suffixes are actually vowel-initial, e.g. -im and -ic, and the length in (140) is the result of Root Elision (§6.6), since the same rule ought to apply in (141) and (142). In addition, the form of the suffixes after a consonant-final stem confirms that they consist simply of -m or -c:

(143) kəl-m- → kəl- ‘peer down at’ [158]  
kəl-c- → kəl- ‘peek’ [165]  
niʔi-hyut-m- → dihyutʰm- ‘break by dropping onto an object off the ground’ [162]  
niʔi-hyut-c- → dihyutʰc- ‘break by dropping onto the ground’ [162]

Thus, the suffixes are consonant-initial, with lengthening of a stem-final vowel only when the preceding syllable is short. This is precisely the context where Iambic Lengthening ought to apply, though in this case there is no Syllable Extrametricality:

(144) (.) x  
maʔa ?a <c> → maʔaʔa <c>
Final-Consonant Extraprosodicity ensures that the final syllable is treated as open, and can undergo Lengthening.

Underived bases do not lengthen, whether or not there is a final consonant:

(145) a. Ɂa-hal- → *daha'-1- ‘dig’ [171]
   moʔon-   → *moʔon- ‘hit’ [177]

b. Ɂa-c'a- → dac'a- ‘grab’ [168]
   tinuwi-   → *buwi- ‘string’ [212]

Although, for example, Ɂa-hal- is morphologically complex, the prefix Ɂa- is added in level 1, where the lack of syllable structure prevents Iambic Lengthening from applying. In level 2, syllables are present, but the form no longer counts as derived. Thus, addition of the suffix is necessary to trigger application of Iambic Lengthening.

This Presuffixal Lengthening is different from the Iambic Lengthening which occurs later in the derivation. Most obvious is that here the initial syllable is incorporated into the foot structure. This can be accounted for if Iambic Lengthening is ordered before Syllable Extrametricality. The level 2 derivation of maʔac- would occur in the following steps:

(146) Level 2: Iambic Lengthening (.  x) ma ʔa' <c>
      Syllable Extrametricality (x) <ma> ʔa' <c>

In later levels, all words having bases of at least two syllables — including those with Presuffixal Lengthening — undergo metrical rules in a way that shows that their initial syllable is extrametrical. For example, the output of (146) undergoes the following subsequent derivation to create maʔaci'du (cf. (43)):

(147) Level 3: CV Adjunction  (x  .) <ma> ʔa' ci <n>
      Level 5: Foot Extrametricality <x  .> <ma> ʔa' ci du
      Foot Flipping   <x  > <ma> ʔa' ci du

218
In later levels, the invisibility of the first syllable persists from the time of its original assignment in level 2 and, in effect, precedes Iambic Lengthening. In level 2, however, the initial syllable starts out visible, and Foot Construction and Iambic Lengthening apply before it is marked invisible; this gives us the result illustrated in (98).

Naturally, at some point after Syllable Extrametricality applies, and before Iambic Lengthening applies again in level 3, the foot structure from level 2 must be eliminated so that new feet which respect the invisibility of the first syllable can be created. We could rely on Parasitic Delinking (§5.5.2) to apply when one of the syllables a foot dominates becomes invisible, since the assignment of extrametricality to a syllable is clearly relevant to foot structure. The derivation in (146), then, is more explicitly as shown here:

(148) Level 2: Iambic Lengthening (. x) ma ?a' <c>
Syllable Extrametricality (. x) <ma> ?a' <c>
Parasitic Delinking <ma> ?a' <c>
Footing (x) <ma> ?a' <c>

Thus, Parasitic Delinking could account for the different foot structures in levels 2 and 3.

The second difference between the two applications of Iambic Lengthening is the status of laryngeal increments. Since a syllable preceding an increment is always invisible in level 3 (§6.5), we have no evidence there for whether or not the increment bears weight in that syllable. The Decrement, however, is much easier to state if the increment is not part of

29 An alternative to Parasitic Delinking here is a rule of Deforestation which applies at the beginning of level 3 to clear the way for reapplication of Foot Construction. This approach has the advantage of relating the level 3 phenomenon to the Deforestation which occurs postlexically: it is actually the same rule which reapplies throughout the derivation. It has the disadvantage, however, that it appears to create a violation of the Stratum Domain Hypothesis (K.P. Mohanan 1982), since the rule does not apply in the intervening levels of the lexicon. If, for example, it applied in levels 4 and 5, it would eliminate the effect of CV Adjunction and Foot Flipping would not occur.

30 Stress placement shows clearly that postlexically an increment bears weight. This is predicted by the analysis in §6.4.
the syllable, but rather visible and moraically licensed (§6.5). To block level 2 Iambic
Lengthening in (141), on the other hand, the increment must be syllabified as a coda.
Naturally, this Syllabification precedes Syllable Extrametricality. It appears that we must
somehow remove the increment from the syllable, but there is no other motivation for this
structure-changing resyllabification. There is, however, another possible analysis of
Presuffixal Lengthening which does not rely on the syllabification of the increment, and
avoids this complication.

Nearly all the examples of the level 2 suffixes that I have seen are with stems of at least
two syllables — either a disyllabic root or a monosyllabic root and an instrumental prefix.
In these cases, an increment can have an effect on the weight of the preceding syllable, but
only if it forms part of the syllable which eventually undergoes Syllable Extrametricality.
As mentioned above, this creates problems for an analysis of the Decrement which requires
the increment to be visible and moraically licensed. Since the increment does bear a mora,
however, we have another way of looking at the source of vowel length before these
suffixes. Suppose that Syllable Extrametricality precedes Increment Delinking, giving us
the representation desired for the Decrement:

(149)  \[ <\sigma> \quad \sigma \]
\[ \mu \quad \mu \quad \mu \]
\[ h \quad i \quad k \quad o \]

Contrast this with a verb that has no increment:

(150)  \[ <\sigma> \quad \sigma \]
\[ \mu \quad \mu \]
\[ d \quad a \quad n \quad a \]

An obvious difference is that while the incremented stem *hėhko-* has two moras in the
visible domain, the unincremented *dana-* has only one. (The mora under the invisible
syllable counts as invisible as well.) The effect of Presuffixal Lengthening is to ensure that

220
the level 2 suffixes are preceded by at least two moras by adding a mora to the stem in (150) to make dana-:

(151) $\langle \sigma \rangle$ $
\begin{array}{c}
\mu \\
\mu \\
\mu \\
\mu \\
\mu \\
da \ n \ a <m>
\end{array}$

In other words, it is possible to think of Presuffixal Lengthening as the increase of the visible domain to a minimum of two moras.\(^{31}\) This is precisely the minimum size of a well-formed iamb, and languages which impose minimal word requirements typically define the minimal word as a foot (McCarthy and Prince 1986).

Supporting evidence for this analysis comes from the exceptional application of the Decrement with the Semelfactive. I know of one verb where this clearly applies, $\langle \nu \rangle \nu$-

'disembowel with the fingers':

(152) $\begin{array}{c}
\nu \rangle \nu \langle \text{wela} \\
\nu \rangle \mu \langle \text{c-i}
\end{array}$

$\rightarrow$ $\begin{array}{c}
\text{du} \rangle \text{buwela} \\
\text{du} \rangle \text{buci}
\end{array}$

'I am dressing (birds)' [D]

'scoop it out!' [D]

Notice in the second form that the Semelfactive -c is present and the increment is missing. There is also Presuffixal Lengthening. If suffixation of the Semelfactive precedes application of Syllable Extrametricality — as the Iambic Lengthening analysis requires — and the Decrement applies before suffixation (§6.5.2), that rule will have to pick out an increment which is not word-initial, significantly complicating the formulation of the rule. On the other hand, if Syllable Extrametricality precedes morphological operations — consistent with the minimal word analysis — the operation of the Decrement is simple.

Obviously, under this analysis a monosyllabic stem, which does not undergo Syllable Extrametricality, should also be susceptible to lengthening depending on whether an increment is present. I have seen only two examples of a level 2 suffix -m or -c added to a monosyllabic stem, shown in (142); both of these verbs have an increment, and fail to

\(^{31}\) Formally, the rule could be considered a special application of Initial-Syllable Lengthening (§8.6).
undergo Presuffixal Lengthening. Either the Iambic Lengthening or minimal word analysis accounts for these facts. I have no other relevant data on the Essive or Terrestrial, but a special allomorph of the Semelfactive, -hci, is found with three other monosyllabic stems, all of which are without an increment:

(153) ca- 'sit (sg)' ca-hci- 'sit down (sg)' [161]
    ni- 'hold' ni-hci- 'pick up' [165]
    ho- 'be hot' ho-hci- 'get hot' [165]

These are stems where the minimal word analysis predicts Presuffixal Lengthening before -m or -c, but those suffixes do not seem to be found here. The allomorph which does occur, however, has the interesting effect of adding weight to the preceding syllable by a different means, a coda consonant:

(154) σ σ σ
    \ / \ |
    μ μ μ μ
    \ / \ / \ /
    ca ca h c i

While the Iambic Lengthening analysis sheds no light on why exactly these roots should take a longer allomorph, under the minimal word analysis they can be seen as an alternate means of satisfying the minimum of two moras in the output.

Syllable Extrametricality applies to (154) after suffixation of -hci makes the domain longer than a syllable. This is relevant to when Syllable Extrametricality applies in general: it must precede suffixation to make the mora count right, and must follow suffixation to apply to cahci-, but must not apply to the other level 2 forms which undergo Epenthesis to become longer than a syllable:

(155) ?ni-o-m-c- → ?domci 'extend the hand' [159]
    hca-hc- → hcahti- 'run (pl)' [179]

It appears that Syllable Extrametricality is cyclic, but precedes Epenthesis. The Non-Exhaustiveness Condition is sensitive to a minimum domain of one syllable, since the final
morified /c/ or /t/ which later triggers Epenthesis (§6.3.1) is not enough to permit application of Extrametricality, even though strictly speaking there would be something left in the domain (i.e. a mora). This fits with the fact that there are words in Kashaya that end up with just one visible syllable, but no reason to think that there are words with a mora but no syllable.

5.7.2. ‘Blocking’ of Syllable Extrametricality

Syllable Extrametricality never applies when the initial consonant of the base is incremented, even if the base is longer than one syllable. This is true of both nouns (a) and verbs (b):

(156) a. hsi bó
       hcomá

       ‘three’
       ‘feast’

   b. hqow’il-
      hšokó-
      ṭdabáme-
      ṭdané-
      ṭkulú-

      ‘return’ [166]
      ‘sit’ [D]
      ‘throw away a nonlong object’ [180]
      ‘throw away a long object’ [180]
      ‘cough’ [21]

The locations of stress and the effect of Iambic Lengthening in (156), abstracted away from the presence of suffixes, show that the first syllable is visible in each case. This is true even when the increment is eventually lost at the phrasal level:32

(157)  ḥsi bó-ṭe mu        → sibó-te mu        ‘there are three of them’ [3.14]
       ṭkulú-meň-i     → kulú-medu        ‘be coughing’ [3.14]

In addition, the choice of the allomorph -men’ for the Durative shows that the first syllable is not extrametrical; after a vowel which is in the first visible syllable of the stem, the Durative is -čiňı (§8.3.3).

32 In fact, the extrametricality of the first syllable cannot be tested when the increment survives, since that is possible only when the word is nonperipheral (§6.4).
It would be easy to explain the blocking of Syllable Extrametricality in these bases under a theory of linear peripherality, since the increment is moraically licensed and would render the initial syllable nonperipheral:

(158) * \(<\alpha> \sigma\) \\
     \mid \mid \mu \mu \mu \mid \mid \h \co \ma

I have already argued, however, for hierarchical peripherality, which does not prevent Syllable Extrametricality here.\textsuperscript{33} In fact, it appears that the presence of the increment in these words which fail to undergo the rule is basically coincidental. There are other words which also are exceptions to the rule, but where appeal to peripherality is of no use since there is no increment:

(159) damîhca- \\
     damît- \\
     \textit{rusāq-} \\
     \textit{matārmen} \\
     \textit{miyā-} \\
     ‘throw away a group of objects’ [180]\textsuperscript{34} \\
     ‘throw away objects separately’ [180] \\
     ‘wash one’s face’ [100] \\
     ‘my/our brother’s wife’ \\
     Third-Person Possessive

What many of these exceptional forms seem to have in common is the historical application of Aphesis (§8.4): the initial (extrametrical) syllable was deleted, but stress did not move.:\textsuperscript{35}

(160) \textit{*hamiya-} > \textit{miya-} \\
     \textit{*tōhcoma} > \textit{hcoma}

\textsuperscript{33} An alternative to targeting a syllable is to target a single mora directly, since there is no conclusive evidence that Syllable Extrametricality applies to CVV syllables. ‘Mora Extrametricality’ offers an explanation for the forms in (156) even in a hierarchical interpretation of peripherality — the incremental mora makes the nuclear mora of the first syllable nonperipheral. It raises, however, the complication of why Mora Extrametricality applies to CVC (see (22) and (23)) but not to CVV, even though both are binomic.

\textsuperscript{34} Actually, since \textit{damîhca-} has a closed second syllable, the extrametricality of the first syllable is not testable. We see below, however, that it can be analyzed in a way parallel to \textit{damît-}.

\textsuperscript{35} The form \textit{*hamiya-} is reconstructed for Proto-Pomo by McLendon (1973); \textit{tōhcoma} is a Southern Pomo word which retains the syllable now lost in Kashaya (Oswalt 1961:90).
To account for stress placement after this change, the new initial syllable had to be prevented from undergoing Syllable Extrametricality. I assume that the morpheme simply acquired a diacritic marking it as an exception to the rule, and I maintain this analysis synchronically.

Notice that the ‘throw away’ verbs in (156) and (159) share exceptionality to Syllable Extrametricality, but only those in (156), which are singulars, begin with an increment; this is no doubt related to the use of the Decrement to mark Plural Act (§6.5.1). These verbs are all clearly related to roots meaning ‘put’. They are shown here in their underlying form, without Iambic Lengthening:

(161) a. bane-  
    ʔda-bane-  
    ‘put a nonlong object’ [180]  
    ‘throw away a nonlong object’ [180]  

b. ne-  
    ʔda-ne-  
    ‘put a long object’ [180]  
    ‘throw away a long object’ [180]

(162) a. mihca-  
    da-mihca-  
    ‘put a group of objects’ [180]  
    ‘throw away a group of objects’ [180]  

b. mit-  
    da-mit-  
    ‘put objects separately’ [180]  
    ‘throw away objects separately’ [180]

What distinguishes the ‘put’ verbs from those meaning ‘throw away’ is the element (ʔ)da, itself no doubt the aphetized form of hiʔda ‘path, trail, road’. In a synchronic analysis which captures these obvious relationships, there is no reason even to mark the verbs as exceptions to Syllable Extrametricality. The compounding of ʔda and the verb root need only occur after Syllable Extrametricality applies, say in level 3, followed by the Decrement in the plural verbs:

(163) Level 2:   Syllable Extrametricality <mi>hca-  

Level 3:   Compounding  
Decrement  
ʔda<mi>hca-  
ʔda<mi>hca-
Because the extrametrical syllable is internal to the word, the Peripherality Condition prevents its interpretation (or effects its removal).\textsuperscript{36} Because Syllable Extrametricality does not reapply after Compounding, the complex verb only APPEARS to be an exception to the rule. Before it is combined with the verb root, $\dd{d}a$ goes through the leve{l} 1 and 2 rules itself (including Aphesis from $hi\dd{d}a$) but is unable to undergo Syllable Extrametricality due to the Non-Exhaustiveness Condition, and therefore brings no invisibility with it to the compounded form.\textsuperscript{37}

\textsuperscript{36} A technical aside: since it applies before Increment Delinking, the application of Syllable Extrametricality would not be blocked under the linear interpretation of peripherality; but once the increment is delinked and morified, the Peripherality Condition would either remove the [+ex] diacritic or prevent its interpretation. Subsequent loss of the increment in damiheca- and damit- could not be permitted to allow the reassertion of the [+ex] diacritic on the first syllable, favoring a Peripherality Condition which actually removes the diacritic. If my analysis is correct, however, this point is moot.

\textsuperscript{37} This compounding is, in the terminology of Inkelas (1989), Mcompounding, since it results in a single phonological word. It differs from the productive Pcompounding discussed in §8.5.
Chapter 6

Mora and Syllable Structure

In this chapter I discuss issues relating to the lower levels of the prosodic hierarchy in Kashaya, namely the mora and the syllable. §6.1 lays out the basic prosodic structure of the language. The phenomenon of Closed-Syllable Shortening is analyzed in §6.2 as a side effect of Syllabification. §6.3 gives a wide range of evidence for a limited type of Final-Consonant Extraprosodicity. We consider in §6.4 the implications of laryngeal increments for feature geometry and the linking of onset consonants to prosodic structure, and in §6.5 a rule which deletes an increment under certain morphological conditions. §6.6 gives two rules which resolve vowel-vowel sequences in the lexicon, while §6.7 describes a postlexical rule whereby vowel-glide sequences become long vowels. Finally, §6.8 motivates a morphologically triggered vowel-shortening rule, which differs from the general shortening of vowels word-finally.

6.1. Basic Prosodic Structure

The maximal syllable in Kashaya has two moras, taking the shape CVV or CVC; in this respect it is like a great many other languages. In addition, an onset is required in every syllable, so that the minimal syllable is CV. Word-finally one finds the superheavy syllables CVVC or CVCC. The following words illustrate the possible syllable structures; spaces represent syllable breaks:
(1) bu ța qá  ‘bear’
čiș kan  ‘pretty’
qa la’ ša  ‘moon’
yom ta  ‘dreamer’
țih yu’  ‘ice’
ma’ ku  ‘deaf’

(2) ce máy  ‘I saw it open in toward here’ [245]
șuh we’n  ‘is shaking’ [40]
dáw  ‘is pleasing’ [40]
yo țórë  ‘isn’t keeping it’ [99]
qa ne mëc’  ‘is related’ [40]
qa șov’që  ‘is getting well’ [40]

(3) si namqë  ‘must have drowned’ [243]
si namy  ‘just drowned’ [245]
si namië  ‘is not drowning’ [245]
mor lâns  ‘might have run down’ [250]
câc’që  ‘must have seen (pl)’ [2.70]
imh sârë  ‘isn’t taking it away’ [104]

The words in (1) show a variety of syllable structures, involving the types CV, CVV, and CVC. In (2) the words end in CVVC, while those in (3) end in CVCC. In this section I set forth the basic principles which derive this limited set of syllables: Morification (§6.1.1) and Syllabification (§6.1.2). There are also certain exceptional syllables in borrowings (§6.1.3). Discussion of superheavy syllables which arise during the derivation is deferred until §6.3.2.

6.1.1. Morification

As noted earlier, I assume the mordaic theory of Zec (1988), where the mora is treated as the lowest unit in the prosodic hierarchy (cf. Selkirk 1978, 1986, Nespor and Vogel 1982, 1986, Hayes 1989), given here without the higher-level phrases:
Every segment must be integrated into this prosodic structure: that is, a consonant or vowel is dominated by a mora, which is part of a syllable, etc. Due to the Strict Layer Hypothesis (Selkirk 1984), which states that it is not possible to skip layers in the prosodic hierarchy, if the mora is the lowest level of the hierarchy (Zec 1988) no segment can link directly to a syllable node, and the onset consonant must link to a mora. The rule of Morification groups segments under moras according to rising sonority. For example, a CV sequence rises in sonority and forms a single mora, while a following C is lower in sonority than the V and is given a separate mora:

\[
\text{C V C} \rightarrow \mu \mu
\]

The Morification algorithm is constrained so that it creates only moras of the type CV, C, and V. That is, a mora dominates a maximum of two segments; and when two segments are present, the first must belong to the low sonority class [+cons] and the second to the high sonority class [-cons].

In some cases, mora structure is present underlingly, and Morification makes use of this structure as well. For example, a long vowel has two underlying moras, and an onset consonant is simply linked to the first of these prespecified moras:

\[
\text{C V} \rightarrow \mu \mu
\]
Here, *Morification* does not introduce a new mora: it just accomplishes the linking of the consonant to a mora which is provided by the underlying representation of the vowel.

Ito (1986) argues that all segmental material must be **prosodically licensed** by association to a prosodic constituent, or by extraprosodicity, which serves as an alternate form of licensing. Any segment which is not licensed in one of these ways is deleted by Stray Erasure (Steriade 1982). Ito assumes that the prosodic constituent which licenses segments is the syllable. If, following Zec (1988), moras rather than syllables are the smallest members of the prosodic hierarchy, segments can be moraically licensed as well. That is, it is possible for a segment to be linked only to a mora for at least part of the derivation. This follows other work suggesting that association to a mora is sufficient to satisfy the prosodic licensing requirement: see Hyman (1985, 1990) for Gokana and other West African languages, Bagemihl (1991) for Bella Coola, and Lin (1987) for Piró.¹ I argue in §6.4.3 that syllable structure is absent in level 1 of the lexicon, so that all licensing there is by moras. In addition, I appeal to moraic licensing in the treatment of word-initial laryngeal increments (§6.4) and word-internal consonants following a long vowel (§6.2).

### 6.1.2. Syllabification

Syllabification is the grouping of moras into syllables. A Kashaya syllable can consist of one or two moras, but not more:

\[
\sigma
\begin{array}{c}
/ \\
\mu \ ( \mu \ )
\end{array}
\]

Zec (1988) argues that in a branching syllable, the moras are labeled ‘strong’ and ‘weak’ (similar to the labeling on feet) regardless of the type of segments dominated. In most cases (and always in Kashaya) the leftmost mora is the head of the syllable and is strong;

---

¹ This nonexhaustive syllabification is comparable to the use of nonexhaustive foot structure in a theory where degenerate feet are not created (e.g. Kager 1989, Hayes 1991a, Mester 1991).
the second mora is then weak. Nonbranching syllables contain unlabeled moras (but as the head, the single mora can be considered strong):

\[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\mu_s & \mu_w & \mu_s \\
\checkmark & \checkmark & \checkmark \\
\checkmark & \checkmark & \checkmark \\
\checkmark & \checkmark & \checkmark \\
\end{array}
\]

The strong mora is the head of the syllable. In Kashaya, the regular syllable types CV, CVV, and CVC contain an obligatory strong mora of the shape CV, with an optional weak mora which dominates either V or C.

There are no true diphthongs in Kashaya, i.e. syllables which contain more than one set of vocalic features. A consequence of this restriction is that while the weak mora can dominate either a vowel or a consonant, the only vowel possible under the weak mora is the same one which heads the strong mora, yielding a long vowel. This constraint is actually enforced by the productive rules of Root and Mora Elision (§6.6).

Besides strong/weak, another sort of distinction which can be made is that between nuclear and nonnuclear moras. A nuclear mora dominates a segment which is able to head a syllable (subject to language-specific determination). This labeling occurs in both branching and nonbranching syllables. I use the subscript ‘n’ for a nuclear mora, and ‘m’ for a nonnuclear (or ‘marginal’) mora:

\[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\mu_n & \mu_m & \mu_n \\
\checkmark & \checkmark & \checkmark \\
\checkmark & \checkmark & \checkmark \\
\checkmark & \checkmark & \checkmark \\
\end{array}
\]

This distinction between nuclear and nonnuclear moras is in line with the arguments of Steriade (1990), and also can be applied to the type of data presented by Levin (1985) in favor of a nucleus constituent in the syllable.\(^2\) These two mora types could be exploited to

\(^2\) A basic formal difference between Levin’s theory and a nuclear mora theory is that there, onsets are excluded from the nuclear constituent, but here they are syllabified under the first nuclear mora.
make possible a distinction between tone-bearing (i.e. nuclear) and non-tone-bearing moras in languages which require this difference (e.g. Hyman 1992). The nuclear labeling supplements, rather than replaces, the strong/weak (or head/non-head) distinction, since when a tone links to the first mora of a long vowel, it is necessary to refer to the head of the syllable (Poser 1984, Zec 1988, Inkelas and Zec 1988). The distinction between a short and long nucleus corresponds partly to that between a light and heavy syllable, except in the case of CVC, which has a short nucleus but (in Kashaya and many other languages) is heavy. We see below that the nucleus is useful in Kashaya for stating rules of allomorphy (§6.3.4) as well as formalizing the rule of Epenthesis (§6.3.1).

6.1.3. Exceptional Superheavy Syllables

While there are no examples of word-internal CVVC syllables in the native vocabulary, they do exist in certain loanwords. This results from a tendency to borrow stressed vowels as long (even if that vowel is not always stressed in Kashaya):

(10)    kú‘í pa   ‘fault’   (Spanish culpa)
Pó’s pa ra ‘match’   (Spanish fósforo)
man ta ‘material for clothes’   (Spanish manta ‘blanket’)
cáš ka ‘dishes’   (Russian čaška ‘cup’)
ʔa lirt’ ka ‘turnip’   (Russian rěd’ka ‘radish’)
báš k’oj ‘raspberries’   (Central Pomo bás’k’oj)

Following work which expresses exceptionality by prespecifying that element of the representation which must be prevented from undergoing the normal rules (Kiparsky 1982, 1990, Poser 1984, Pulleyblank 1986, Inkelas and Cho 1991), I treat these CVVC syllables as underlyingly morified:

(11)    μ   μ
        1
        1
    C V C

3 There is one example of such a syllable in the number system, i.e. námča ‘eleven’, which I would propose to treat in the same way as the borrowings. The initial element ná’(n) is found in ‘twelve’ and ‘thirteen’ as well, and is further exceptional in that it must be lexically marked as stressed.
Since the coda consonant is already linked to a mora, it does not undergo Morification; the only effect of Morification is to link the onset consonant to the following vowel’s mora (as in the case of a simple long vowel in (6)).

In an example such as kuvla, only the /u/ rime needs to be marked as exceptional; the rest of the structure follows from Morification:

\[
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
k u l p a \\
\rightarrow \\
k u l p a
\end{array}
\end{array}
\end{array}
\end{array}
\end{array}
\]

Syllabification applies regularly:

\[
\begin{array}{c}
\sigma \\
\begin{array}{c}
\sigma \\
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
\mu \mu \\
\begin{array}{c}
k u l p a
\end{array}
\end{array}
\end{array}
\end{array}
\end{array}
\end{array}
\]

Notice that the underlying morification in (11) violates the normal limit against branching weak moras that, together with the two-mora limit, is responsible for determining the limited syllable structure of Kashaya. This is because that constraint is a part of Morification, and is not relevant to structure which is given underlyingly rather than being produced by rule. At the syllabic level, where all structure is added by rule, the exceptional mora is treated like any other.

There are also CVVC syllables in borrowed vocabulary which occur at the end of the word:

\[
\begin{array}{lll}
(14) & \text{ka fé}^y & \text{‘coffee’} & \text{(Spanish} \text{ cafè)} \\
 & \text{wo tò}^n & \text{‘button’} & \text{(Spanish} \text{ botón)} \\
 & \text{scn tá}^w & \text{‘cent’} & \text{(Spanish} \text{ centavo)} \\
 & \text{ré}^y & \text{‘king’} & \text{(Spanish} \text{ rey)} \\
 & \text{pi čé}^l & \text{‘pitcher’} & \text{(English)} \\
 & \text{ca má}^y & \text{‘hello’} & \text{(Alutiiq)}
\end{array}
\]

\[\text{4 In the theory of Zec (1988), two underlying moras over a consonant are necessary to represent a geminate, so the prelinking of the coda to the weak mora does not predict a surface geminate, as it would for Hayes (1989b). If the coda must resyllabify as an onset, it is delinked from the weak mora (§6.3.5).}\]
I treat these with the same sort of underlying structure as in (12). Although as seen in (2) there are examples of CVVC at the end of words in native vocabulary, these all go through a particular rule which makes the syllable possible (§6.3.2). The same rule is responsible for the CVCC syllables in (3).

I know of one non-final CVCC syllable, in *huʔyiboiho* ‘gnat’. Interestingly, the offending syllable /tuyi/ has a glide as the first of the two consonants. I treat this syllable with an underlying complex nucleus, with the remaining moraic structure provided by rule:

\[
\begin{align*}
\mu \\
/\mu \\
? \ u \ y \ i 
\end{align*} \quad \rightarrow \quad \begin{align*}
\mu \\
/\mu \\
? \ u \ y \ i
\end{align*}
\]

This configuration has the advantage of accounting also for the fact that the /y/ fails to undergo Glide Deletion (§6.7), and as discussed in that section I use the same underlying linking of the vowel and glide to represent other glides which fail to undergo the rule (but which do not occur in superheavy syllables).

One complication in the treatment of irregular CVVC syllables is determining their mora labeling. Since the weak mora dominates both V and C, it is unclear whether it should be labeled nuclear or nonnuclear. The verb *resd̪r*- takes the allomorph -ʔ of the Absolutive which occurs after a nonnuclear mora, but I could not elicit it with the Locomotory, which is sensitive to the length of the preceding nucleus (§6.3.4). I would expect, however, that the presence of a long vowel should entail a heavy nucleus. It may be that the VC mora counts as nuclear for the calculation of overall length of the nucleus, but nonnuclear for rules which look only at the nature of the final mora of the syllable. Formally, this could be treated as double labeling: since the mora dominates both V and C, it is marked as nuclear and nonnuclear, in that order (μₐ,m). The mora counts as part of a heavy nucleus since it bears nuclear labeling, but a rule which looks at the right edge of the word or syllable will treat the mora as nonnuclear, since that labeling is ordered after the nuclear labeling. This would then resemble the ‘edge effect’ well known in the autosegmental

234
literature. Better evidence regarding this issue may come from languages in which CVVC syllables do not have such a marginal status as in Kashaya.

6.2. Closed-Syllable Shortening

It is not surprising, given the restrictions on Kashaya syllable structure outlined in §6.1.2, that when morphological concatenation leads to a word-internal CVVC syllable, the long vowel must shorten. Each of the verbs below is given first in a form where the underlying long vowel is allowed to surface (a), then in two instances where the vowel shortens (b):

(16) a. ca-ač·in  →  cač čín  ‘while flying (pl)’ [3.6]
b. ca-ač·qá  →  cač qá  ‘must have flown (pl)’ [2.70]
ca-ač·ti  →  caʔ ti  ‘about to fly (pl)’ [3.6]

(17) a. hi-ša·r-yá  →  hi šary  ‘about to break’ [3.6]
b. hi-ša·r-hqa-w  →  hi šah qáw  ‘cause to break’ [3.6]
hi-ša·m-qá  →  hi šameq  ‘must have broken’ [3.7]

(18) a. īa·hwe·n-i  →  dah we·ni  ‘shake your hand!’ [2.71]
b. īa·hwe·n-meʔ  →  dah wen méʔ  ‘shake your hands! (pl)’ [2.71]
īa·hwe·n-ti  →  dah wen ti  ‘about to shake one’s hand’ [2.71]

(19) a. siwic·in  →  siwícín  ‘while hanging’ [3.7]
b. siwic·meʔ  →  siwícmeʔ  ‘hang (there)! (pl)’ [3.7]
siwic·ma  →  siwícba  ‘after hanging’ [3.7]

It is clear that a nonfinal CVVC syllable — or a CVVCC syllable in final position — cannot be fit into the syllable structure of the language; shortening the vowel remedies the situation. The question remains: when and how does this shortening take place? I argue in this section that in CVVC syllables, the coda C is moraically licensed in the lexicon but not syllabified. Postlexically, a requirement for syllabic licensing overrides the two-mora limit so that an intermediate stage with three moras is permitted, but this is repaired by Closed-
Syllable Shortening.5

We know from Iambic Lengthening (§5.1) and CV Adjunction (§5.5.2) that coda consonants bear weight in the lexicon; this is the result of normal Morification. The data shown above indicate that a consonant after a CVV sequence also bears weight, since it causes shortening of the preceding vowel. This shortening cannot be immediate, however, because the CVV which eventually shortens is treated for the purposes of postlexical stress assignment as long: that is, it undergoes Foot Extrametricality. The stress on hišahqâw in (17b) is not *hišahqâw, which is expected from the surface form. Similarly, the stress on dahwenméʔ from (18b) is not *dahwenmeʔ. More examples where a long vowel is skipped by stress but surfaces as short:

(20) ı̂nâ-liʔ-qa-w  →  dalî̂tqâw  ‘let wave with the hand’ [103]
iiʔ-č-maŋʷ-i  →  dï̂cmaqô  ‘bring the message in!’ [190]
mo-aqʷ-qa-menį̂  →  mohqâmaʔdu  ‘drive’ [212]
sinam-ʔ-â-eʔ mu  →  sinamîʔe mu  ‘he didn’t drown’ [2.117]
qa̤-m-muč-yâ-eʔ  →  qa̤č-namâʔyeʔ  ‘race each other (NIVV)’ [297]
ca̤-weʔn-muč-ʔlî  →  cahwenmûfli  ‘a seesaw’ [204]
šu-qa-ʔ-a-m-muč-ʔ  →  šuqʷammûʔ  ‘pull apart’ [204]
ina-ı̂-ne-an-waʔ-i  →  baśeųwaŋdû  ‘direct around’ [135]
mo-ań-wn-ičen-i  →  mon̄waŋdûʔedû  ‘keep running here and there’ [221]
caḷ-no-ań-muč-éni-ʔkʷe  →  cahnoimûc̕-erik⁵  ‘should keep talking together’ [336]

The problem presented by the Kashaya data is not simply one of ordering, since both Morification and Syllabification must be available to apply to CVC syllables in the lexicon, well before stress placement. Rather, we must explain why these rules are prevented from applying in the same way to lexical CVVC syllables. I argue that the eventual coda

5 The apparent assumption in the previous literature is that languages will resolve an impossible CVVC syllable by shortening the vowel rather than deleting the coda consonant; this fact could be attributed to a principle of melody satisfaction, whereby a solution which results in no loss of melodic material is preferred over one which does involve such loss (in this case, the coda consonant). I am aware of no language which clearly violates this generalization (Myers 1991a, citing McCarthy 1987, makes a similar statement). FeiFei-Bamileke offers a potential counterexample, since all long vowels are underlyingly followed by a consonant, which surfaces only when a vowel follows (Hyman 1972). These consonants could, however, be analyzed as flating (as in French; cf. Tranel 1990), so that they never carry any weight — they either link as onsets or are lost — and would not be expected to trigger shortening.
consonant is morified in the lexicon, but is not syllabified (and therefore has no effect on syllable weight) until postlexically.\footnote{Buckley (1990) considers, and rejects, an alternative based on a moraic theory where consonants link directly to the syllable node (cf. Hayes 1989b, Archangeli 1989).}

Let us consider the derivation of \textit{hišahqw} (for the moment, with all segmental material considered at once, rather than cyclically). Only the long vowel needs underlying moraic structure:

\begin{equation}
(21) \quad \mu \mu \\
\hfill \text{hišahqw}
\end{equation}

Regular Morification applies to give the following result:

\begin{equation}
(22) \quad \mu \mu \mu \mu \mu \\
\hfill \text{hišahqw}
\end{equation}

If in Kashaya prosodic licensing is taken care of by Morification, it is not necessary for every segment also to be linked to a syllable. In fact, due to the bimoraic limit on syllables, I propose that the /h/ will not be able to join a syllable:

\begin{equation}
(23) \quad <\sigma> \sigma \sigma \\
\hfill \text{hišahqw}
\end{equation}

Syllable Extrametricality has applied to the first syllable. The /h/ cannot be a coda since the preceding syllable already has two moras; it cannot be an onset since there are no (regular) complex onsets; and it cannot head its own syllable since it is not sufficiently sonorous. The segment is not stray erased, however, since it is prosodically licensed by the mora.

Foot Construction and Foot Extrametricality yield the following result:
I assume that postlexically segments must be syllabically licensed, in addition to moraically licensed. I suggest that the requirement of syllabic licensing takes precedence over the bimoraic limit. Consequently, Syllabification occurs to satisfy prosodic licensing:

But since there is a maximum of two moras per syllable, the third mora immediately triggers Closed-Syllable Shortening:

This shortening is a side-effect of Syllabification rather than a true rule. Although the second syllable surfaces as CVC, the earlier long vowel is reflected in the placement of stress.

Of course, the addition of suffixes to the base *his*<i>a</i>* occurs in stages: -<i>qa</i> in level 3 and -<i>w</i> in level 5. Let us consider the derivation of a different form, *siwi*<i>c</i>mé<sup>♯</sup>* ‘hang! (pl)’ in (19b), and its implications for the application of Foot Extrametricality. The root *siwi*c- has the following structure, after Morification, Syllabification, and Foot Construction:

---

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The final consonant /c/ is extraprosodic. Foot Extrametricality is blocked by the Non-Exhaustiveness Condition. On the next cycle, -me is added. This makes /c/ visible; it morifies but cannot syllabify. As illustrated in §5.5.4, the presence of the unfooted syllable [me] is sufficient to permit the application of Foot Extrametricality to the preceding foot:

\[
\begin{array}{l}
\sigma \quad \sigma \\
\mu \quad \mu \quad \mu \quad \mu \\
\mu \quad \mu \quad \mu \quad \mu \\
\sigma \quad \mu \quad \mu \\
\end{array}
\]

From these word-internal data it is conceivable that Closed-Syllable Shortening takes place immediately, since Foot Extrametricality has applied lexically and the effect on stress can be achieved by persistence of the invisibility. However, see §6.3.3 for evidence that Closed-Syllable Shortening is postlexical, as assumed here.

Paradis (1988) claims that there is a hierarchy of constraints which depends on the focus of a constraint: metrical > syllabic > skeletal > segmental. The constraint which is higher in the structure takes precedence over one which is lower; the phonology can create a violation of the lower constraint in order to satisfy the higher one, but will then repair the newly created violation. Both constraints here involve the syllable: one requires syllabic licensing, the other limits the syllable to two moras. It is not entirely clear which should a priori be higher on the scale; but let us suppose that the syllabic licensing constraint has a syllabic focus, while the bimoraic limit has a skeletal focus (which in Paradis’ framework corresponds to our mora). From this assumption it follows that licensing will take precedence over the bimoraic limit. Since lexically segments need be licensed only moraically — which constraint would have a skeletal focus as well — the moraic licensing and the two-mora limit are equal in the lexicon and neither can create a violation of the other. It happens that moraic licensing can be accommodated by a structure-building operation without violating the bimoraic constraint, so that is what happens.
The correlation between the lexicon and moras on the one hand, and syllables and the postlexical component on the other, is reminiscent of work on other languages. For example, Hyman and Byarushengo (1984) note that tonal rules in Haya refer to moras in the lexicon, but syllables postlexically. Similarly, Zec (1988) proposes that in Bulgarian, Morification applies in level 1, but Syllabification not until level 2. Together with the proposal in §6.4.3 that Syllabification in Kashaya is not in effect until level 2 of the lexicon, we see the increasing relevance of syllables as the derivation progresses: no syllables in level 1; syllables in the rest of the lexicon but moraic licensing where necessary; and obligatory syllabic licensing postlexically.

There are several morphological operations which can result in the shortening of a long vowel in a closed syllable, so that it counts as CVC for postlexical stress. I show in §6.8, however, that this Morphological Shortening is distinct from the prosodically motivated shortening discussed here, and in fact has nothing to do with syllable structure.

6.3. Final-Consonant Extraprosodicity

The standard account for languages which permit superheavy syllables only in word-final position is to treat final consonants as extraprosodic (McCarthy 1979, Itō 1986). Not only does Kashaya have such syllables, but Itō (1986) has proposed that final consonants are extraprosodic in all languages during the lexical derivation (see also Borowsky 1986, Rice 1990). Besides accounting for the distribution of superheavy syllables, this extraprosodicity maintains the hypothesis that syllabification is a structure-building operation. For example, languages very often have consonant-final stems which can take vowel-initial suffixes. Itō suggests that, rather than taking a coda consonant and resyllabifying it as an onset, extraprosodicity makes possible an analysis where the final consonant was never syllabified in the first place, and simply links as an onset when it becomes non peripheral.
In Kashaya, there is good reason to believe that Final-Consonant Extraprosodicity applies only when the stem-final consonant is preceded by a vowel. This is intuitively reasonable, since only then does the ultimate position of the consonant in syllable structure truly depend on the nature of the following suffix. If the next suffix begins with a vowel, the consonant becomes an onset:

\[
\begin{array}{c}
\sigma \\
\mu \\
C V <C> + V \\
\end{array} \quad \leftrightarrow \quad C V C V
\]

But if the next suffix begins with a consonant, that consonant becomes an onset and the first consonant becomes a coda:

\[
\begin{array}{c}
\sigma \\
\mu \\
\mu \mu \mu \\
C V C <C> + C V \\
\end{array} \quad \leftrightarrow \quad C V C V
\]

When the stem-final consonant is preceded by another consonant — that is, when we start out with a stem-final CC cluster — the second consonant has no choice but to syllabify as an onset regardless of what follows, since it is not possible for both consonants to syllabify as a coda:

\[
\begin{array}{c}
\sigma \\
\mu \mu \\
\mu \mu \mu \\
C V C <C> + ... \\
\end{array} \quad \leftrightarrow \quad C V C C ... \\
\]

As we see in §6.3.2, the derivation of a word-final CC cluster, as illustrated in (3), is due to the application of a particular rule and not generated by extraprosodicity.

Final-Consonant Extraprosodicity is necessary after a vowel because if the consonant were visible and syllabified as a coda, we would expect it to undergo rules targeting coda consonants (§6.3.4). This makes the wrong prediction if the consonant eventually
becomes an onset, as in (29). As shown below in §6.3.1, however, Extraprosodicity must not occur in exactly the case illustrated in (31), where the eventual syllabification of the consonant is not in doubt. Accordingly, I restrict the application of the rule to a postvocalic environment:

(32)  \[ \text{Final-Consonant Extraprosodicity} \]

\[
\text{RC} \rightarrow <\text{RC}> / \quad \text{[} \]

This limitation on the application of the rule encodes the idea that exaprosodicity is used only when necessary — that is, only when the eventual syllabic position of the final consonant cannot be determined at that stage of the derivation. It avoids the need for structure-changing resyllabification, since Extraprosodicity fails to apply only when the stem-final consonant in question must surface as an onset.

The rest of this section is devoted to motivating the formulation of Final-Consonant Extraprosodicity in (32). §6.3.1 shows that Epenthesis must apply to final CC clusters before further suffixation, so both consonants must be visible to trigger the rule. §6.3.2 demonstrates the restricted distribution of superheavy syllables, and derives the possibility of such syllables not from Final-Consonant Extraprosodicity but from the rule of /ə/ Deletion together with the noncyclicity of the final level of the lexicon. §6.3.3 supports this position by showing that final CVVC syllables which do not benefit from /ə/ Deletion undergo Closed-Syllable Shortening to become CVC; this shows that the final consonant is visible and morified at the word level. §6.3.4 shows the role that Final-Consonant Extraprosodicity does play earlier in the lexicon, noting also that not every rule is respectful of this invisibility. Finally, §6.3.5 argues that while Final-Consonant Extraprosodicity makes resyllabification for the most part unnecessary, in a small set of exceptional words there is a place for a rule which permits a former coda to become an onset.
6.3.1. Epenthesis

It is clear from the interaction of Epenthesis and the choice of allomorphs that a stem-final CC cluster undergoes Epenthesis before the next suffix is added. This would not be expected if the second of these consonants were invisible, since a single stem-final consonant is easily syllabified.

Two suffixes (among others) show allomorphy based on whether the final segment of the stem is a consonant or a vowel. The Absolutive suffix is -ʔ after most consonants and -w after a vowel:

(33)  
\[
\begin{array}{ll}
\text{mo-m-ʔ} & \rightarrow \text{móin} & \text{‘run across’ [265]} \\
\text{čiʔwin-ʔ} & \rightarrow \text{čhwini} & \text{‘get red hot’ [171]} \\
\text{ňa-hai-ʔ} & \rightarrow \text{dahai} & \text{‘dig (a hole)’ [171]} \\
\text{mu-hk’uy-ʔ} & \rightarrow \text{muhk’uy} & \text{‘burn up’ [170]} \\
\text{lihnut-ʔ} & \rightarrow \text{libù} & \text{‘whistle’ [103]} \\
\text{piʔot-ʔ} & \rightarrow \text{piʔot} & \text{‘knock off’ [102]} \\
\text{siwac-ʔ} & \rightarrow \text{suwaʔ} & \text{‘get dry’ [99]} \\
\text{cač-ʔ} & \rightarrow \text{càʔ} & \text{‘see (pl)’ [105]} \\
\text{simq-ʔ} & \rightarrow \text{simáʔ} & \text{‘sleep’ [100]}
\end{array}
\]

(34)  
\[
\begin{array}{ll}
\text{ši-w} & \rightarrow \text{šiw} & \text{‘make, do’ [3.7]} \\
\text{c’eʔe-w} & \rightarrow \text{c’eʔeʔw} & \text{‘leach’ [3.7]} \\
\text{maʔa-w} & \rightarrow \text{maʔaw} & \text{‘eat’ [3.7]} \\
\text{caʔno-w} & \rightarrow \text{caḥnów} & \text{‘sing, bark’ [3.7]} \\
\text{maʔcu-w} & \rightarrow \text{baḥcūw} & \text{‘jump’ [3.1]}
\end{array}
\]

The Durative is -iʔ or -aʔi after most consonants, while -meʔi is found only after vowels:

(35)  
\[
\begin{array}{ll}
\text{haluč-iʔi} & \rightarrow \text{haluc’idu} & \text{‘keep putting over one’s head’ [214]} \\
\text{nuʔiʔan-i} & \rightarrow \text{duhluḍa’du} & \text{‘keep picking’ [213]} \\
\text{mo-maʔi} & \rightarrow \text{momádu} & \text{‘keep running across’ [213]}
\end{array}
\]

(36)  
\[
\begin{array}{ll}
\text{mo-aq-qa-meʔi} & \rightarrow \text{mohqmɛdu} & \text{‘keep driving’ [212]} \\
\text{mo-ala-meʔi} & \rightarrow \text{molamɛdu} & \text{‘keep running down’ [213]} \\
\text{ʔkulu-kulu-meʔi} & \rightarrow \text{kuluʔkuluɛdu} & \text{‘keep coughing’ [213]}
\end{array}
\]

Again, the choice of allomorphs for the Durative depends on knowing the final segment of
the stem.

When the stem preceding either of these suffixes ends in CC, the postvocalic allomorph is found:

(37)  kel-m-w → kelmaw  ‘peer directly down at’ [158]
   kel-c-w → kelicw  ‘peek’ [2.74]
   mo-ht-w → mohtiw  ‘run back and forth’ [3.14]
   ni-hyut-m-w → dihyurtmaw  ‘crumble by dropping on an object off the ground’ [162]
   ni-hyut-c-w → dihyurtciw  ‘crumble by dropping on an object on the ground’ [161]

(38)  kel-c-men-i → kelicmendu  ‘keep peeking once’ [3.7]
   nnu-kil-c-men-i → duklicmendu  ‘keep pointing once’ [213]

These facts show that the epenthetic vowel7 which occurs in the surface form must be present in the representation before the next suffix is added; otherwise the appropriate allomorph could not be chosen. It is hardly insightful to say that -w and -meni are selected after V or CC, especially if a V later appears by rule after the cluster.

Other consonant-initial suffixes, whose form does not depend on what precedes, are compatible with this analysis, since it does not matter whether the epenthetic vowel is inserted before or after suffixation:

(39)  mo-ht-mul-? → mohtimul  ‘run around (pl)’ [2.74]
   kelhil-mul-? → kelhilmul  ‘peer around (pl)’ [188]

On the other hand, when a vowel-initial suffix is added to a stem ending in CC, it is the vowel of the suffix which surfaces, rather than the epenthetic vowel which ought to be present before suffixation:

(40)  a.  mo-ht-ar-i → mohtadu  ‘run along (pl)’ [2.74]
   mo-ht-ala-w → mohtaaw  ‘run down (pl)’ [2.74]
   mo-ht-ar-i-c-? → mothubii  ‘run away (pl)’ [2.74]
   b.  kel-c-ala-w → kelcaw  ‘peek down’ [2.74]
   kel-c-ar-i-c-? → kelciibii  ‘peek up’ [2.74]

7 As discussed in §3.3.1, the epenthetic vowel is [i] after coronals and [a] after labials.
c. kel-m-ala-w → kelməlaw 'peer down at the ground' [2.113]
kel-m-ûnic-? → kelmibî? 'peer up (pl)' [2.113]

Normally, when two vowels come together it is the features of the first vowel which survive (§6.6), but this is not what happens with an epenthetic vowel:

(41) SUFFIX EPENTHESIS SUFFIXATION ELISION
mo-hi- → mohti- → mohti-ala- → *mohtêla-
kêl-m- → kelma- → kelma-ûnic- → *kêlməbic-

How can we explain this apparent conflict?

I suggest that Epenthesis essentially inserts a mora, but no vowel features. In a theory of the syllable where the onset links to the syllable node, insertion of a mora after an unsyllabified consonant (C') is simple to represent (shown here with subsequent Syllabification):

(42) \[
\begin{array}{c}
\sigma \\
\mu \\
\end{array}
\]
C' \rightarrow C

This is the change shown informally in (31). In the mora-linked onset theory assumed here, however, it is not so convenient graphically, since every visible consonant is already dominated by a mora. We cannot represent Epenthesis as the insertion of a vocalic Root node, since that makes false predictions with respect to Elision. Given the distinction outlined in §6.1.1 between nuclear and nonnuclear moras, however, we can formulate Epenthesis as a minimal change: the labeling of a mora as nuclear (n) when it is preceded by another nonnuclear (m) mora.

(43) Epenthesis

\[\mu_m \rightarrow \mu_n / \mu_m\]

This label carries with it the implication of a vowel in Kashaya, where no other segments can head a syllable; the features (including [-cons, +son]) are filled in by default at the end

245
of the lexicon, and will be generated to the right of the consonant to obey the rising sonority requirement on strong moras. The newly labeled mora is able to project a syllable immediately.\(^8\) Epenthesis as formulated here appears to enforce a constraint against having two nonnuclear moras in a row: by the normal rules of the language such a sequence could never be syllabified.

When a vowel-initial suffix is added to a stem which has undergone Epenthesis, the lack of any features under the nuclear mora means that Elision cannot apply and the vowel simply links to the mora which is already present:

\[
\begin{array}{c}
\sigma & \sigma \\
\slash \backslash & \mid \\
\mu_n & \mu_m & \mu_n \\
\slash \backslash & \mid & \slash \backslash & \mid & \slash \backslash \\
kelc\,a\,l\,a \\
\end{array}
\rightarrow 
\begin{array}{c}
\sigma & \sigma & \sigma \\
\slash \backslash & \mid & \slash \backslash \\
\mu_n & \mu_m & \mu_n & \mu_n \\
\slash \backslash & \mid & \slash \backslash & \mid & \slash \backslash \\
kelc\,a\,l\,a \\
\end{array}
\]

The presence of /a/ prevents later insertion of default features for /i/. The remaining consonant and vowel of the suffix undergo normal Morification and Syllabification.

Under this treatment of Epenthesis, the selection of ‘postvocalic’ allomorphs of the Absolutive and Durative is actually sensitive to the presence of a nuclear mora at the end of the stem. Since these allomorphs (-men\(^{i}\) and -w) are consonant-initial (recall from §2.4 that glides are consonants), that consonant cannot link to the nuclear mora and receives a mora by regular Morification (which it shares with a following vowel, if present):

\[
\begin{array}{c}
\sigma & \sigma \\
\slash \backslash & \mid \\
\mu_n & \mu_m & \mu_n \\
\slash \backslash & \mid & \slash \backslash \\
kel\,c\,m\,e\,n \\
\end{array}
\rightarrow 
\begin{array}{c}
\sigma & \sigma & \sigma \\
\slash \backslash & \mid & \slash \backslash \\
\mu_n & \mu_m & \mu_n & \mu_n & \mu_m \\
\slash \backslash & \mid & \slash \backslash & \mid & \slash \backslash \\
kel\,c\,m\,e\,n \\
\end{array}
\]

Ultimately the features for [i] are inserted to head the second syllable [ci].

---

\(^8\) In fact, an alternative formalization is simply to project a syllable node from the unlabeled mora, making it necessarily nuclear since it heads a syllable. In such a framework the (non)nuclear status of a mora follows from its location in syllable structure rather than from the nature of the segment(s) dominated by the mora.

246
After /m/, where the epenthetic vowel is [a], there are two ways to handle the features. One possibility is that [+back] Insertion is actually a context-sensitive redundancy rule, which applies after /m/:

\[(46) \text{ [-cons]} \rightarrow \text{ [+back]} / \text{ /m/ } \]

The problem here is that [+back] Insertion must apply only in derived environments — otherwise all morpheme-internal /mi/ sequences would become [ma] (cf. the discussion of [+round] Insertion in §3.5.2). Yet at the end of the lexicon no derived/underived distinction is possible. An alternative is that the simple presence of the nuclear mora is sufficient to trigger [+back] Insertion as given in §3.3.3; but this must not occur immediately, since the presence of vowel features before further suffixation makes the wrong prediction about Elision. It is not clear, however, how we might motivate the triggering of the rule on the next cycle, when a consonant-initial suffix is added: it may be that default insertion of a Root and Place node occurs only when the presence of a following consonant makes it clear that these nodes will not be supplied by a vowel-initial suffix. This solution is not entirely satisfactory either, but seems the best available at present.

Rules of allomorphy which, descriptively, refer to a vowel-final stem are now treated formally as referring to a stem ending in a nuclear mora: this includes true vowels (long or short) and CC clusters which have undergone Epenthesis. Stems ending in a single consonant fail to select the allomorph, since their final mora is nonnuclear. The moraically licensed increments at the beginning of a word (§6.4), as well as those in word-internal CVVC syllables (§6.2), are not adjacent to a nonnuclear mora on either side, and do not trigger Epenthesis. Glottal Merger (§3.1.1) precedes (and bleeds) Epenthesis. Regardless of the exact formulation of Epenthesis, the second consonant of the stem-final CC cluster must be visible in order for the rule to apply; otherwise there is no reason why Epenthesis should be triggered. This indicates that Final-Consonant Extraprosodicity has not applied
to that consonant, and the rule must be restricted to post-vocalic environments as shown above in (32).

6.3.2. Distribution of Superheavy Syllables

There is a vowel which is represented by Oswalt (1961) as the morphophoneme ììì, for which I retain the symbol /a/. Recall from §3.3.2 that I treat this vowel as exceptionally [-round]. It is found only in the following Evidential suffixes, added in level 5 of the lexicon:

(47)  
-ìnà  Aural  
-qà  Circumstantial  
-yà  Visual  
-(w)à  Factual

In addition to its triggering of [-round] Spreading, a special characteristic of this vowel is that it is deleted when it occurs word-finally, but not when another suffix follows it.

The following examples show the /a/ in word-final position, where it is lost. Notice that after this happens, the final syllable can be superheavy CVVC or CVCC:

(48)  
sìnàm-ìnà  →  sìnàmàn  'I heard him drown' [3.8]  
càhnò-ìnà  →  cahnón  'I hear him talk' [241]

(49)  
sìnàm-qà  →  sìnàmqà  'must have drowned' [243]  
talàq-qà  →  talàqíq  'must be wearing' [244]  
dàqàq=qà  →  dàqàqíq  'must have found' [288]  
šu-qà=qà  →  šuqà=qíq  'must have sawed it off' [2.114]

(50)  
mo-ìnìic-yà  →  mo'bi'y  'I saw him run away' [2.114]  
cìe'cì-yà  →  cìe'cìy  'I saw him leach' [72]  
cìo-yìic-yà  →  cìo-yìiy  'I saw him die' [241]  
ca'ma-xì  →  ca'maráy  'I saw it open inward' [245]  
sìnàm-yà  →  sìnamìy  'I saw him drown' [245]  
mo-mul-ìc-yà  →  momú'liy  'I saw him run all the way around' [245]
(51)  sinam-t-ā → sinam²  ‘isn’t drowning’ [245]
      sinam-ā → sinam  ‘is drowning’ [245]
      mo-ari-ā → mo’ni  ‘runs’ [245]
      ce-mac-ā → cema’c⁶  ‘it is open towards here’ [245]
      ɳa³-qa-maq-ā → dahsamáq⁶  ‘the waves roll in’ [246]
      nimuyi’c-ā → bimuyi’c  ‘they are eating’ [245]
      ɳa³-wā → da’w  ‘is pleasing’ [40]

Other changes in these suffixes include the loss of gemination in -innd; Coda Aspiration of the /q/ in -qdt; and Coronal Debuccalization before -yd with Glottal Merger. Often, the only indication that the Factual -d is underlyingly present is the superheavy syllable, though the allomorph -wa leaves behind /w/.

When a suffix follows, the suffix-initial vowel (in all cases /e/ undergoes Mora Elision and the /a/ surfaces:

(52)  ɳi’c-wač-innā-em → dićwačinnam  ‘what I heard them say (Subj)’ [243]
      ściy’c-innā-em → ściy’cinnam  ‘what I heard him say (Subj)’ [243]

(53)  p’i-ma-qā-em → p’imaqām  ‘they must have gone across (Resp)’ [244]
      șu-q’a-qa-el → șuq’aqāl  ‘the one who must have sawed it off’ [2.114]

(54)  mo-ińic-yā-em → mo’b’yam  ‘I saw him run away (Resp)’ [2.114]
      mo-ińic-yā-el → mo’b’yal  ‘the one I saw run away’ [2.61]
      ce-tey-ə-em → ce’teyām  ‘I saw him teach (Resp)’ [72]
      mo-mul-yā-el-li → momūlyali  ‘where I saw him run around’ [288]
      mo-mul-ić-yā-em → momūli’yam  ‘I saw him run all the way around (Resp)’ [245]

(55)  mo-ani-ā-el → mo’dálm  ‘one who is running (Obj)’ [288]
      ɳa³-qa-ić-ā-el → daça’cál  ‘one who likes (Obj)’ [289]
      ɳa³-wa-em → da’wām  ‘want (Resp)’ [285]
      și-wā-em → șiwām  ‘is doing (Resp)’ [286]
      qawi-wā-em → qawiwāl  ‘that he is building (Obj)’ [288]
      ca⁹ho-wā-em → ca’hnawāl  ‘the one singing’ [290]
      muwi-wā-em → buwiwām  ‘he’s stringing beads (Resp)’ [284]

Although the Explanatory suffix -e has no surface realization postvocically, the fact that the /a/ is preserved shows that its deletion is ordered before Mora Elision, and the presence of the Explanatory blocks deletion:

249
(56) hi-çe-t-yā-e → hîchya ‘I see that it’s ready’ [290]
câ-no-wa-e šoc-i → calmowâ šoci ‘listen, he’s singing’ [290]

That the Explanatory is actually -e can be seen when it is suffixed to the Assertive =ız to form =ız ‘(because) it is’ (Oswalt 1961:290).

Although they are also added in level 5, the Performatives -(w)ela, -mela differ from the Evidentials considered so far, because their final /a/’s never delete:

(57) mo-mac-mela → momâc’mela ‘I ran in here’ [247]
mawil-mela → bawilmela ‘I put it in’ [247]

In other words, the rule deleting the final vowel must target /ā/ in particular. In addition, a rule simply deleting any final /a/ would, by the Strong Domain Hypothesis, be expected to apply to an /a/ that arises in earlier levels of the grammar.

Formally, I treat /ā/ Deletion as the removal of the mora dominating a [-round] vowel when it is word-final:9

(58) /ā/ Deletion

\[
\begin{array}{c}
\mu \\
\mid \\
\text{RV} \\
\mid \\
\text{[-round]}
\end{array}
\Rightarrow \emptyset \ ]w
\]

I assume that when the mora is deleted, the features which it dominates are stranded. By Parasitic Delinking (§5.5.2), the syllable structure is also removed. The unmorified vowel is stray-erased, but the onset consonant can link to the preceding mora:

---

9 This is similar to certain analyses of yer vowels in the Slavic languages (e.g. Lightner 1972, Gussman 1980, Rubach 1984), where the vowel which is subject to deletion is marked [-tense]. The analysis of the yer as unlinked (Hyman 1985, Kenstowicz and Rubach 1987, Rubach and Booij 1990) is not transferable to Kashaya: the metrical and syllable structure facts show that the vowel must be morified before it is deleted.
(59) \[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\wedge & \wedge & \wedge \\
\mu & \mu & \mu \\
\wedge & \wedge & \wedge \\
d a ? t a q å & \rightarrow & d a ? t a q
\end{array}
\]

Level 5 is noncyclic, and Final-Consonant Extraprosodicity does not reapply, but neither does Morification. This means that the stray consonant does not receive a new mora; it simply links to the preceding mora and does not cause shortening of a long vowel (§6.2):

(60) \[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\wedge & \wedge & \wedge \\
\mu & \mu & \mu \\
\wedge & \wedge & \wedge \\
t a l a q å & \rightarrow & t a l a q
\end{array}
\]

Note that this output is precisely the structure given underlyingly for irregular CVVC syllables (§6.1.3): the two types of syllables are pronounced the same, and have the same phonological representations, but come about in different ways (a fact which is reflected in the freer distribution of the exceptional syllables).

All examples of final CVVCC shortening to CVCC, for example *hišamq*^b^ ‘must have broken’ in (17b), involve the interaction of Closed-Syllable Shortening with /å/ Deletion. This form exits level 2 with the following structure:

(61) \[
\begin{array}{c}
<\sigma> \\
\wedge \\
\mu & \mu & \mu \\
\wedge & \wedge & \wedge \\
hiša <m>
\end{array}
\]

The /m/ is invisible on this cycle and Epenthesis is not triggered. Foot Extrametricality is blocked by the Non-Exhaustiveness Condition. No other morphology occurs until level 5, where the Circumstantial -qd is added:

(62) \[
\begin{array}{ccc}
<\sigma> & \sigma & \sigma \\
\wedge & \wedge & \wedge \\
\mu & \mu & \mu & \mu \\
\wedge & \wedge & \wedge & \wedge \\
hiša m q å
\end{array}
\]

251
The /m/ morifies but cannot syllabify. When the /a/ is deleted, the /q/ simply links to the preceding mora:

(63) \[ \langle \sigma \rangle \sigma \]

\[
\begin{array}{cccc}
\text{\textbackslash}\text{\textbackslash} \\
\mu & \mu & \mu & \mu \\
\text{\textbackslash}\text{\textbackslash} & \text{\textbackslash}\text{\textbackslash} & \text{\textbackslash} \\
\text{hi} & \text{s} & \text{a} & \text{m} \quad \text{q}
\end{array}
\]

This satisfies its prosodical licensing requirement, even though the mora is not syllabified, since syllabic licensing is not yet necessary. Postlexically, however, that requirement comes into force and the free mora, with both of its consonants, syllabifies and causes the same sort of Closed-Syllable Shortening as seen in (26):

(64) \[ \sigma \sigma \]

\[
\begin{array}{cccc}
\text{\textbackslash} \\
\mu & \mu & \mu \\
\text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} \\
\text{hi} & \text{s} & \text{a} & \text{m} \quad \text{q}
\end{array}
\]

Foot Extrametricality cannot apply, since without the Nonfinal Verb suffix -e' this verb must be sentence-final. Extrametricality is blocked by the Non-Exhaustiveness Condition, even if the vowel is still long at the time when it applies.

The loss of gemination in Aural -\textit{inn\textbackslash}d follows automatically from deletion of the mora to which it is linked as onset:

(65) \[ \sigma \sigma \sigma \sigma \]

\[
\begin{array}{cccc}
\text{\textbackslash}\text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} \\
\mu & \mu & \mu & \mu \\
\text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} \\
\text{ca} & \text{h} & \text{n} & \text{o} & \text{n} & \text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} & \text{\textbackslash} \\
\text{ca} & \text{h} & \text{n} & \text{o} & \text{n}
\end{array}
\]

Note that the final syllables in (59) and (65) have different weights, and we would expect them to behave differently for stress placement. This prediction is not testable, however. A verb with an Evidential but without the Nonfinal Verb suffix -e' must be final in the sentence, and in that position stress cannot be used to determine syllable weight.
These examples show that the presence of word-final superheavy syllables can be derived without the use of Final-Consonant Extraprosodicity, and in fact their distribution is better accounted for if only the rule of /ə/ Deletion is able to generate them.

The same double linking which we end up with in (63) is present underlyingly in the case of the Suppositional -ins̃, so that there is never a chance for the CC cluster to trigger Epenthesis:

\[
\begin{array}{c}
\mu \\
/\backslash \\
i n s
\end{array}
\]

The presence of only one consonantal mora makes Epenthesis as formulated in (43) inapplicable. This prespecification of mora structure, similar to that proposed for exceptional CVVC syllables in §6.1.3, encodes the fact that -ins̃ is the only suffix which can lead to a final CC cluster without the presence of the vowel /ə/:

(66)

\[
\begin{array}{c}
\text{mo-al-a-ins̃} \\
\text{mo-m-ins̃}
\end{array} \rightarrow 
\begin{array}{c}
\text{mo-lánš} \\
\text{mománš}
\end{array}
\]

'I suppose he ran down' [250]  
'I guess he ran across' [2.90]

A following suffix is also possible:

(67)

\[
\begin{array}{c}
\text{=?-ins-em} \\
\text{=?-ins-e}'
\end{array} \rightarrow 
\begin{array}{c}
\text{=?inšem} \\
\text{=?inše}'
\end{array}
\]

'might (Resp)' [250]  
'I suppose (NFV)' [250]

This suggests the need for resyllabification of the prelinked /ə/, as discussed for CVVC syllables i.e. §6.3.4.

6.3.3. Shortening in Word-Final CVVC

We have seen that final superheavy syllables are generated by a single rule, /ə/ Deletion. Any other final sequence of the shape CVVC undergoes Closed-Syllable Shortening, showing that the final consonant must receive a mora. This does not happen in the lexicon, however. I assume that Morification is still active in the postlexical component, and at least

253
certain syllable structure requirements are still in force, as discussed in §6.2 (contra Itô 1986). Final-Consonant Extraprosodicity remains active until the end of the lexicon; after that point, if the effect of the rule is allowed to persist (as for initial syllables and feet), it need not reapply. Phrase-internal consonants are forced by the Peripherality Condition to become visible, so they morify. A phrase-final consonant, however, remains invisible, at least until Glide Deletion applies (§6.7). At the point in the postlexical component where all invisibility is lost, even those phrase-final consonants are morified and, if following a long vowel, cause Closed-Syllable Shortening.

We know that laryngeal increments in word-initial position survive until the postlexical component, at which time they must syllabify or merge with the preceding word or be stray-erased (§6.4). Since the increments are moraically licensed up to this point, we have strong indication that syllabic licensing is not enforced until the postlexical component, where the presence of other words gives the increment a chance to syllabify. A preceding long vowel is shortened, but not until Foot Extrametricality has applied, with the expected effect on stress:

\[
\begin{align*}
\text{timo} & \quad \rightarrow \quad \text{t}i \; \text{móh} \; \text{la'} \; \text{li} \\
\text{timo'} & \quad \rightarrow \quad \text{t}i \; \text{móh} \; \text{lá'} \; \text{li} \\
\text{baco} & \quad \rightarrow \quad \text{ba} \; \text{co} \; \text{da} \; \text{nè'} \; \text{me} \text{?} \\
\text{tama} & \quad \rightarrow \quad \text{ta} \; \text{ma} \; \text{dù'} \; \text{ci} \text{?}
\end{align*}
\]

"maybe a hole" [109]  
"maybe in a hole" [109]  
"abandon the boat! (pl)" [109]  
"know something" [108]

The Non-Exhaustiveness Condition prevents Foot Extrametricality from applying to the word-final long vowels in the lexicon. This shows that Closed-Syllable Shortening operates postlexically, and follows Foot Extrametricality.

Relevant data also come from words such as \textit{taca} ‘man’ and \textit{mic'a} ‘sweat’, underlyingly \textit{taca'c}, \textit{mic'a'q}, where the vowel in the final syllable must be long postlexically to undergo Foot Extrametricality. Note that for stress they pattern like \textit{āc'a} (with a long vowel) rather than like \textit{q'aʔdás} (with a short vowel in a closed syllable):
Foot Extrametricality could not apply to the word lexically, since that would exhaust the domain. The stress is explained if the vowel in the final syllable of ?aca? and mic?a? is preserved until the postlexical component, showing that Closed-Syllable Shortening is a postlexical process which follows (at a minimum) Foot Extrametricality.

The word ‘man’ exits the lexicon with the long vowel intact because the final consonant is extraprosodic. This protects the /c/ from Coda Aspiration.

The vowel is thus long when postlexical Foot Extrametricality applies, accounting for the stress pattern in (70). Later, the /c/ becomes visible and morifies. Closed-Syllable Shortening is triggered by the requirement for syllabic licensing and the vowel shortens. Word-Final Debuccalization also applies to give us the final form:

Further evidence that final consonants must eventually be morified comes from nouns and adjectives which can surface with long vowels in a suffixed verbal use, but in their normal unsuffixed forms have a short vowel. Notice that in the verbalized forms the underlying length surfaces (a), but in the plain noun or Assertive the length is lost (b):
(73) a. ṇ̃ōt-am-? → boštān
    ṇ̃ōt-aq qa-w → boštāhqaw
b. ṇ̃ōt → bōt

'become soft' [126]
'make soft' [126]
'soft' [D]

(74) a. mič̣a'q-an-i → mič̣a'q-a'du
    mič̣a'q=? → mič̣a'q
b. mič̣a'q → mič̣a'q

'be sweating' [3.3]
'it's sweat' [3.2]
'sweat (n.)' [3.2]

(The verb in (74a) has undergone Foot Flipping.) The only way to account for the length in the verbs is to give it underlyingly in the adjective or noun on which the verb is based.

In the nonverb forms where the long vowel must surface in a closed syllable, the final consonant is visible, acquires a mora, and shortens the preceding vowel (§6.2). Since there is no /â/ present, there is no way for the superheavy syllable to survive. Except for borrowings (§6.1.3) and words which have undergone /â/ Deletion (§6.3.2), there are no examples of final CVVC on the surface in Kashaya. The visibility of final consonants in level 5, combined with Closed-Syllable Shortening, explains this distribution. The stress facts show that Shortening occurs postlexically, after Foot Extrametricality.

6.3.4. Sensitivity to Extraprosodicity

An obvious case where rules in Kashaya are sensitive to Final-Consonant Extrametricality is the prosodic rules of Morification, Syllabification, and Foot Construction, as described in §5.5. This is natural, since the basic purpose of extraprosodicity is to exclude a constituent from incorporation into higher structure. The effect of Final-Consonant Extraprosodicity is less uniform in the area of segmental phonology.

The morphologically triggered rule of Palatalization (§3.5.2) must apply to stem-final consonants, at least in level 5, since the Absolutive allomorph is sensitive to whether it has applied. The Absolutive is -i after /â/ and -? after other consonants, including [ç] which is the result of the Palatalization rule:

256
(75) ‘run along’ [154]

<table>
<thead>
<tr>
<th></th>
<th>(sg)</th>
<th>(pl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffixation</td>
<td>mo-añ-</td>
<td>mo-ht-añ-</td>
</tr>
<tr>
<td>Palatalization</td>
<td>mőri-</td>
<td>mohtač-</td>
</tr>
<tr>
<td>Suffixation: Absolutive</td>
<td>mőri-i</td>
<td>mohtač-?</td>
</tr>
<tr>
<td>Final Form</td>
<td>movőu</td>
<td>móhta?</td>
</tr>
</tbody>
</table>

This suggests that Palatalization applies to the stem-final /ń/ before the suffix is chosen. In level 3, however, the complex allomorphy of the Durative suffix suggests a different conclusion. The Durative is described fully in §7.2.3; here I consider just a few allomorphs. After /ń/ which is part of a verb root, the suffix is -añ, whether or not Palatalization eventually applies:

(76) ‘keep picking’ [213]

<table>
<thead>
<tr>
<th></th>
<th>(sg)</th>
<th>(pl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>ſu-hluń-</td>
<td>ſu-hluń-</td>
</tr>
<tr>
<td>Suffixation: Durative</td>
<td>duhlun-añ-</td>
<td>duhlun-ani-</td>
</tr>
<tr>
<td>Palatalization</td>
<td>duhluđañ-</td>
<td>duhlućač-</td>
</tr>
<tr>
<td>Suffixation: Absolutive</td>
<td>duhluđañ-i</td>
<td>duhlućač-?</td>
</tr>
<tr>
<td>Final Form</td>
<td>duhluđađu</td>
<td>duhluća?</td>
</tr>
</tbody>
</table>

Notice that the selection of the Absolutive is consistent with the facts of (75). Similarly, after /ń/ of a suffix the Durative is -icen even when there is Palatalization:

(77) ‘keep running along’ [216]

<table>
<thead>
<tr>
<th></th>
<th>(sg)</th>
<th>(pl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffixation</td>
<td>mo-añ-</td>
<td>mo-hi-añ-</td>
</tr>
<tr>
<td>Suffixation: Durative</td>
<td>mőri-icen-</td>
<td>mohtań-icen-</td>
</tr>
<tr>
<td>Palatalization etc.</td>
<td>mőrener-</td>
<td>mohtačiyič-</td>
</tr>
<tr>
<td>Suffixation: Absolutive</td>
<td>mőrener-î</td>
<td>mohtačiyič-?</td>
</tr>
<tr>
<td>Final Form</td>
<td>modučedu</td>
<td>móhtačiyi?</td>
</tr>
</tbody>
</table>

The common environments of these allomorphs are best captured if they are added before Palatalization occurs. Even more convincingly, different forms of the suffix are used after a surface [č] depending on whether it is underlying or the result of Palatalization. We have
seen that -anı or -icenı occurs after /nı/ regardless of its surface realization; when the Plural Agent feature is present, -(i)waňı is used after an underlying /ći/.

(78) ‘keep running all the way around (pl)’ [217]

<table>
<thead>
<tr>
<th>Suffixation</th>
<th>mo-h-t-mul-ci-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffixation: Durative</td>
<td>mohtimu'lič-waňı-</td>
</tr>
<tr>
<td>Palatalization</td>
<td>mohtimu'ličwaçi-</td>
</tr>
<tr>
<td>Suffixation: Absolutive</td>
<td>mohtimu'ličwaçi-</td>
</tr>
<tr>
<td>Final Form</td>
<td>móhtimu'ličwa?</td>
</tr>
</tbody>
</table>

Clearly, to distinguish between underlying /nı/ and /ći/, the suffix must be chosen before Palatalization applies; any alternative would involve unacceptable globality. I argued in §3.5.2 that Palatalization is an ordered phonological rule triggered by the diacritic {Plural Agent}, but that the diacritic is not added to the representation until level 3. Since the Durative is a level 3 suffix, we can simply order the addition of {Plural Agent} after the addition of the Durative.10 In the subsequent derivation, Palatalization applies to any /nı/ in the representation, including one which is extraprosodic; this accounts for the fact that the Absolutive (a level 5 suffix) treats [ći] derived from /nı/ in the same way as underlying /ći/: the distinction has been eliminated by Palatalization.

The Absolutive allomorphy shows that the final consonant is visible to Palatalization. There are two rules, however, which do not apply when the coda consonant that they normally target is final in the domain: Final-Consonant Extraprosodicity accounts for these facts easily. The most compelling argument comes from Coda Aspiration (§3.1.7). Consider the following form:

(79) ńa-hyut-i → dahiuyti ‘break it!’ [2.94]

---

10 A Durative suffix such as -(i)waňı which cooccurs only with a Plural Agent can be treated as a portmanteau which introduces both the segmental content and semantics of Durative, plus the feature {Plural Agent}.
If there were an intermediate stage *dahyut- where the final /t/ is syllabified as a coda, we would expect it to become [tʰ], but that yields the incorrect form *dahyut't. We have already seen from its interaction with Debuccalization (§3.2) that Coda Aspiration is a cyclic lexical rule and is eligible to apply to the intermediate form; the invisibility of the final consonant prevents this from happening. The second rule which is relevant is Glide Deletion (§6.7). This postlexical rule targets a glide in coda position, but fails to apply when that glide is phrase-final. The presence of Final-Consonant Extraprosodicity postlexically accounts for this blocking effect.

What distinguishes Coda Aspiration and Glide Deletion from Palatalization is that they specifically target a segment in the coda. Palatalization targets a segment regardless of its position. Among segmental rules, only those which make reference to the location of features in coda position — Coda Aspiration and Glide Deletion — are sensitive to the invisibility of the final consonant. This follows from the fact that the invisible consonant is not syllabified and cannot fulfill the structural description of the rule. Similarly, metrical rules such as Iambic Lengthening and CV Adjunction respect invisibility, since what they really look at is syllable structure. Palatalization, on the other hand, seems indifferent to whether a potential target is visible or not, and applies in both cases. Since the rule makes no reference to syllable structure or domain boundaries, this is not a surprising result.\(^{11}\)

Another possible explanation, however, is that since Palatalization is a morphologically triggered rule, it has access to invisible consonants the way that morphological rules must — for example, any rule of allomorphy which is sensitive to the nature of the stem-final consonant necessarily sees what that consonant is. While I prefer the phonological explanation just outlined, this general issue is relevant to the discussion of Final-Consonant Extraprosodicity. For example, the choice of Absolutive -i and -p depends on the features

\(^{11}\) Even if Final-Consonant Extraprosodicity turned off in level 5, it is not possible to say that Palatalization applies to a newly visible stem-final consonant before the Absolutive suffix is added: Palatalization is inactive in level 5, as shown by its failure to apply to the Quotative -ño.
of the final consonant. More fundamentally, the Locomotory allomorph *-wanai* is possible only after a vowel. Obviously, to distinguish consonant- and vowel-final stems, the consonant must be visible.\textsuperscript{12} This shows that the invisibility marked on the final consonant is not respected by allomorphy rules. Inkelas' (1989) distinction between morphological and prosodic domains offers a potential formal explanation (§8.5): phonological rules operate on the prosodic domain, where invisibility is marked; but strictly morphological rules, including those which select allomorphs, should have access to the morphological domain, where invisibility has no effect. At the same time, these allomorphy rules may be permitted access to the prosodic domain, but in this case they too must respect invisibility; this is the situation when the choice of suffix depends on the number of syllables in the prosodic representation (see §7.2 for Kashaya examples). In sum: phonological rules can see only the prosodic domain; morphological rules typically see the morphological domain, but where additional phonological constraints are placed on the morphology, the prosodic domain is visible to the morphological rules, which then must respect extrametricality just as phonological rules do.

6.3.5. Resyllabification

There is evidence that not all syllabification is purely structure-building: sometimes consonants must be resyllabified from coda to onset position (Harris 1983, Rubach and Booij 1990). Although it is generally unnecessary in Kashaya due to the intervention of Final-Consonant Extraprosodicity, we do seem to require resyllabification in a limited

\textsuperscript{12} After a consonant-final stem, the Locomotory is *-anai* if the preceding sequence is CVC and *-araian* if it is CVVC. In effect, the allomorph is chosen such that the suffix ends in *...anai* after Iambic Lengthening. One way of capturing this allomorphy is by referring to the weight of the syllable, modulo Final-Consonant Extraprosodicity: the shorter form after a light syllable and the longer form after a heavy syllable. An equally possible strategy, however, is to refer to the nucleus of the preceding syllable: when that nucleus is long (VV), the long allomorph is chosen; when the nucleus is short (V), the short allomorph appears. This solution is indifferent to Final-Consonant Extraprosodicity, and in fact goes more directly to the heart of the matter, since these allomorphy rules are really concerned with whether the previous vowel is long, rather than whether the previous syllable is heavy.
context, specifically in borrowings such as resář- ‘pray’ and mansář- ‘tame’. The VVC rime does not undergo Closed-Syllable Shortening, but the final /r/ must still be subject to resyllabification if a vowel follows:

\[(80) \quad \text{resář-te'?} \rightarrow \text{resářte'?} \quad \text{‘I’m going to pray’ [2.89]} \]
\[\text{resář-i} \rightarrow \text{resáři} \quad \text{‘pray!’ [2.89]} \]
\[\text{mansář-in} \rightarrow \text{mansářin} \quad \text{‘while taming’ [70]} \]

I account for the lack of Closed-Syllable Shortening by prelinking the /r/ to the weak mora of the long vowel (§6.1.3):

\[(81) \quad \mu \mu \\
\text{resár} \]

The form resářte' shows that the /r/ is underlyingly morified with the preceding vowel, and therefore must belong to the same syllable; resáři shows that the /r/ can surface as the onset of the following syllable.

To account for this resyllabification, we need not say that Syllabification itself is structure-changing. Rubach and Booij (1990), for example, argue for a rule of Coda Erasure which removes syllable structure above the coda consonant and is followed by normal structure-building Syllabification to relink the former coda as an onset.¹³ This is comparable to the position that while Foot Construction is structure-building only, a rule of Deforestation can apply to remove old foot structure, which is then replaced in a structure-building fashion (e.g. Steriade 1988b). For Kashaya, I assume that the final consonant in resář- is syllabified, but when a vowel-initial suffix is added to the stem, Coda Delinking (a translation of Coda Erasure into a moraic framework) applies and the consonant is free to resyllabify as an onset.

¹³ This accomplishes in two steps what Levin (1985) treats as the single structure-changing CV Rule. Rubach and Booij prefer to treat all syllabification rules, including this basic one creating onsets, as structure-building, and so propose the separate rule of Coda Erasure to do the structure-changing work.
(82) **Coda Delinking**

\[ \sigma \]
\[ \mu_w \]
\[ \not{=} \]

RC

The rule must not apply when a consonant-initial suffix is added, since the delinked /h/ in *resáʔ*- would then be subject to regular Morification and would trigger Closed-Syllable Shortening when it reattaches as a coda. Coda Delinking applies only when the consonant is required as an onset, and could be considered a constraint-triggered rule which responds to the constraint in Kashaya that every syllable have an onset (chapter 4).

6.4. Laryngeal Increments

In this section I discuss Kashaya laryngeal increments. §6.4.1 presents the basic data which we must account for. §6.4.2 proposes formal representations for the increments. §6.4.3 explores implications of the analysis for theories of the moraic tier and contour segments.

6.4.1. The Phenomenon

A number of native languages of California have what are termed LARYNGEAL INCREMENTS: a glottal segment /ʔ/ or /h/, or sometimes vowel length, which is intimately connected with the following consonant. An increment has the effect of ‘strengthening’ or adding weight to the vowel which it follows (Gensler 1986, Oswalt 1986). Here I discuss only the increments that are found in Kashaya, and make no claims about the phonological representation of increments in the other Pomoan and non-Pomoan languages which have them.

In Kashaya, there are two types of laryngeal increments: laryngealization /ʔ/ and aspiration /h/. The increments will be represented as raised symbols to distinguish them
from the normal segments /r/ and /h/ with which they contrast (more on this below). When
the consonant is unspecified for laryngeal features (i.e. a plain voiceless obstruent or a
voiced sonorant), either increment is possible, though neither need occur, as illustrated by
these verb roots:

(83) ʰjualan-  ‘fade’ [152]
 ʰti-  ‘roll up’ [45]
 ʰta-  ‘twist’ [172]

(84) ʰlud-  ‘remove an appendage’ [153]
 ʰlu-  ‘wrap’ [155]
 ʰluč-  ‘put over one’s head’ [214]

(85) ʰyut-  ‘crumble’ [103]
 ʰyu-  ‘injure’ [76]
 ʰyeč-  ‘press’ [170]

The two laryngeal increments are not, however, free to combine with absolutely any
following consonant. If the consonant itself has a laryngeal feature — i.e. if it is glottalized
or aspirated — that feature must agree with the increment. Specifically, the only increment
found before an aspirate is [ʰ]:

(86) ʰp’o-  ‘overflow’ [137]  (*ʰp’o-)
 ʰqi-  ‘do to pieces’ [137]  (*ʰqi-)
 ʰqa-  ‘open’ [144]  (*ʰqa-)
 ʰk’uy-  ‘burn’ [170]  (*ʰk’uy-)
 ʰq’at-  ‘rip open’ [69]  (*ʰq’at-)

In parallel fashion, only [ʔ] occurs before a glottalized consonant:

(87) ʔpan-  ‘shut’ [170]  (*ʔpan-)
 ʔta-  ‘detect’ [74]  (*ʔta-)
 ʔsi-  ‘touch lightly’ [140]  (*ʔsi-)
 ʔtol-  ‘make smacking sound’ [136]  (*ʔtol-)
 ʔni-  ‘pick up, hold’ [80]  (*ʔni-)
 ʔku-  ‘finish’ [76]  (*ʔku-)
 ʔqoʔdic-  ‘do for good’ [152]  (*ʔqoʔdic-)

263
We see from this data the first fact that our analysis must capture: the nature of the laryngeal increment depends on the laryngeal features of the following consonant.

It should be noted that the increment cannot be considered a predictable side-effect of laryngeal features on the consonant. This can be seen for plain stops and sonorants in (83) through (85), where the same consonant is found preceded by either increment, or neither. But we also cannot say that all glottalized stops are preceded by [ʔ], since in addition to the forms in (87) there are many roots beginning with a glottalized consonant but no increment:

(88)  
-śi̯l-  
  'feel something sticky' [23, 3.14]  
-i̯et-  
  'attach (pl)' [181]  
-i̯un-  
  'bruise' [170]  
-i̯uc-  
  'break in two' [72]  
-i̯i̯i̯-  
  'mark, scratch' [140]  
-q̲a-  
  'leave behind' [204]

Similarly, the presence of the [h] increment cannot be predicted for aspirated stops, as these verbs illustrate:

(89)  
-p̲θila-  
  'go (pl)' [72]  
-p̲r̲e̯i̯-  
  'spread out' [144]  
-p̲r̲ar̲-  
  'fall out' [172]  
-k̲u̯n̲u̯q̲-  
  'spoil' [100]  
-q̲a̯a-  
  'cut off' [78]

As the discussion of the Decrement in §6.5 makes clear, the presence or absence of an increment can mark a morphological distinction.

The following minimal and near-minimal sets show the segment /c/ with and without aspiration, and the [h] increment, in all logically possible combinations:

(90)  
-ça-  
  'sit (sg)' [161]  
-hca-  
  'fly' [223]  
-c̲a̯-  
  'grasp' [44]  
-hc̲a-  
  'knock over' [44]
(91)  
-ce-  'grab, hold tightly' [147]
-bce-  'obstruct' [137]
-c'ere-  'leach' [70]
-hc'e-  'pry' [163]

It is clear that the increment must be present in underlying representations, and not added by rule at some later stage.

The simplest analysis of Kashaya syllable structure will, if possible, preserve the restriction against onset clusters for all types of consonants. But there are a number of reasons to believe that the laryngeal increment and the following consonant syllabify together as an onset, forming an apparent cluster. The most blatant case is word-initially, where we find many increment-consonant combinations:

(92)  
\begin{align*}
\text{hku} & \quad \text{'one' [39]} \\
\text{hla'li} & \quad \text{'maybe' [58]} \\
\text{hcomá} & \quad \text{'feast' [90]} \\
\text{nio} & \quad \text{'put the hand' [159]} \\
\text{nůrčič} & \quad \text{'know' [105]}
\end{align*}

Clusters of ordinary consonants are never found in this position, as we would expect given the syllable structure outlined above; if the increment and consonant are treated as one segment, there is no syllable structure violation. Similar evidence that the increment and consonant do not constitute a cluster comes from the structure of the verb root. As mentioned in §2.3.2, a root never begins with a true consonant cluster, yet very often has an increment before the initial consonant. If roots are simply prohibited from beginning with consonant clusters — that is, they must be syllabifiable — then treating the increment and consonant as a single segment accounts for the fact that they can occur in this position.

The next piece of evidence is Aphesis, or the deletion of the initial syllable of certain words (§8.4). Aphesis was common in the history of Kashaya — it seems to be the source of the word-initial increments we see in (92) — and also occurs synchronically:
The aphesitized forms are typically used in compounds (§8.5). Notice that when the initial syllable is lost, the increment associated with the following onset consonant remains. I have found no examples of aphesis applying synchronically to a word which has a true consonant cluster after the vowel of the first syllable. It appears best to describe the Aphesis as the deletion of an initial minimal syllable. Under such an analysis, we predict that it simply cannot apply to an initial CVC syllable; this explains the gap in the data, but requires us to treat the increment as part of the following syllable and not as a coda.

The most compelling source of evidence that the increment is part of the onset, confirming the arguments given so far, is the nature of reduplication. §8.3 gives a thorough description of reduplication in Kashaya; for present purposes we need only know that in nouns a lexical redundancy rule copies the final syllable of a stem, and reduces the copied syllable to a minimal CV. Spaces here indicate syllable breaks:

(94) BASE REDUPLICATED
ko lo'  ko lo' lo  'concave'
bi ye'  bi ye' ye  'sunflower'
ho pom  ho póm po  'smokehole'
ʔuy boʃ  ñuy boʃ bo  'gnat'

The output is not, for example, *kolo lo' or hopompom. When there is a consonant preceding the final syllable before reduplication, that consonant is not copied. We expect this result, since it is the coda of the preceding syllable:

(95) BASE REDUPLICATED
miʔ diʃ tʃi  miʔ diʃ tʃi  'wrentit' (cf. miʔdiʃ 'nut')
q'aʔay lo  q'aʔay lo lo  'ogre' [41] (cf. q'aʔay 'raven')
hoʔ sim tʃa  hoʔ sim tʃa tʃa  'mythological creature'

Copying on the final CV only rules out *miʔdiʃtiʃi. When the onset of the final syllable includes an increment, however, it is included in the reduplicated syllable:
(96) BASE REDUPLICATED
haʔdi  haʔdiʔdi  ‘various’ (cf. hadu ‘different’)
šuʔnu  šuʔnúʔnu  ‘huckleberry’
šoʔlo  šoʔlóʔlo  ‘clover species’
hoʔšim  hoʔšúmši  ‘mythological creature’ [2.51]¹⁴
baʔšim  baʔšúmši  ‘chipmunk’

In (92b) the increment undergoes Glottal Merger with the preceding /m/.¹⁵ The increment
must be copied: *haʔdidl is ill-formed. It is important to note that this case must be
distinguished from that of ordinary clusters, parallel to (95), where the first consonant
happens to be a non-incremental /h/ or /l/:

(97) BASE REDUPLICATED
nah mo  nah mo mó  ‘armpit’
muh ū  muh ū ū  ‘great horned owl’
daʔjó  daʔjó jó  ‘screech owl’
moh ko  moh ko kó  ‘whippoorwill’ [45]
haʔtó  haʔtótó  ‘rotten’ [Os91]

Here, copying the glottal consonant results in *nahmohmo. Since onset clusters are
normally not permitted in Kashaya, the increment and the following consonant must
somehow count as a single segment. The alternative is to complicate an otherwise simple
CVC syllable structure; essentially we would have to permit an extra placeless segment in
the onset, but even this allowance will not distinguish between daʔjójó and šuʔnúʔnu.
One of these forms will necessarily go against the normal syllabification algorithm, and the
syllable structure would have to be given underlingly.

Eventually the increment is delinked from onset position (§6.4.3). If it is word-
internal, as in the reduplicated forms above, the increment syllabifies as the coda of the
preceding syllable. It bears weight and is pronounced the same way as nonincremental /h/

¹⁴ Bun Lucas has given me two different forms of this word on different occasions: hoʔšúmši and
hoʔšúmtata. In both cases the fact of reduplication is the same, but the stem differs by a syllable. I
consider this interesting evidence for the psychological reality of the reduplication rule.

¹⁵ An alternative analysis for ‘chipmunk’ is the base baʔšim with nonincremental /l/ and underlying
/h/.

267
or */I/. If the increment is word-initial, its fate depends on the preceding word. After a vowel, it syllabifies as a coda, where it bears weight and results in shortening of a long vowel (§6.2):

(98) ̉rímo ʰlɐ’li → ̉rí mɔ́h lɐ’li ‘maybe a hole’ [109]
     ̉rímo’ ʰlɐ’li → ̉rí moh lɐ’ li ‘maybe in a hole’ [109]
     cahno ʰcohqw → cah nɔ́h coh qaw ‘argue (cause to shoot words)’ [D]
     qahca ʔbeway’ → qah cáʔ be way ‘hold a knife against’ [D]
     baco’ ʔdanẽme? → ba coʔ da nẽ meʔ ‘abandon the boat! (pl)’ [109]
     ʔamaʔ ʔdúcĩʔ → ʔa maʔ dúcĩʔ ‘know something’ [108]
     wa’du ʰnati’či → wa’ dúh na ti’ či ‘try to walk!’ [135]

Following a sonorant, the increment merges with preceding consonant by the independent process of Glottal Merger (§3.1.1), thereby creating an aspirated or glottalized sonorant:

(99) ʔčiškan ʰmi → ʔčiš kan’ mi ‘really pretty’ [108]
     yowal ʰcoʔli → yo wãl’ coʔ li ‘when he shot the former...’ [D]

When the segment preceding a laryngeal increment is a fricative, Merger is not possible and the increment is deleted:

(100) bićãš ʰlɐ’li → bi ćãš lɐ’li ‘maybe a louse’ [108]

Similarly, in utterance-initial position, the increment cannot syllabify or merge, and it is lost:

(101) ʰlɐ’li → lɐ’ li ‘maybe’ [58]
     ʰcoqo → co qó ‘shoot!’ [D]
     ʔbeway’ → beway’ ‘hold against’ [D]

Two orderings are possible for the phrase ‘one day’ with different consequences for the increment in ʰku ‘one’:

(102) maci ʰku → ma cĩh ku ‘one day’ [2.14]
     ʰku maci → ku má cĩ
The deletion supports the idea that increments are not part of a complex onset sanctioned by the syllable structure, since such an analysis predicts that the utterance-initial glottal segment should remain: if the cluster is well-formed lexically, it ought to be well-formed postlexically, where constraints such as Structure Preservation are relaxed, not made stricter (Kiparsky 1982, Borowsky 1986, Itô 1986, Rice 1990). The presence of increments word-internally as in (96) rules out extraprosodicity as a general solution for increments.

6.4.2. Representations

Our analysis must capture the general three-way distinction among a normal cluster where the first consonant is glottal (hC), glottalization or aspiration of a consonant (C'), and an incremented consonant (hC'). More specifically for the increments, there are two fundamental facts to account for: featural dependence and behavior as an onset. Following conventional practice, I represent the shared features by linking a single Laryngeal node to two elements on a higher tier — in this case, the Root tier. Further, I propose that the special behavior of the two segments as a complex onset be represented by underlying association to a single mora. This lexical specification of idiosyncratic onsethood encodes the markedness of increments directly, and is consistent with the treatment of exceptional CVVC syllables in §6.1.3, as well as the representation of -ins in (66).

In the case where a laryngeal increment precedes a consonant that itself has laryngeal features, a single Laryngeal node is linked to both elements (the increment and the consonant) to express the featural dependence:

(103)  

```
        μ
       / \  
      RC   RC  
     /   /    
    Lar  Place
```
In this representation the increment and consonant correspond to the two Root nodes; their single-segment status is reflected by the single mora, and the sharing of laryngeal features follows from the shared Laryngeal node. This expresses well-formed \( ^{\text{L}}k^{\text{xy}} \)- but not ill-formed \( ^{\text{L}}k^{\text{yx}} \)-. Since the shared features must be represented by the Laryngeal node — otherwise the connection between the increments and glottalization/aspiration is lost — we cannot appeal to a [glottal] feature under the Place node as suggested by McCarthy (1989b) in a different context.

When an increment precedes a consonant with no laryngeal features, the representation is slightly different. We cannot simply associate the Laryngeal node with the same Root node as the following Place features, since then it would indicate, for example, glottalized \( \text{h}u \) or aspirated \( \text{h}t \) rather than incremented \( u^{\text{L}}u \) or \( u^{\text{L}}u \). As the consonant is underspecified for laryngeal features, it should have no Laryngeal node at all. In addition, since either increment is possible, the increment needs its own Laryngeal node, independent of the following consonant. This gives us the geometry below for forms like \(-k\text{ce}-\) and \(-k\text{coq}-:\

\[
\text{Lar} \quad \text{RC} \quad \text{RC} \\
\quad \quad \mu
\]

From the two representations in (103) and (104) it follows that when an increment precedes a consonant that has laryngeal features, the increment must correspond; but when the consonant has no underlying laryngeal features, the increment can take either form.\(^\text{16}\) Note that the representations in (103) and (104) include two Root nodes. Assuming the model of feature geometry outlined in §2.2.1, the presence of both Root nodes is also necessary to permit independent specification of the features [cons], [son], [cont], and [nas]: while the increment is always a glottal consonant (which I treat as an obstructuent), the following

\(^{\text{16}}\) We need make no special statement to prevent spreading of the Laryngeal node in (104) — which would incorrectly neutralize the contrast between (103) and (104) — because there is no rule or general process in the language which would generate this spreading.
consonant can belong to any class, as long as the laryngeal features are consistent.

These incremental representations are distinct from normal clusters, where the /h/ or /r/
preceding a consonant has its own timing unit:

(105)  
\[ \mu \quad \mu \]
\[ \text{RC} \quad \text{RC} \]
\[ \text{Lar} \quad \text{Lar} \quad \text{Place} \]

A cluster as in (105) is simply one where the first consonant happens to be a glottal and the
second consonant also has Laryngeal features:

(106)  
\[ \text{c}a?c^{o} \quad \text{\textquoteright nine\textquoteright} \]
\[ \text{qa?p^u}l\acute{a} \quad \text{\textquoteright wormwood\textquoteright} \]
\[ \text{q}^{\prime} \text{a} \text{buk^u} \text{z}^{\prime} \text{u} \quad \text{\textquoteright isopod\textquoteright} \]
\[ \text{c}o?c^{o} \quad \text{\textquoteright quilt\textquoteright} \]
\[ \text{ca?t}^{a} \quad \text{\textquoteright squat, short and stocky\textquoteright} \]
\[ \text{ha?c}^{o} \quad \text{\textquoteright breath vapor\textquoteright} \]

Such clusters have the same distribution as other nonincremental clusters — for example,
they are never found word- or root-initially, and do not reduplicate as a unit. I am not
aware of any clusters where /h/ is followed by an ejective; this may be related to the general
rarity of underlying [asp] in coda position §3.1.7).

It is also possible, of course, to have a simple glottal consonant before a consonant
which has no underlying Laryngeal node:

(107)  
\[ \mu \quad \mu \]
\[ \text{RC} \quad \text{RC} \]
\[ \text{Lar} \quad \text{Place} \]

This configuration reflects the cluster in \textit{nahnom}č in (97), for example, and contrasts with
the incremented consonant in (104).
6.4.3. Implications

The nature of the timing tier is a matter of debate in current phonological theory. Proposals from earlier stages in the development of autosegmental phonology represent timing on a skeletal tier, where each segment normally has a slot regardless of its position in the syllable. In Clements and Keyser (1983), the difference between C and V slots also expresses syllabic identity, while in Levin (1984, 1985), Kaye and Lowenstamm (1984), and Guerssel (1986), syllabic identity follows from being in the nucleus within a hierarchical syllable structure. In more recent work, many researchers have adopted some version of the moraic theory first introduced to modern phonology by Hyman (1985), where the mora serves as a unit of weight and expresses both timing (long versus short segments) and syllabic identity. Two particularly influential arguments for moraic phonology are McCarthy and Prince (1986) and Hayes (1989b). As suggested by my use of moras elsewhere, I accept these arguments and my goal is to analyze Kashaya increments within a moraic theory.

In the moraic theory exemplified by Hayes (1989b) and McCarthy and Prince (1986, 1990), onset consonants never have weight at any point in the derivation; that is, they are never dominated by a mora. Rather, a vowel (which always carries some weight) has an underlying mora, and an onset consonant adjoins directly to the syllable that dominates the nuclear mora:

(108) \[
\begin{array}{c}
\sigma \\
/ \mu \\
/ t a
\end{array}
\]

There is no structure between the features defining an onset such as /t/ and the syllable node to which it eventually links. Since in Kashaya the laryngeal increments occur exclusively in onset position, there is no means of expressing in the lexicon the distinction between an incremented consonant such as [ht] and a true cluster [ht]. If no syllable can be specified
underlyingly, the two structures in (103) and (107) cannot be distinguished at that level. Since increment-consonant combinations occur in onset position, under Hayes' theory they should never bear a mora to which the two Root nodes are underlyingly linked. (Consonants have moras only when they are geminate.) Including underlying syllable structure in the lexicon — the only thing available here — is explicitly rejected by Hayes (1989b).17

One way of salvaging the Hayesian mora is by adding a skeleton to the representation. Since even the onset has a skeletal position, moras in the previous section could correspond to an X slot. This analysis dovetails with more direct arguments for the skeleton provided elsewhere. For example, Crowhurst (1988) argues for the type of representation given for a CVC syllable in (109) based on the need for empty X slots ('ghost consonants') in some languages; such an approach combines the advantages of moraic and skeletal theory:

(109)

\[
\begin{array}{c}
\sigma \\
\mu \\
X \\
RC
\end{array}
\]

Archangeli (1988b) gives similar evidence of ghost consonants. Meanwhile, Tranel (1990) claims that floating consonants in French — a melody without a skeletal slot — cannot be accounted for in a purely moraic theory, which has no skeletal slots at all. In addition, Schindwein (1990) argues that more subtle cases of compensatory lengthening are best analyzed by a representation that includes moras and skeletal slots, which she calls the 'segmental moraic theory'. Still, the structure in (109) constitutes a major expansion in the power of the theory, and seems to threaten the advances made by researchers such as

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17 Hayes rejects underlying syllable structure as too powerful, given the observation that syllabification in a language is always predictable by rule. Inkelas and Cho (1991), on the other hand, argue that sometimes underlying syllable structure is necessary, in precisely those cases where surface syllabification is not what the normal rules predict.
Hayes (1989b) and McCarthy and Prince (1986) in constraining the representation. It is an alternative which should be pursued only as a last resort.

For Kashaya, at least, it is possible to appeal to less drastic measures: specifically, the mora as described in §6.1.1, where the onset links to the mora.\(^{18}\) In a language with no onset clusters, such as Kashaya, only one consonant can be morified with a following vowel by this rule. In a sequence /nahmo/, this means that the /h/ must form its own mora, later to become the coda of a heavy syllable:

\[
\begin{array}{c}
\sigma \\
/\mu \mu \mu / \\
/\mu / /\mu/
\end{array}
\]

\[
\begin{array}{c}
\sigma \\
/\mu \mu \mu / \\
/\mu / /\mu/
\end{array}
\]

\[
nahmo \rightarrow nahmo \rightarrow nahmo
\]

For marked structures, it is possible to provide a mora underlyingly; in Kashaya, we can simply link an increment and the following consonant to the same mora. When morification takes place, the following vowel will be linked to that mora; no new one needs to be provided by the Morification algorithm:

\[
\begin{array}{c}
\mu \\
/\mu/ \\
/\mu/
\end{array}
\]

\[
\begin{array}{c}
\mu \\
/\mu/ \\
/\mu/
\end{array}
\]

\[
hk u \rightarrow hku
\]

The marked structure of the increment is directly reflected in the fact that it must be underlyingly morified with the following consonant.

Syllable-dependent rules such as Syllable Extrametricality and Iambic Lengthening fail to apply in level 1 of the Kashaya lexicon; I propose that syllable structure is absent at that level. This resembles the analysis of Bulgarian by Zec (1988) where moras, the smallest units of the prosodic hierarchy, exist independent of syllables in the first level of the lexicon. At level 2, however, syllables are created and in Kashaya a limit of two Root

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\(^{18}\) Katada (1990) gives evidence from a Japanese language game to support the mora-linked onset. Waksler (1990) and Hayes (1991a) adopt this version of moraic theory as well.
nodes in the strong mora of the syllable is enforced by delinking the increment. Word-
internally, the increment then syllabifies as a coda. Word-initially, it cannot syllabify but is
moraically licensed until the postlexical component. At that point it must similarly syllabify
as a coda or be deleted.

So far we have looked only at how to represent well-formed increment structures, but
we must also account for the type of increment which is not found. Since the laryngeal
features of the increment and following consonant cannot be independent of each other, the
following representation must be ruled out:

\[(112) \qquad *\mu
\]
\[
\begin{array}{c}
\text{RC} \\
\text{Lar}
\end{array}
/ \quad / \quad / \\
\begin{array}{c}
\text{RC} \\
\text{Lar} \\
\text{Place}
\end{array}
\]

How are we to exclude (112)? A promising area to look for a solution is the theory of
contour segments, single segments which contain two ordered values for a feature: classic
eamples are prenasalized consonants, which are [+nas, -nas], and affricates, which have
been treated as [-cont, +cont]. Just as with increments only one Laryngeal node is
possible, a prenasalized stop must have only one Place node to account for the fact that
unitary segments such as [m^t] are impossible.

Theories differ in the level at which they assume a branching structure exists. For
example, Goldsmith (1976), Clements (1985a), and Sagey (1986) treat prenasalized stops
with a terminal feature contour:

\[(113) \qquad x
\]
\[
\begin{array}{c}
\text{Root}
\end{array}
/ \\
\begin{array}{c}
[+nas] \\
[-nas]
\end{array}
\]

Sagey (1986) limits possible contours by stipulating that class nodes cannot form contours.
Piggott (1987, 1988) and Rosenthal (1988, 1991) argue instead for a Root node contour,
with each node dominating a terminal feature: 19

(114) \[ x \]
    / \  
   Root Root
  \  
 [-nas] [-nas]

Piggott (1988) proposes that ONLY class nodes (like Root, Place, Laryngeal) can form contours. Since in Kashaya the contour is clearly of a class node (the Root node), we must pursue the latter approach. Rosenthal (1988, 1990) constrains possible contours in Piggott’s framework by the Contour Node Condition (CNC):

(115) Class nodes A and B on tier T can form a contour when the head dominates the same set of non-null class nodes as the non-head.

Following Shaw (1987), the ‘head’ of a contour is the right node. Thus, we may paraphrase (115) as follows: a sequence of class nodes AB can be linked to the same higher node only if those class nodes dominated by A are also dominated by B. This means that the Root nodes in (114) can form a contour if the right Root dominates the same class nodes (e.g. Place) as the left Root. This constraint ensures, for example, that the nasal and oral components of a prenasalized consonant are at the same place of articulation.

The CNC correctly rules out the geometry in (112), since the two Root nodes dominate different Laryngeal nodes. It also permits (103), since the right (head) Root node dominates all class nodes (in this case, just Laryngeal) that the left (non-head) Root dominates. In (104), however, there are no shared class nodes, but the configuration must still be permitted: the CNC incorrectly rules it out. Another problem with the CNC arises if we accept the considerable arguments for a moraic timing tier. When every segment has its own ‘X’ or other timing slot, only contour segments such as prenasalized stops have more than one Root node under a single timing slot. If, on the other hand, segmenthood is

19 Although their work precedes the development of feature geometry, Clements and Keyser (1983) propose representations of contour segments where the branching is essentially at the Root node level.
defined by the Root node and the timing tier is moraic, the common situation of having more than one segment linked to a single mora will be ruled out unless the CNC is coincidentally satisfied by the segments involved.

Is there an alternative to the CNC? I suggest that multiple class nodes can be prohibited by a type of OCP effect. For example, in Kashaya only one Laryngeal node is permitted under each mora:

\[(116) \quad [\text{Lar Lar }]_\mu\]

Since vowels are underspecified for [voiced], they require no Laryngeal node and a CV mora is permitted. This resembles the constraint in Seri against more than one Laryngeal node in a syllable (§4.2.1). In addition, as stated in §6.1.2, the strong (head) mora can dominate only one Root node besides the vowel which heads the syllable. Since the number of Root nodes permitted is determined by whether the mora heads a syllable, however, the restriction is not enforceable until Syllabification occurs — at level 2 in Kashaya. In underlying representations and at level 1, the prespecified linking of incremented consonants to one mora exempts them from the normal constraints against word- and root-initial clusters and permits them to reduplicate in the special way illustrated above. Once Syllabification occurs, constraints on syllable structure are enforced: the increment is delinked from the strong mora and thereafter behaves like an ordinary glottal consonant. The actual delinking of the increment can be effected by the following rule:

\[(117) \quad \text{Increment Delinking}\]

\[
\begin{array}{c}
\mu_s \\
\ne \\
RC \\
\end{array} \quad \text{RC} \\
\]

If (117) is treated as a persistent rule, it could be seen as the formal implementation of the constraint against onset clusters in Kashaya, though the derivation given below in (121) suggests that Increment Delinking cannot apply immediately when its structural description
is met. 20

Similar effects can be generated for other contour segments. For example, if prenasalized consonants are the only onset clusters permitted in a language, a restriction against more than one consonantal Place node per mora ensures that the nasal must share place of articulation with the following consonant:

\[
(118) \quad * \left[ \begin{array}{c}
[+\text{cons}] \\
[+\text{cons}] \\
\text{Place} \\
\text{Place}
\end{array} \right]_\mu
\]

The same constraint actually holds in Kashaya as well, since the increments are not permitted to bear place features. Similarly, affricates must have the same place of articulation for the stop and fricative portions of the segment, and they could perhaps be handled with a similar constraint. Recent research suggests, however, that affricates are not contour segments at all: the two values for [cont] may be unordered relative to each other (Hualde 1988, Lombardi 1990), or affricates may be phonological stops which are realized with phonetic affrication (Steriade 1989). If either of these claims is true, affricates are not relevant to the theory of contour segments.

The metrical behavior of the following form presents interesting evidence for determining when Increment Delinking should apply:

\[
(119) \quad \text{mo-ala-hqa-w} \rightarrow \text{molah-qaw} \quad \text{‘drive down’ [3.14]}
\]

From the lack of vowel length in the first syllable (where we expect [o?] by Root Elision) and the displacement of stress onto the third syllable, we can see that Foot Extrametricality and Flipping have applied. The long vowel which was created in the strong branch of the flipped iamb has been eliminated by Closed-Syllable Shortening (§6.2). As shown in §5.5.2, the anti-iamb is erased if a coda consonant is added to the foot.

---

20 As noted in §1.3, the notation \( HC \) as used in derivations in this dissertation reflects a stage before Increment Delinking has applied, i.e. underlying representation, level 1, or early level 2. HC reflects a later stage where the increment is dominated by a separate mora.
I analyze the eventual sequence [hq] as an incremented consonant, with the same sort of structure seen in (104):

(120)
\[
\begin{array}{c}
\mu \\
\cap \\
\text{h q a}
\end{array}
\]

The vowel of the suffix requires no special underlying structure. Foot Flipping is ordered before CV Adjunction, and they apply cyclically. Increment Delinking is ordered after Foot Flipping. The two suffixation cycles in level 2 are labeled ‘a’ and ‘b’:

(121) Level 2a: Footing, CV Adjunction
\[
(x .) \\
mo la
\]
Level 2b: Footing
\[
(x .) \\
mo la hqa
\]
Foot Extrametricality
\[
<x .> \\
mo la hqa
\]
Foot Flipping
\[
<x .> \\
mo la' hqa
\]
Increment Delinking
\[
<x .> \\
mo la' h qa
\]

The former increment links to the preceding syllable postlexically to cause Closed-Syllable Shortening. Until that time, it is moraically licensed, just like those in word-initial position. The relative ordering of CV Adjunction and Increment Delinking is unimportant, but this derivation supports an analysis where Foot Flipping is not restricted to level 5; the suggestion that Foot Flipping applies only to extrametrical feet handles the facts perfectly (§5.5.4).

Kashaya increments also have implications for the theory of the timing tier proposed by Selkirk (1990). She argues that timing, rather than being expressed by a level independent

\[\text{\textsuperscript{21}}\] The relationship between these two rules is similar to that between Iambic Lengthening and Syllable Extrametricality in one possible analysis of Prefixal Lengthening (§5.7.1); which one feeds or influence the operation of the other, it is ordered after it. Cyclicality and level ordering make possible the eventual feeding or influence.
of the tiers which contain distinctive features, should be represented on the Root tier within a model of feature geometry. The standard autosegmental representation of length involves a single Root node linked to two timing units (which I treat as moraic):

(122) \[ \mu \mu \]
    \[
    \sqrt{RC}
    \]

Selkirk, on the other hand, argues that length should be represented as a Place node linked to two Root nodes:

(123) \[
RC \quad RC
\]
    \[
\sqrt{Place}
\]

Selkirk gives several types of evidence for the two-root theory of length; for example, it permits laryngeal fission, whereby the two parts of a geminate acquire different laryngeal features — for which they must necessarily have different Laryngeal nodes. This is easily accommodated in the two-root theory, since only the Place node is shared, and not the Laryngeal node:

(124) \[
RC \quad RC
\]
    \[
\sqrt{Place}
\]
      \[
\sqrt{Lar}
\]
      \[
\sqrt{Lar}
\]

There are other possible approaches to laryngeal fission (e.g. Hayes 1990) and to the other cases Selkirk adduces, such as geminate inalterability (Hayes 1986a, Schein and Steriade 1986, Inkelas and Cho 1991), but she argues that the two-root theory makes more accurate predictions and is more constrained than the alternatives.

This theory runs into problems in dealing with Kashaya laryngeal increments. As argued above, two Root nodes are necessary to express the separate status of the increment and the following consonant, and to make possible the shared Laryngeal node. But

\[22\] The features [nasal] and [continuant], not shown here, are also present separately for each Root node.
crucially, since the combination of increment and consonant patterns as a single segment early in the lexical phonology, the two Root nodes cannot be interpreted as long; a different timing tier is necessary. At the same time, however, the two Root nodes do represent eventual potential length: as shown in (98), a post-vocalic increment surfaces as a weight-bearing coda. This is comparable to a geminate, which serves as the coda of one syllable and onset of the following syllable; in the case of Kashaya, though, these two syllabic positions are associated with different features (partly shared in some cases).

True geminates have a marginal status in Kashaya (§3.5.3). There is one interesting case which illustrates a connection between the two-root theory of length and the representation of increments. It was stated in §2.3.1 that no verb root begins with a cluster. I know of one exception to the prohibition on root-initial clusters: -m'mi- ‘do perfectly, in detail’ [42]. This case is mitigated by the fact that the two consonants, aspirated /mʰ/ and plain /m/, are identical except for their laryngeal features: the partial geminate structure could exempt the cluster from the morpheme structure constraint (cf. Itô 1986). This independence of laryngeal features is precisely what the two-root theory predicts as possible:

(125)

```
      μ
    /    \
   RC  RC
  /     \
Lar  Place
```

Interestingly, Bun Lucas (who is younger than the speakers described in Oswalt 1961) has only the form /hmi-, which has apparently been simplified to conform to the general pattern. Historically, this change would consist of delinking the Place node from the first Root node, resulting in the structure already seen in (104):

(126)

```
      μ
    /    \
   RC  RC  →  RC  RC
  /     \     \     \     
Lar  Place  Lar  Place
```
In this particular case, the generalization about verb-initial clusters is preserved if /m'm/ is given the monosegmental representation in (125); such a treatment also maximizes the similarity between it and the incrementized /m/ derived from it.

The Kashaya evidence suggests that the two-root theory of length is not valid for all languages, at least in a version where the Root tier is taken as a straightforward representation of length. There are, however, interesting (if indirect) correlations between the Root tier and timing, which could shed light on the precise role of the Root tier in determining the prosodic length of a melodic segment. It could, for example, be the case that two Root nodes are necessary, but not sufficient, for establishing a long segment.

6.5. The Decrement

There is a morphologically triggered rule, called by Oswalt (1961) the Decrement, which deletes a laryngeal increment in particular morphological circumstances. In §6.5.1 we see the variety of morphological triggers, and in §6.5.2 formulate the rule. §6.5.3 describes circumstances under which the Decrement is blocked.

6.5.1. Examples

A simple case where the Decrement applies is with a locative suffix that consists of lengthening a word-final vowel. If any increment is present in the stem, it is deleted:23

(127) a. dono  ‘mountain’  dono’  ‘in, to the mountains’ [130]
    kulu  ‘wilderness’  kulu’  ‘in, to the wilderness’ [130]
    ?imo  ‘hole’  ?imo’  ‘in a hole’ [109]

b. ?aʔq’a  ‘water’  ?aʔq’a’  ‘at, to the water’ [130]
    biʔda  ‘stream’  bida’  ‘below, downward’ [130]
    ?aʔca  ‘house’  ?aca’  ‘home(ward)’ [130]

When there is no increment, as in (a), the Decrement has no effect.

23 Notice that all the output words take the form CVCVV, but this seems insufficient cause to posit a template (§8.1).
Other triggers of the Decrement come from the class of fifteen Directionals, most of which trigger the loss of an increment in the root:

(128) ʔio-ʔimic-i → dobic'i  ‘raise your hand!’ [193]
na-ʔne-ʔimic-i → dadebiʔ  ‘waves to rise up’ [193]
maʔcu-ʔimic-i → bacubif  ‘jump up’ [2.20]

The only change brought by the Decrement is the loss of the increment; notice that a long vowel in the stem is preserved (and undergoes Foot Flipping):

(129) ʔet-ʔimic-i → ʔetibif  ‘stand up’ [193]
niʔi-ʔimic-i → dixibif  ‘start to tell’ [194]

This fact is relevant because the next set of suffixes, the Plural Act, results in the loss of vowel length in the stem as well. The forms in (129) show that this is a separate rule, independent of the Decrement; this Morphological Shortening is discussed in §6.8.

We turn now to the Plural Act form of the verb, where the increment can be lost whether or not a suffix is also present as a marker of the plural. Only some of the suffixes which mark the Plural Act are accompanied by the Decrement. First, consider -ʔa-, which is suffixed to vowel-final stem (a), infixed before a final consonant (b), and Debuccalizes before a coronal (c):

(130) a. ſu-ʔku-t-an'i → duktadu  ‘always finish working (pl)’ [2.116]
na-ʔte-a-ti → dacan'  ‘knock them over!’ [168]
p1i-ʔmi-t-an'i → pimitadu  ‘see in detail (pl)’ [2.55]
muʔa-t-qa-w → muiqtqaw  ‘cook (pl)’ [205]
b. p1ʔa-ʔyaʔdīw → p1iyāqaw  ‘recognize (pl)’ [170]
c. p1ʔi-ʔild'-mʔ → piciftin  ‘be overhanging (pl)’ [D]
na-ʔkoltl'- → dakōhilw  ‘spill (pl)’ [172]
qa-ʔlullict- → qalūhiw  ‘fail to bite off (pl)’ [172]
si-ʔwaltl- → siwāhilw  ‘sag from being wet (pl)’ [172]
maʔsaltlc-w → masāhčiw  ‘be damp-dry (pl)’ [172]

24 In fact, it is possible to make a generalization about the Directionals which trigger the Decrement. Of the fifteen suffixes, six begin with /ə/ and the rest begin with a vowel. All and only those which begin with a vowel are accompanied by the Decrement. The generalization about initial segments is not true for other suffixes, as shown most clearly by the Plural Act discussed below. See §6.5.3 for a potential explanation of the Directional pattern.
In -ʔyʔaʔ- the increment is deleted and the vowel length is lost. Examples where only
Morphological Shortening applies are given in §6.8. Similar facts hold for -ʔa- and -ʔa-

(131) ʔna-ʔqotol-ʔa-w → daqototaw  ‘fail to do (pl)’ [170]
ʔnu-ʔlun-ʔa-w → dulʔaw  ‘pick (berries)’ [170]
ʔnu-ʔtay-ʔa-w → dutʔayaw  ‘touch (pl)’ [170]
ʔmu-ʔkʔuy-ʔa-w → mukʔuyaw  ‘burn up (pl)’ [170]

Some verbs ending in a plain anterior Coronal stop take no overt suffix, and show just the
effect of the Decrement:

(132) ʔnu-ʔlahat-ʔaʔ-ʔi → dulaʔatadu  ‘knock out (pl)’ [2.117]
ʔaʔ-ʔnutun-ʔ → daʔubuʔ  ‘submerge (pl)’ [172]

As argued in §8.1, this allomorph, while subject to phonological restrictions in the choice
of stems, is not phonologically derived from the -ʔ- affix, which is infixed and debuccalizes
as in (130c). See (178) in §6.8 for similar examples involving Morphological Shortening
as the sole overt exponent of the Plural Act.

The effect of the Decrement is not predictable from the segmental shape of the Plural
Act suffix. The suffixes -ʔaq and -ʔataq are accompanied by the Decrement with some verbs,
but not with others:

(133) a. ʔmaʔʔcʔit-ʔaq-ʔ → baaʔʔitʔaʔ  ‘string together (pl)’ [174]
ʔʔʔkʔal-ʔaq-ʔ → dikaʔʔolaʔ  ‘prune (pl)’ [174]
b. qaʔʔpʔul-ʔataq-ʔ → qaʔʔulʔataʔ  ‘winnow (pl)’ [174]
ʔmu-ʔkʔul-ʔataq-ʔ → muʔʔkulʔaʔ  ‘stir while cooking (pl)’ [174]

In each pair, the first root undergoes the Decrement but the second does not, showing the
morphologically triggered (and idiosyncratic) nature of the rule. A similar suffix is
illustrated in (179) below. The last verb has an alternate Plural Act, muʔʔkulaʔ with -ʔaq,
which also fails to undergo the Decrement. Although qaʔʔulʔataʔ loses its increment with
-ʔataq, the same root can also take the Plural Act suffix -ʔat (together with the Durative -ʔaʔ),
which never triggers the Decrement: qaʔʔpʔulʔatadu. At least historically, -ʔataq surely

284
consists of -at plus -aq, and it is the latter suffix which can trigger the Decrement. Interestingly, -aq is added only to roots ending in /l/, whether or not -at is also present; this suggests that -ataq has been lexicalized as unit, and has inherited the properties of -aq with respect to the Decrement and the requirement that the root end in /l/. The alternative is to say that -aq is sensitive to the last consonant of the root even if -at intervenes.25

Another suffix, -t, derives verbs from nouns and adjectives. It triggers both the Decrement and Morphological Shortening, and provides another example of the loss of a glide in this context:

(134)  hoʔto-t-i → hoʔotf  ‘put your head (there)!’ [125]
sil.ta-t-ani-i → silata’du  ‘come here, Flatty!’ [125]

See §6.8 for examples of Morphological Shortening triggered by this suffix.

There appears to be only one prefix in Kashaya which triggers the Decrement, the third-person possessive miya- used in the kinship system (§8.6):

(135)  miya-ʔwe → miyaʔwe  ‘his/her/their mother’
       miya-ʔceye → miyaʔceye  ‘his/her/their son-in-law’
       miya-ʔdaq’an → miyaʔdaq’an  ‘her/their husband’

Notice that after the loss of the increment Iambic Lengthening applies. As mentioned in §5.7.2, this prefix is an exception to Syllable Extrametricality.

6.5.2. The Form of the Rule

The Decrement must remove the laryngeal increment, but leave unchanged the laryngeal features of the following consonant; for example, /hʔ/ becomes [cʰ], not [c]. Since the affixes which trigger it are all added after level 1, where increments cease to be distinct from plain glottals, the special representations of increments discussed in §6.4 are

25 That -ataq has been reanalyzed as a single suffix is a necessary assumption under the analysis of blocking given in §6.5.3, since otherwise -at would be expected to block the Decrement when it is triggered by -aq.
irrelevant to the formulation of the Decrement. At this stage an increment is dominated by a mora; deletion of that mora will remove the increment without affecting the laryngeal features of the following consonant, which are independently licensed by a different mora.

We can note at this point that the effect of the Decrement is always in the first visible syllable of the word to which it applies:26

(136)  Ṽu-ʔkut-ʔaʔ → <du>ʔutáʔdu  ‘always finish working (pl)’ [2.116]
qℓ-ʔul-ʔaʔ → <qa>ʔuláʔtaʔ  ‘winnow (pl)’ [174]
ʔno-ʔmíč-ʔi → dobićí  ‘raise your hand!’ [193]

The Decrement, then, targets a word-initial glottal mora, modulo the effect of Syllable Extrametricality. The morphological loss of an increment which is truly word-initial is obvious only in a larger phrasal context. In the following pair, only -ʔala ‘down’ triggers the Decrement:

(137)  hce-mʔ → hceń  ‘lie open’
       hce-ʔala-w → ceľaw  ‘be open downward’

When ʔimo ‘hole’ precedes each verb, the initial difference surfaces since the increment can syllabify:

(138)  ʔimo hceń → ʔi móh ceń  ‘hole to lie open’ [D]
       ʔimo ceńaw → ʔi mo cećaw  ‘hole to be open downward’ [D]

At the beginning of an utterance, of course, the initial increment of any word is lost even if the Decrement has not applied.

The Decrement does not affect a glottal consonant which is not in initial position (modulo Syllable Extrametricality). In the following examples, the glottals result from Debuccalization:

26 That is, at the beginning of any root which takes an instrumental prefix (which always undergoes Syllable Extrametricality); before the second syllable of a polysyllabic root which takes no prefix (since the root itself undergoes Syllable Extrametricality); and initially in a monosyllabic root which takes no prefix (since the Non-Exhaustiveness Condition prevents Syllable Extrametricality from applying, and the entire root remains visible).
(139) kehl-ala-w → kehlalaw ‘peer down (pl)’ [178]
<da>yeʔa-ala-w → <da>yɛʔalaw ‘push down with the hand (pl)’ [3.15]

Since the glottal is not word-initial, it is not deleted. Similarly, a noninitial glottal which is moraically licensed is left intact even though, as seen in (128), -iṭiṭic triggers the Decrement:

(140) <hi>šaʔqa-ṭiṭic-i → <hi>šahqabé-ci ‘go finish breaking it!’ [3.15]

See §6.2 for discussion of this moraically licensed /h/ and the preceding long vowel.

In one respect, the Decrement appears to be nonlocal, since it is generally triggered by suffixes and has its effect at the left edge of the word. The rule itself can be considered local, however, since adjacency to the left edge is in fact a requirement. I formulate it as the deletion of an unsyllabified mora:

(141) Decrement

\[ μ^- \rightarrow \emptyset / [ \_ \]

Since the only moraically licensed consonants found in initial position are glottals, no features need be given in the rule to express that fact. I assume that the Decrement is triggered by a diacritic feature of an affix. It appears, however, that the application of the Decrement must precede actual affixation: otherwise the prefix miṭa-, which also triggers it (see (135)), will prevent the increment from being in word-initial position. This resembles Prosodic Circumscription, which applies to a stem before the morphological operation which triggers it (see §8.1 for references and discussion). See §6.8 for similar evidence that Morphological Shortening applies before the triggering suffix is added.

6.5.3. Blocking of the Decrement

Oswalt (1961) includes in his analysis a suffix which has the effect of removing the diacritic which triggers the Decrement. The suffix actually has no segmental content: it
derives a verb from an adjective, and the resulting verb requires a Directional suffix. Recall that all vowel-initial Directionals trigger the Decrement; in these derived verbs, however, the rule fails to apply:

\[(142) \quad \text{'muh}^{b}k\text{-a}^{i}-i \rightarrow \text{buh}^{k}d\text{u} (\ast\text{buh}^{k}d\text{u}) \quad \text{"walk along hunched over"} [128] \]
\[
\text{pi}^{b}k\text{-a}^{i}-a^{i}-w \rightarrow \text{pi}^{k}k\text{-l}^{a}w (\ast\text{pi}^{k}k\text{-l}^{a}w) \quad \text{"stretch slender neck downward"} [128] \\
\text{pu}^{b}h^{i}-a^{q}a^{i}-? \rightarrow \text{pu}^{h}h^{i}\text{-q}a^{i}? (\ast\text{pu}^{h}h^{i}\text{-q}a^{i}?) \quad \text{"go up alone"} [128] \\
\]

The problem inherent in this analysis is that the blocking effect of adjective-to-verb conversion does not take place until the next cycle, where the Decrement-triggering suffix is added. Rather than removal of a Decrement diacritic which is present in the representation at the time of conversion, it would appear that a new diacritic must be added, one which cancels the Decrement on the next cycle.

An alternative to the diacritic-removal analysis relies on bracketing. Suppose the verbs in (142) are derived simply by adding morphological brackets marked as a verb. In Inkelas’ (1989) framework, this is accompanied by new prosodic brackets; extrametricality is represented by exclusion from the prosodic domain:

\[(143) \quad \text{morphological} \quad [ \text{buhku} ]^{A} \rightarrow [ [ \text{buhku} ]^{A} ]^{v} \]
\[
\quad \text{prosodic} \quad \text{bu [ hku ]} \quad \text{bu} [ [ \text{hku} ] ]
\]

The Decrement applies before actual affixation of the trigger, as I assumed above. Further, the rule can only see ‘inside’ one bracket; this is a natural expression of locality. In other words, it applies to the first syllable after the leftmost prosodic bracket of the stem. If the change from an adjective to a verb brings with it not just a new morphological bracketing, but also new prosodic brackets, the increment will be shielded from the Decrement. In effect, the rule tries to apply to first syllable after the first bracket, but nothing is there in this case:

\[(144) \quad \text{bu} [ [ \text{hku} ] ] \]

\[\uparrow\]

288
This approach is much more principled than one which must somehow ‘remember’ that the Decrement cannot apply on the next cycle.

Supporting evidence for this treatment of blocking comes from cases where a real suffix intervenes between the root and the triggering suffix. As discussed in §7.2.3, the function of the -w Movement suffix is unclear, but when it is present it prevents the loss of an increment which normally accompanies vowel-initial Directionals:

(145) a. qo²kh²-o-w-ay-ac-? → qohq°owä'ya? ‘keep standing against (pl)’ [213]
    b. mi³ca-w-ay-? → mihcawäy ‘toss to someone (pl)’ [D]
       mi³ba-ay-? → micäy same (but rarer) [D]

The last two forms illustrate the blocking effect of -w very clearly. The following verbs have word-initial increments:

(146) ʔña-wala-we-ya-e → ʔdawa‘lawiye
       ʔmë-we-ya → ʔbewäy

We see from the phrasal context that these increments survive the lexical derivation, due to the presence of -w:

(147) ma²šä ʔdawa‘lawiye to qahca ʔbewäy
       ‘I’m starting to get hungry’ [235]
       ‘hold a knife against (someone’s throat)’ [D]

The explanation here is the same as in (144), except that the new brackets include phonological content as well:

(148) mi [ hca ] w ]
       ↑

Recall that the Decrement applies before addition of the suffix which triggers it, so -ay is not yet present in this representation. If -w has not been added, the Decrement finds what it is looking for:

(149) mi [ hca ]
       ↑
The different bracketing accounts for the different outcomes in (145b).

I mentioned above that all Directional suffixes, except those beginning with /m/, trigger the Decrement. It may be that this -m should be treated as a separate suffix which has the same effect of blocking the Decrement which would normally be triggered by the ‘rest’ of the Directional. For example, rather than saying that -an ‘along, here’ triggers the Decrement, while -m ‘across’ and -man ‘in an enclosed place’ do not, we could treat the latter suffix formally in two parts, -m and -an, with a lexically defined meaning distinct from the meaning of the component parts. While this -an also carries the Decrement diacritic, it is blocked by the brackets provided by previous suffixation of -m:

(150) morphological

prosodic

\[ \text{[ bahcu ]}_v \rightarrow \text{[ [ bahcu ]}_v \text{m } ]_v \]

\[ \text{ba [ hc]u} \rightarrow \text{ba [ [ hc]u } \text{m } ] \]

The same blocking of the Decrement would happen here as shown in (144). The noncompositionality of the semantics makes the breakdown of the suffixes less appealing, and this explanation may have historical validity only, but §3.5.2 gives evidence from vowel assimilation for a similar decomposition of certain Directionals.

6.6. Elision

Since every syllable in Kashaya requires an onset, when two vowels come together in morphological concatenation something must be done to create a well-formed syllable structure. Exactly what happens depends on where in the word the first vowel lies, and in what level of the lexicon the concatenation occurs: either the two vowels become one long vowel, or the second vowel is simply deleted.

When the first of the two vowels which come together is in the first visible syllable of the word, the output is a long vowel with the features of the first vowel. The base is shown below in bold, with the application of Syllable Extrametricality where appropriate:
(151)  \begin{align*}
{\text{mo-aqac-?}} & \rightarrow {\text{mo-qa?}} \quad \text{‘run up from here’ [192]} \\
{\text{mo-iümic-?}} & \rightarrow {\text{mo-bi?}} \quad \text{‘run away’ [193]} \\
{\langle \text{c'i-} \rangle \text{-ne-an-i}} & \rightarrow {\text{c'i-} \text{de} \text{tu}} \quad \text{‘carry along’ [186]} \\
{\langle \text{c'i-} \rangle \text{-ne-iümic-?}} & \rightarrow {\text{c'i-de} \text{bi?}} \quad \text{‘lift up’ [194]} \\
{\langle \text{pi>hki-ala-w} \rangle} & \rightarrow {\text{pihki-iáw}} \quad \text{‘stretch slender neck down’ [128]} \\
{\langle \text{pu>h} \text{i-aqac-?} \rangle} & \rightarrow {\text{puh} \text{i-qa?}} \quad \text{‘go up alone’ [128]} \\
{\langle \text{bu>h} \text{ku-an-i} \rangle} & \rightarrow {\text{buhku-du}} \quad \text{‘go along hunched over’ [128]}
\end{align*}

Later in the word, the second of the two vowels in the string is deleted, and the result is a short vowel. Again, the features of the first vowel survive:

(152)  \begin{align*}
{\langle \text{ma>lucma-iümic-?} \rangle} & \rightarrow {\text{malúch} \text{mobi?}} \quad \text{‘start to bake (pi)’ [2.52]} \\
{\langle \text{miu>wi-wa-em} \rangle} & \rightarrow {\text{buwi-wa} \text{m}} \quad \text{‘he’s stringing (beads)’ [284]} \\
{\langle \text{q'a>hqa-iümic-ni-na} \rangle} & \rightarrow {\text{qahqabi} \text{bíina}} \quad \text{‘he must have rescued him’ [2.52]} \\
{\text{mo-iümic-ño-el}} & \rightarrow {\text{mo-bi} \text{idol}} \quad \text{‘the one they say ran away’ [2.61]}
\end{align*}

In \text{mo-bi} \text{idol} both processes apply, with the output depending on the location of the vowel sequence.

We can account for the pattern in (151) with a rule which spreads the features of the first vowel onto the second, dislodging the features present there:

(153)  \text{Root Elision}

\[
\begin{array}{c}
\sigma \\
\mu \\
\mu \\
\downarrow \\
\mu \\
RV \\
\uparrow \\
RV
\end{array}
\]

As formulated, the two moras do not need to be in the same syllable for the rule to apply, but Root Elision can still serve to enforce the constraint against diphthongs (§6.1.2). Since the rule refers to the edge of the domain, it is sensitive to Syllable Extrametricality.

The forms in (152) are generated by a different rule, which removes the entire mora of the second vowel to yield a short vowel as the output.

(154)  \text{Mora Elision}

\[
\begin{array}{c}
\mu \\
\mu \\
\downarrow \\
\downarrow \\
RV \\
RV
\end{array}
\]
After the deletion of the mora, the stranded vocalic Root node has no place to link and is stray-erased. The environment for Root Elision is more specific, so by the Elsewhere Condition it applies in preference to Mora Elision. For strings later in the word, the structural description of Root Elision is not met, so Mora Elision applies instead.

Root Elision is not in effect throughout the lexicon. Vowel-initial suffixes added in level 5 never surface with a long vowel in the syllable to which they are suffixed. This is true even if that syllable is the first visible one of the word, the normal purview of Root Elision:

\[
\begin{align*}
(155) & \quad \text{<ca>}^{\text{h}}\text{no-innā-em} \rightarrow \text{cahnōnnam} & \text{‘I heard someone singing’ [3.6]} \\
& \quad \text{<ca>}^{\text{h}}\text{no-iʔha} \rightarrow \text{cahnōʔba} & \text{‘would sing’ [3.6]}
\end{align*}
\]

Although in a word-internal syllable we would expect Closed-Syllable Shortening anyway, the fact that the stress falls on the second syllable in each case shows that the vowel in that syllable is short, and not subject to Root Extrametricality. This means that Mora Elision has applied, and that Root Elision turns off before level 5.

Most suffixes in Kashaya contain vowels which are underlyingly short and acquire length only by processes such as Root Elision or Iambic Lengthening. There is one, however, which consists of a long vowel, the Nonfinal Verb suffix -e\'\(\text{e'}\): When added to a vowel-final stem, the result is usually a long vowel with the features of the first vowel, even though it is not in the initial visible syllable of the word:

\[
\begin{align*}
(156) & \quad \text{rīwuwi-mela-e'} \rightarrow \text{buwimēla'} & \text{‘I strung beads (NFV)’ [247]} \\
& \quad \text{mo-aqcac-t-iya-e'} \rightarrow \text{moqāqtiya'} & \text{‘don’t let (me) run up (NFV)’ [258]} \\
& \quad \text{maʔu=ʔ-rio-e'} \rightarrow \text{maʔūʔdo'} & \text{‘it is said that next... (NFV)’ [324]} \\
& \quad \text{mo-aloqʷ-rio-e'} \rightarrow \text{mo'λogdo'} & \text{‘they way he ran up here (NFV)’ [283]} \\
& \quad \text{rīwuwi-wela-e'} \rightarrow \text{buweiwela'} & \text{‘I was stringing beads (NFV)’ [248]} \\
& \quad \text{maʔac-mela-e'} \rightarrow \text{baʔac'mela'} & \text{‘I’m going to gather (NFV)’ [247]}
\end{align*}
\]

With final /\(l/\, however, we get the opposite result: the features of -e\(\text{e'}\) take priority:
Uvular Assimilation (§3.3.2) changes [qe'] to [qa'] in the last example.

In all of these cases we expect Mora Elision, not only because of the position in the word but also because it is a level 5 suffix. In (156) we can achieve the correct result with the present formulation of the rule. As given above in (154), the first mora of the suffix is deleted. When the suffix vowel is short, that leaves no other moras; but when the suffix vowel is long, another mora remains, and the features of the first vowel spread onto it by compensatory lengthening:

(158) \[ \mu \mu \mu \rightarrow \mu _{-}^{L} \mu \]

The features for /e/ must be deleted at the same time as the first mora, or else they would still be on the remaining mora to give us the sequence [ae]; if Mora Elision applied again another mora would be lost and the output would be the incorrect short [a]. The deletion of those features would follow from an assumption that the head features of a prosodic constituent are deleted when that constituent is deleted, consistent with what we see for /a/ Deletion in (58). Kashaya appears to have automatic rightward spreading, but only of vowel features. There are no cases of consonant features spreading to a following empty mora to create a geminate, but vowel spreading is required also in Iambic Lengthening (§5.1), Initial-Syllable Lengthening (§8.6) and morphological templates (§8.2).

Something else is going on in (157). It seems that before -e', /a/ behaves as though it were word-final and undergoes Deletion. One way of accounting for this fact is to say that the Nonfinal Verb suffix is not added until the next level, by which time the final /a/ will have been deleted. The disadvantage of this approach is that this would mean giving an entire level of the lexicon to a single suffix. It also causes difficulties in accounting for the
behavior of the consonants preceding the /ã/ — for example, the nonaspiration of /q/ and
the gemination of /n/, as well as their failure to trigger Closed-Syllable Shortening. The
same problems arise if -e' is treated as a (postlexical) clitic. I suggest that -e' is essentially a
lexical clitic of sorts: it imposes word brackets on the stem to which it attaches:

(159) cohtoc-yã- \rightarrow [ [ cohtoc-yã ]_w e' ]

This allows /ã/ Deletion to apply even when the vowel is not completely final in the form: it
is still followed by a right word bracket, which is what the rule looks for:

(160) [ [ cohtoc-yã ]_w e' ] \rightarrow [ [ cohtoc-y ]_w e' ]

Once Deletion occurs, the leftover consonant links as an onset to the first mora of -e'. This
analysis can also explain why -e' is the only long vowel possible at the end of a verb: it is
not actually labeled with a word bracket (which it imposes on the stem to which it attaches),
but some larger constituent, call it the phonological phrase:

(161) [ [ cohtoc-y ]_w e- ]φ

If Final Shortening applies only to vowels at the end of a word, it automatically fails to
affect -e', as well as to the assimilated versions of the suffix in (156).27 The phrasal
bracketing may be related to the fact that this Nonfinal Verb suffix occurs only when the
verb is not at the end of the sentence. See Poser (1990) for a case where a lexical affix
imposes a phrasal boundary on the stem to which it attaches.

6.7. Glide Deletion

A sequence of a vowel and a glide surfaces unchanged when it is final in a phrase (for
example, in isolation):

27 Under this analysis Mora Elision and rightward spreading apply across the lw boundary, but this
assumption creates no empirical difficulties: there is no other context where two vowels come together
across a word boundary.
(162) baláy  ‘blood’
    muʔtaw  ‘cooked’
    ?anáw  ‘very’
    huʔúy  ‘eye’
    qʰabóy  ‘loose’

It is also left intact when the glide is the onset of a syllable:

(163) ʔu-hṭay-ela  →  duhtayɛla  ‘I am touching it’ [106]
    balay=ʔeɾ  mu  →  balayɛɾ  mu  ‘that is blood’ [82]

When it is not final in a phrase, however, a VG rime is realized as a long vowel with the
features of the original short vowel. This can be word-internally:

(164) ʔu-hṭay-ti  →  duhtáti  ‘about to touch’ [2.12]
    ʔu-hṭay-qâ  →  duhtáqâ  ‘must have touched’ [2.112]
    hanoy-hanoy-ʔ  →  hanôʔhanoy  ‘limp repeatedly’ [157]
    hanoy-tʰu=ʔ  →  hanôʔtuʔ  ‘don’t limp!’ [2.112]

Or it can be in word-final position within a phrase:

(165) balay min  →  baláv min  ‘like blood’ [107]
    muʔtaw min  →  muʔtâv min  ‘as if cooked’ [107]
    ?anaw bahʔe  →  ?anáv bahʔe  ‘very big’ [2.50]
    huʔúy mo  →  huʔȗʔ mo  ‘face’
    huʔúy qʰaʔbe  →  huʔȗʔ qʰaʔbe  ‘eyeball’
    huʔúy ʂintə  →  huʔȗʔ ʂintə  ‘pupil’
    qʰaboy ʂuʔtaw  →  qʰabâʔ ʂuʔtaw  ‘be tied loose’ [D]
    bihšê boʔow cohtoʔ  →  bihšê boʔow cohtoʔ  ‘he left to hunt deer’ [D: ʔbe]

The rule is necessarily postlexical for two reasons. First, it is sensitive to the presence of a
following word. Second, it must follow stress placement, which is postlexical. The
affected syllable acts as though its rime is VC rather than VV: notice in many of these
examples that the stress falls on that syllable rather than undergoing Foot Extrametricality
(§5.5.3).
Somewhat like the rule of Root Elision, this rule spreads the features of a vowel onto the mora dominated by a following glide within the same syllable:

(166) **Glide Deletion**

\[
\begin{array}{c}
\sigma \\
\mu \\
\mu^* \\
RV \\
RS \\
[-nas] [-lat]
\end{array}
\]

If we assume that glides are consonants (§2.4) and Final-Consonant Extraprosodicity can persist to the postlexical component (§6.3), the structural description of the rule will be met only when the glide is nonfinal.

There is no simple way to distinguish glides from other consonants in the feature system I assume, though a good generalization would seem to be that the rule targets the most sonorous class of consonants. The best solution may be related to a hierarchy of sonority such as used by Zec (1988), to which the rule of Glide Deletion can somehow make reference: only the most sonorous consonants, the glides, fit the requirements of the rule. Another possibility is to include the feature [vocalic] in the inventory, and let it refer to glides and vowels. Cho (1990) is similar in permitting three major class features: [cons], [vocalic], and [son].

There are two circumstances in which Glide Deletion fails to apply. First, it does not apply to glides with laryngeal features, whatever their source. In some cases the laryngeal features come from Glottal Transfer across a word or clitic boundary (§3.1.4):

(167)

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{nu-}^*\text{hay-}^\text{ma})</td>
<td>(\text{duhtá}^\text{y}^\text{ba})</td>
<td>'after touching' [2.54]</td>
</tr>
<tr>
<td>(\text{nu-}^*\text{hay-}^\text{no})</td>
<td>(\text{duhtá}^\text{y}^\text{do})</td>
<td>'they say he touched' [2.50]</td>
</tr>
<tr>
<td>(\text{balay=}^\text{nak}^\text{e})</td>
<td>(\text{balá}^\text{y}^\text{bak}^\text{e})</td>
<td>'for blood' [2.54]</td>
</tr>
<tr>
<td>(\text{mu}^\text{tafaw=}^\text{nak}^\text{e})</td>
<td>(\text{mu}^\text{ta}^\text{á}^\text{w}^\text{bak}^\text{e})</td>
<td>'for cooking' [2.106]</td>
</tr>
<tr>
<td>(\text{ma}^\text{ta}^\text{aw=}^\text{nak}^\text{e})</td>
<td>(\text{ma}^\text{ta}^\text{á}^\text{w}^\text{bak}^\text{e})</td>
<td>'for eating' [319]</td>
</tr>
<tr>
<td>(\text{manew=}^\text{nak}^\text{e})</td>
<td>(\text{man}^\text{é}^\text{w}^\text{bak}^\text{e})</td>
<td>'for dancing' [2.107]</td>
</tr>
</tbody>
</table>

296
The contrast between maʔawbaḵ’e in (167) and ʔaną’ baʔu’tε in (165) shows that Glottal Transfer is not possible across a word boundary.28

The complex glide can also be the result of Glottal Merger with a following consonant, whether lexically with a suffix or postlexically with a word-initial increment:

(168) niu-hat-ʔa-w → duhávtaw ‘touch (pl)’ [170]
muʔ-hk’uy-ʔa-w → muʔk’uytaw ‘burn up (pl)’ [170]
ʔnu-hk’uy-ʔaʔe → duhk’uyk’e ‘will kill’ [264]

(169) muʔtaw hmi → muʔtaw’mi ‘really cooked’ [107]
balayʔiow → baláytow ‘suck blood’ [106]
balay hmi → balá’y’mi ‘real blood’ [107]
huʔuy hku → huʔu’y’ku ‘one eye’ [39]

Finally, in some cases the laryngeal feature appears to be underlying:

(170) wây’čin ‘repeatedly’
tuʔtu ‘sugar’
šíwši ‘chick’
háʔa ‘redbud’
qáʔči ‘pelican’
háʔč’a ‘dry brush’
háʔko ‘wrigglers, mosquito larvae’

If, as suggested above, the application of Glide Deletion is linked to a sonority hierarchy, the fact that glottal features result in lower sonority (Zec 1988) may explain why the rule fails to apply to these complex glides. Otherwise the rule may have to include a statement that no Laryngeal node is present, or that the Laryngeal node must be the same as that for the preceding vowel (if [voiced] has already been inserted by this point).

The other glides which fail to undergo Deletion are do not have distinctive laryngeal features: they are simply exceptions found in certain idiosyncratic words, some clearly borrowed and some with irregular syllable structure (i.e. larger than CVC) and stress, in addition to the anomalous glide behavior:

28 Oswalt (1961:107) reports the form balay baʔu’tε, without glottalization but also without Glide Deletion. In Bun Lucas’ speech, the glide in balaybaʔu’tε is the same as that in duʔu’yaʔba.
(171)  cáynik(a)
      frwra
      péwlo
      qažaylolo
      huñyibobo, ñiboñbo
      ñiyqañaw
      kénykey ñiw

‘teapot’ (Russ. čaynik)
‘pound’ (Span. libra)
‘town’ (Span. pueblo)
‘ogre’ [41] (compound with qaži ‘raven’?)
‘gnat’ (compound with huñay ‘eye’)
‘Squashed-Eye (name)’ [Os91]
‘nod head while talking’ [2.62]

These examples show anomalous word-initial glide-consonant clusters. In obvious borrowings, and at least one potentially native word, a word-final glide also fails to undergo the rule in the appropriate phrasal environment:

(172)  réy ʃin ɐ  mu
      kañey ʃin ɐ  mu
      qažay bahñe
      qažay ?acañ

‘he is not the king’ [3.6] (Span. rey)
‘that is not coffee’ [3.14] (Span. café)
‘big raven’ [3.16]
‘raven people (the Pomo)’ [3.16]

By standard assumptions, a postlexical rule such as Glide Deletion should not be subject to lexically marked exceptions; if possible we should represent the exceptionality in some phonological way. The forms in (172) provide a clue to the proper representation of those in (171). As argued in §6.1.3, exceptional VVC rimes are linked underlyingly to moraic structure. The same should be true of those ending in glides:

(173)  μ  μ
       \ /\
       rey

This structure already explains why the glide is immune to Deletion: the effect of the rule is to spread the vowel rightward onto the second mora, but that linking is already present, and the rule is preempted. Suppose that we use the same type of prelinking for the cases given in (171):

(174)  μ
       \/
       cāynik

This word undergoes regular Morification and Syllabification to reach the following result:

298
Postlexically, when Glide Deletion applies, the structural description of the rule is not met: the vowel cannot spread to the mora dominated by the following glide when that is the same mora it is already linked to. This solution predicts that the syllable containing the exceptional morification should count as light for purposes of stress, but since these words typically have irregular stress, it is not a prediction which can be meaningfully tested.

There are at least two instances of geminate [yy] which resist Glide Deletion:

(176) tuyyu
     =yya
     'serves you right'
     Plural [317]

I attribute resistance of tuyyu to the same idiosyncrasy seen in (171), rather than to any form of geminate inalterability. The glide which is underlyingly linked to the same mora as the preceding vowel happens also to be linked to a following mora to make it a geminate:

(177) μ μ
     \ / \ / \ / \ / \ /
     τ uy u

Note that this representation makes it possible for a geminate not to add weight to the syllable, a situation which Blevins (1991) argues for. In the clitic =yya the glide cannot be prelinked to the preceding vowel, since it belongs to a different word, yet Glide Deletion does not occur: natáyya ‘children’ rather than *natáyya. The failure of the rule here may be attributable to the presence of a word boundary between the vowel and the glide: [[natáyya]. All cases where Glide Deletion does occur are strictly within the bounds of a word: the presence of a following word serves simply to make Final-Consonant Extraprosodicity impossible, so the word-final glide must be syllabified and vulnerable to Deletion.
There are several reasons for the approach in (177). First, resistance to Glide Deletion is certainly not limited to geminates, as the singleton glides in (171) show: whatever explanation applies there can be used here as well. Second, Glide Deletion does in fact apply to the productive and numerous cases of geminate [yy] which are derived by Sonorization and gemination (§3.5.1); it is not surprising that these derived geminates have no idiosyncratic behavior, since prelinking is not possible.\textsuperscript{29} Finally, I assume the theory of Inkelas and Cho (1991), in which a structure-changing operation such as Glide Deletion is predicted not to show a geminate inalterability effect, so that the failure of the rule to apply in (176) is necessarily idiosyncratic — consistent with the existence of only one example, tuyyu.

The form of Glide Deletion bears a definite resemblance to Root Elision, and results similarly in a long vowel. Root Elision is a cyclic lexical rule, which feeds postlexical stress: the long vowel behaves precisely like an underlying long vowel for metrical purposes. Glide Deletion is postlexical and follows all metrical rules. If Glide Deletion is really Root Elision, we could prevent word-internal VG rimes from undergoing the rule in the lexicon, because all such rimes are morpheme-internal and protected by the Strict Cycle Condition. It is problematic, however, to say that they are simply applications of the same rule which have different characteristics due to the different components in which they apply, since as I argued in §2.4 there is considerable evidence that glides and vowels are distinct in Kashaya, so that the structural descriptions of the rules must be distinct as well.

In addition, glides must be consonants to undergo Final-Consonant Extraprosodicity and

\textsuperscript{29} Word-internal underlying geminate glides (with preceding vowel: VGG) which are not resistant to Glide Deletion would surface as long vowel-glide sequences (VVG). They are unlikely to be posited by the learner as underlying forms, since only metrical facts could distinguish underlying VVG and VGG (§5.3), and a surface VVG sequence which does not behave like a long vowel could more directly be analyzed as having irregular accent. A similar situation arises in the general VVC case, which could be treated as VGC to account for irregular stress. One such word is mātʰho 'poison oak', where a glide can be reconstructed in Proto-Pomo *mātʰyuho (McLendon 1973). Synchronously, however, there is no motivation for positing an underlying glide if it never surfaces as such; and if Syllable Extrametricality does not apply to long vowels (§5.5.4), the stress on mātʰho is regular.
explain why phrase-final glides are immune from Deletion. The similarity between these two rules is, in fact, the only evidence in the language for treating glides as nonsyllabic vowels, and is quite weak compared to evidence against such an analysis. Further, Root Elision is restricted to the first visible syllable, but Glide Deletion applies anywhere in the word. In addition, we have seen that Root Elision appears to turn off before level 5 of the lexicon, so that its application postlexically would require its presence in two noncontiguous domains, a violation of the Stratum Domain Hypothesis (K.P. Mohanan 1982).

6.8. Morphological Shortening

We noted in §6.5.1 that the Plural Act can trigger not only the deletion of an increment but also the loss of vowel length. In all cases this is in the last syllable of the root.30 Like the Decrement, this Morphological Shortening is a property of the infix -t- (a) and the suffix/infix -ta- (b), and also serves in some cases as the sole marker of the Plural Act (c):

\[
\begin{align*}
(178) \quad a. \quad p'\text{a}-&\text{c'ot'lq'-w} \rightarrow p'\text{ac'ot'qow} \quad \text{‘stab (pl)’ [170]} \\
&\text{q'a}-\text{qo'-t'l}-d\text{s-} \rightarrow \text{qaböhiwiw} \quad \text{‘cheeks be puffed up’ [D]} \\
&\text{cori'tlc'-w} \rightarrow \text{coböhiwiw} \quad \text{‘attach nonlong objects to’ [D]} \\
&\text{mamni'tlc'-w} \rightarrow \text{mabihiwiw} \quad \text{‘make a face (pl)’ [D]} \\
b. \quad \text{m'a}-\text{mir'-t'-a'-w} \rightarrow \text{mabfiwilaw} \quad \text{‘turn in a circle with the foot (pl)’ [D]} \\
&\text{qašo'talq'-?} \rightarrow \text{qašotá?} \quad \text{‘get well (pl)’ [171]} \\
&\text{sim'a-talq'-?} \rightarrow \text{simátá?} \quad \text{‘go to sleep (pl)’ [171]} \\
&\text{nuqa'talc'-?} \rightarrow \text{duqatá?} \quad \text{‘get lost (pl)’ [171]} \\
c. \quad \text{ti}-\text{c'-t'-a'-ni} \rightarrow \text{dic'itä'du} \quad \text{‘fall out of (pl)’ [3.15]} \\
&\text{t'u}-\text{le'-t'-a'-ni} \rightarrow \text{duiteit'ádu} \quad \text{‘attach (pl)’ [3.15]}
\end{align*}
\]

Even in closed syllables, we know that the vowel length is lost lexically, and not due to postlexical Closed-Syllable Shortening (§6.2), because the vowels behave as short for stress placement. The forms in (178c) confirm that Morphological Shortening is not the

---

30 I do not have any Plural Act forms for the rare verb roots with a long vowel in a nonfinal syllable, e.g. ma'ku-e- ‘grow deaf’ [127], ūdáćic'- ‘know’ [105], ćar'-hac- ‘marry’ [23, 2.35], -tić- ‘inflates (Sem)’ [166].
result of prosodic conditions: Morphological Shortening is the only marker of the plural (see (182)). The same point is made for the Decrement in (132) above.

We can also illustrate now another Plural Act suffix which is only sometimes associated with the Decrement and Morphological Shortening. In (179a) below the suffix -m is accompanied by Shortening (the Decrement is vacuous), while in (b) neither applies:

\[(179)\]
\[
a. \, \ddot{m}a\ddot{q}a\text{-m-i} \rightarrow \text{baq}^\prime \text{amâ} \quad \text{‘finish them!’ [3.15]}
\]
\[
b. \, \ddot{m}a\ddot{q}a\text{-til-m-w} \rightarrow \text{baq}^\prime \text{ilmaw} \quad \text{‘be too noisy (pl)’ [173]}
\]
\[
\ddot{su}\ddot{q}a\text{-m-muč-?} \rightarrow \ddot{suq}^\prime \text{ammâ} \quad \text{‘pull apart (pl)’ [204]}
\]
\[
\ddot{su}\ddot{h}we\text{-n-m-w} \rightarrow \uu\text{hwenmâw} \quad \text{‘shake (pl)’ [173]}
\]

In the intermediate forms \(\ddot{suq}^\prime \text{ammâ} \) and \(\uu\text{hwenmâw} \), the root vowel is long post-lexically (undergoing Foot Extrametricality), as shown by the final stress; later there is Closed-Syllable Shortening. Again, this confirms with the examples in (133) that the application of the Decrement and Morphological Shortening is morphologically triggered, and not a purely phonological process.\(^{31}\)

With the Plural Act, though not with other affixes, it appears that the Decrement and Morphological Shortening are paired such that they either both apply (where possible) or neither does. This contrasts with the Directionals, for example, where only the Decrement applies (see (128)), and Morphological Shortening applies in contexts where the Decrement does not. One such case is the verbalizing suffix -c, where a long vowel in the stem is shortened:

\[(180)\] \(\ddot{r}h\ddot{y}a\text{-c-ič-i} \rightarrow \ddot{r}ihyayîčî \quad \text{‘strengthen yourself!’ [127]}

Note that the increment /h/ surfaces unchanged. The long vowel [i’] is from Iambic Lengthening.

\(^{31}\) We should note that all cases I have located (in both (133) and (179)), the roots to which the rules fail to apply are monosyllabic (and take instrumental prefixes). This is probably coincidental given the small set of examples, and given that both rules can apply to monosyllabic roots with other Plural Act affixes. The important point is that the same suffix, attached to different roots, may or may not be accompanied by the Decrement and Morphological Shortening, showing that their operation is separable from affixation.

302
It seems more intuitive that a rule which is triggered by a particular affix ought to apply after that affix is added to the stem, but Morphological Shortening is much simpler to formulate if it applies to the stem before affixation. If Shortening precedes affixation, it can apply to a long vowel in the last syllable of the stem:

(181)  
Morphological Shortening

\[
\begin{align*}
\sigma & \quad /\hat{\mu} \times \\
\mu & \mu
\end{align*}
\]

If the rule applied after the triggering affix is added, it would need to reach into the penultimate syllable when the affix is -ta- (178b); infinal -r- (178a) would also complicate the location of the long vowel, especially given that Epenthesis applies to the resulting cluster (§6.3.1).

The effect of Morphological Shortening is in some circumstances manifested only by a difference in the placement of stress. In the following pair, Shortening applies in the Plural Act. Foot Flipping in the singular mimics the segmental effect of Iambic Lengthening in the plural, but Foot Extrametricality in the singular causes displacement of stress:

(182)  
\[
\begin{align*}
\text{ni-či}-\text{ri}-\text{ani-ice}-\text{ni} & \rightarrow \text{dio}-\text{ri}-\text{duc}-\text{e}-\text{du} \quad \text{‘keep falling out (sg)’ [173]} \\
\text{ni-či}-\text{ri}-\text{ani-ice}-\text{ni} & \rightarrow \text{dio}-\text{ri}-\text{duc}-\text{e}-\text{du} \quad \text{‘keep falling out (pl)’ [173]}
\end{align*}
\]

This contrast is the same as that between munaw- ‘be too shy’ and munac- ‘gather’ in §5.3.1, except that the difference in vowel length is derived by rule here rather than being a case of chance resemblance between different verb roots.

If a stem ends in a long vowel and takes the Imperative suffix -i, the final vowel surfaces as short:

(183)  
\[
\begin{align*}
\text{hi-ša}-\text{i} & \rightarrow \text{hiša} \quad \text{‘break!’ [2.57]} \\
\text{qa}-\text{i} & \rightarrow \text{qa} \quad \text{‘leave him/her!’ [2.60]} \\
\text{nu-ki}-\text{i} & \rightarrow \text{duki} \quad \text{‘scratch it with your fingernail!’ [3.18]}
\end{align*}
\]
Contrast this with an Imperative where the stem ends in a consonant preceded by a long vowel:

(184)  
\[ \text{ca-ai}-i \rightarrow \text{ca'du} \]  
\[ \text{qašo'q'}-i \rightarrow \text{qašo'qo} \]  
\[ \text{cumä-c'i} \rightarrow \text{cumä-ci} \]  
\[ \text{ña-na-m'i} \rightarrow \text{damäma} \]  
\[ \text{ńu-še'k'i} \rightarrow \text{duše'ki} \]  
‘fly!’ [2.6]  
‘get well!’ [2.64]  
‘sit down!’ [2.69]  
‘cover it with your hand!’ [158]  
‘pleat it!’ [3.4]

There is never any shortening in this case. This suggests that the shortening in (183) is not the result of Morphological Shortening — which in the Plural Act targets a vowel in the last syllable regardless of whether a final consonant is present — but the strictly Final Shortening seen also in noun compounding (§8.5):

(185)  
**Final Shortening**

\[
\begin{array}{c|c}
\sigma & * \\
\mu & \mu \\
\sqrt{ } & \sqrt{ } \\
\mathrm{JW} & \\
\end{array}
\]

This rule differs from Morphological Shortening because it targets a word-final long vowel, rather than the vowel of a stem-final syllable. While Final Shortening is optional in compounds, it is obligatory in verbs, and accounts for the fact that there are no verbs in the language with long final vowels. The exception is the Nonfinal Verb suffix -e, which as I suggested in §6.6 is not followed by a word boundary. The possibility of a CV output such as qa suggests that Kashaya does not respect the iamb as a minimal word, since that would block the creation of a form with fewer than two moras.32

32 One place where ‘minimal word’ is relevant, however, is in level 2, as suggested in §5.7.1. One finds a CV output in the Imperative also when the stem is CV to begin with, e.g. ca-i \( \rightarrow \) ca 'stay!' [D]. This result is generated by Mora Elision, without the need for Final Shortening, but shows that Mora Elision can create a monomoraic output as well.

304
Chapter 7
Organizations of the Phonology and Morphology

In this chapter I discuss general issues about the organization of the phonology and morphology which arise in trying to relate all the processes of Kashaya. §7.1 provides the traditional description in terms of position classes. §7.2 reanalyses the data using levels in a lexical phonology model, and also provides statements of allomorphy. §7.3 lists all the morphological and phonological rules discussed in the dissertation and gives their place in the grammar.

7.1. Traditional Position Classes

Oswalt (1961) gives the following position classes, labeled A-B for prefixes and I-XV for suffixes:¹

<table>
<thead>
<tr>
<th>(1)</th>
<th>Prefixes</th>
<th>Root Inner Group Suffixes</th>
<th>Root Middle Group Suffixes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>Instrumental</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Plural Act</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
<td>Plural Agent</td>
<td>Va</td>
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<tr>
<td>II</td>
<td></td>
<td>Reduplication</td>
<td>Vb</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>Essive, Terrestrial</td>
<td>VI</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>Semeifactive, Inceptive, Plural Act, Plural Movement</td>
<td>VII</td>
</tr>
<tr>
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<tr>
<td></td>
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</tbody>
</table>

¹ I use Roman numerals for the position classes to avoid confusion with the lexical levels that I propose.
Outer Group Suffixes
XI  Defunctive
XII  Negative
XIII  First Person Object, Remote Past, Inferential
XIV  Evidentials, Modals, Imperatives, Futures, Absolutive, Adverbializers
XVv  Nonfinal Verb, Responsive, Interrogative
XVn  Subjective, Objective
XVb  Explanatory

Linear Ordering:

INNER  MIDDLE  OUTER

There are two prefix classes, A and B. Suffixes are classified in three groups: the Inner, Middle, and Outer. The root and Position Class XIV, shown in bold, are the only slots that must be filled in every verb. Each affix is discussed below. We will see that since some of these 'positions' correspond to processes, they contain no segmental affix. In the rule-based approach to morphology exemplified by Anderson (1991), however, there is no fundamental difference between a process and an affix, so that the position classes could be considered blocks of rules.²

Roughly speaking, my analysis treats the prefixes and the suffixes through Class II as level 1; the suffixes in Class III and part of Class IV as level 2; and the rest of Class IV through Class X (including all of the Middle Group) as level 3. The Outer Group is divided into two levels: Classes XI to XIII are level 4 and Classes XIV and XV are level 5.

² I do not have enough data on the small set of noun suffixes to make definite claims about their place in the grammar. Those which derive verbs from other parts of speech are mutually exclusive and do not require more than one position class. The fact that level 2 verb suffixes can follow at least some of them suggests that the verbalizing suffixes are added no later than level 2. For discussion of other noun morphology, see §8.3.1 and §8.6.
7.2. An Analysis in Terms of Levels

In this section I lay out all the morphology of Kashaya, including affixes and processes, so that it is possible to discuss their interaction. I also discuss the allomorphy conditions which are found with various affixes. In addition, since my representations differ in some cases from Oswalt (1961), this section makes clear my assumptions about the segmental form of the affixes which undergo the phonological rules discussed elsewhere in the dissertation. Most of the statements about allomorphy, cooccurrence, and ordering are taken directly from Oswalt, though in a number of cases I have reformulated the description to correspond to the analysis I have proposed, as well as to avoid global statements. We cover the morphology according to Oswalt's major categories: the prefixes (§7.2.1), Inner Group (§7.2.2), Middle Group (§7.2.3), and Outer Group (§7.2.4).

7.2.1. Prefixes

The twenty instrumental prefixes belong to Class A. Probably the majority of verb roots in Kashaya take an instrumental prefix; it is a lexical property of the root which prefixes are possible (ranging from just one, to all of them), though more than one can never be added at the same time. In my analysis they are added in level 1 of the lexicon. It is the size of the output of level 1 that determines whether a stem will undergo Syllable Extrametricality, and so in this sense the prefixes are more tightly connected with the root than are the suffixes, despite the fact that much greater phonological changes occur after the root than before it. The instrumental prefixes are extremely uniform in their shape: all consist of CV, and exhibit no allomorphy. None of the consonants are ejectives, though [b] and [d], from underlying /hm/ and /nd/, are well represented, and several aspirated stops are attested. Of the five vowels in Kashaya, only /i, a, u/ are found: the feature [-high] is not permitted underlyingly in prefixes. Only three phonological rules — Desonorization, Aspirate

307
Dissimilation, and Height Harmony — apply to them. Their meanings are given here:

(2) ıña- ‘with the lips, snout, or beak; by speech (or hearing)’
ıni- ‘by encircling, e.g. with the arms; by sewing, eating (esp. with a spoon)’
ca- ‘with the rear end, a massive or bulky object, a knife’
cu- ‘with a round object, flowing water, the front end; by shooting’
ci- ‘by holding a small part of a larger object, e.g. a handle’
ına- ‘with the hand (palm), paw; by waves’
ınu- ‘with the finger’
ıni- ‘by gravity, falling, a heavy weight’
ha- ‘with a swinging motion’
hi- ‘with the body’
ma- ‘with the sole of the foot, claws, the butt of the hand’
mi- ‘with the small end of a long object, the toes, nose; by kicking, smelling, counting, reading’
mu- ‘with a quick movement, heat, light, mind or emotions’
pına- ‘with the end of a long object, the fist; by wrapping’
pı- ‘with the side of a long object, the eyes, an ax, a hammer’
pı- ‘by blowing’
qa- ‘between forces: with the teeth, by chewing, eating’
si- ‘by water: wetting, dissolving, slipping, floating, rain, tongue’
sha- ‘by a long object moving lengthwise; with a mesh’
ša- ‘by pulling, pushing and pulling, with a long flexible object’

Aspirate Dissimilation is level 1 only, and Syllable Extrametricality does not apply until level 2. This correctly predicts that although the initial consonant of the prefix is always part of an extrametrical syllable, Aspirate Dissimilation precedes that rule and is not bled.

Position Class B corresponds to the Plural Act ‘prefix’ ıv- discussed in §8.1, which I treat as a template rather than a prefix per se: in other words, the Plural Act marker is incorporated into the root. Association to this template must precede prefixation of the instrumental prefixes, since all Plural Act forms which take the template also take an instrumental prefix, which precedes the apparent ıv- prefix and undergoes Height Harmony if applicable:

(3) šu-lojo-ći-wač-ı? → šolojiyoćwa? ‘be peeling (clothes) from themselves’ [215]
Ideally, association to this template would occur at the same time as other Plural Act processes, but that does not seem to be possible: the Plural Act suffixes are level 3, as I argue below. In addition, since the plural template constitutes the root, it is not surprising that association to it should occur in level 1 before any other morphology. The association to the special Plural Act template in a different level from the rest of the Plural Act morphology is similar to the situation in English, where irregular noun plurals are level 1 and regular plurals are level 2 (Kiparsky 1982).

7.2.2. The Inner Group Suffixes

The Inner Group includes two position classes which are, again, not affixal. Class I is the Plural Agent, discussed in §3.5.2. The Palatalization rule triggered by the {Plural Agent} feature affects all tokens of /ː/ in verb suffixes up to the Defunctive, Class XI; the only later suffix containing /ː/ is the Quotative Evidential -nɔ (Class XIV), which is not affected by the rule. This means that Palatalization turns off somewhere between the levels where these suffixes are added: below we see that the Defunctive is level 4, and the Quotative is level 5, so Palatalization turns off after level 4.

Not only is the transformation from /ː/ to [ɛ] much simpler to express than that from [d] to [ɛ], as argued in §3.5.2, but the fact that only a root-final /ː/ can undergo Palatalization is best captured by allowing all other such segments to become [d] before Palatalization has a chance to apply, sparing the root-final token from the rule. That is, Palatalization must not apply until Desonorization has applied to the root consonants are in onsets; but after that it must apply on each cycle BEFORE Desonorization in order to bleed that change. I suggest that the {Plural Agent} diacritic is inserted in level 3, at the same level as the Plural Act suffixes; and from that point on it triggers Palatalization where appropriate. Although Palatalization is ordered before Desonorization and, by the Strong Domain Hypothesis, ‘active’ from the beginning of the derivation, the crucial
morphological trigger is not present until level 3, and Palatalization cannot apply before that time.

Class II refers to both types of reduplication in the verb: CV and stem (§8.3). These must also be in level 1, since — at least in CV Reduplication — the special status of increments is respected (§6.4.1). Only one type of reduplication can apply to a single verb, i.e. the two rules are in a disjunctive relationship. This may be attributable to semantics, however: Mora Reduplication in verbs marks the Iterative (action repeated a few times), while Stem Reduplication marks the Frequentative (action repeated in quick succession).

There are six true suffixes which Oswalt includes in the Inner Group. They share the property that none can occur more than once in a single verb. Class III includes two suffixes which are mutually exclusive, although this fact follows also from their semantic incompatibility. The Essive -m indicates primarily that the action of the verb occurs in one spot off the ground or floor,\(^3\) while the Terrestrial -c refers to an action on the ground or the floor.

Class IV includes four suffixes: the Semelfactive, Inceptive, Plural Act, and Plural Movement. The Semelfactive most often indicates the action is performed once, but can also mean ‘start’ or ‘away’ with verbs of motion. It is segmentally identical to the Terrestrial, -c, under normal circumstances; since it triggers the same Presuffixal Lengthening, it is located in level 2. The Essive and the Semelfactive can be found in either order, confirming that they are added in the same level.

\[
\begin{align*}
\text{3no-m-c-w} & \rightarrow \text{dómciw} \quad \text{‘extend the hand’ [159]} \\
\text{p'i-hce-c-m-w} & \rightarrow \text{pihéčɛ'rnaw} \quad \text{‘overhang and shelter the ground’ [D]}
\end{align*}
\]

There are several idiosyncratic Semelfactive forms, some given in (5) below. An additional quirk is that it takes the form -cc when followed by the Reflexive -ič, a level 3 suffix. To

\(^3\) Oswalt (1961) refers to this suffix as the Supraterrestrial, due to the primary meaning given above; but because of its other meanings Oswalt (1990) uses the term Essive, which I adopt here as well. The latter work does not list the additional meanings which justify the new term, and it is not a matter I have pursued myself.
avoid a ‘look-ahead’ clause, we can posit a special portmanteau level 2 suffix -ccoć which includes a Reflexive meaning. In fact, Oswalt (1961:200) suggests that -ccoće is a special Retractive suffix meaning ‘back with a quick movement’.

Since the Essive, Terrestrial, and Semelfactive consist simply of single consonants, they do not add an additional syllable to the verb stem and ought to have no effect on whether Syllable Extrametricality can apply to the stem. As a result, it is difficult to apply an additional test which would confirm that they are added in level 2, where we predict they should in fact be relevant to Syllable Extrametricality. The irregular Semelfactive allomorph -hci, however, provides a limited test. It is found on the following verbs:

(5)  ca-  ‘sit (sg)’  cahci-  ‘sit down (sg)’ [161]
    ni-  ‘hold’  nihci-  ‘pick up’ [165]
    ho-  ‘be hot’  hohci-  ‘get hot’ [165]

The verb ca- does not undergo Syllable Extrametricality; this is expected since the rule is blocked by the Non-Exhaustiveness Condition (§5.2). The related Semelfactive form, cahci- ‘sit down’, does undergo the rule, showing that the element -hci is present when that rule applies. The same is true of the verbs ni- and ho-: they undergo the rule only when -hci is present. This limited set of data confirms that the Semelfactive is added when Syllable Extrametricality is still active, which means that the earlier Essive and Terrestrial suffixes must also be added before the rule turns off. The only level at which Syllable Extrametricality applies is level 2, which is precisely where we have located these suffixes.

The Inceptive takes the unvarying form -yic. It is subject to normal Iambic Lengthening (i.e. modulo Syllable Extrametricality):

(6)  ìnuwi-yic-i → <bu> wi yî ci  ‘start stringing beads!’ [167]

I have very little data on this suffix, but its Iambic Lengthening is the same as with level 3 suffixes, so I place it there. The Inceptive can be used only after a stem ending in a vowel.
The Plural Act, which marks either a plural object undergoing an action or repeated action on a singular object, has many forms. Most have specific restrictions on the final segment of the root to which they attach, and many trigger the Decrement (paired with Morphological Shortening in each such case):

(7)  
-\text{-t-} \quad \text{infixed before the root-final consonant, if any; Decrement} 
-\text{-h-} \quad \text{infixed before root-final } /\acute{k}/; \text{Decrement} 
-\text{-ta-} \quad \text{infixed before root-final } /r/, q, q^*, c'/; \text{Decrement} 
-\text{-Ø} \quad \text{with some roots ending in } /t, y/; \text{Decrement} 
-\text{-ta} \quad \text{after } /l, n, n^/, i, c'/; \text{Decrement} 
-\text{-qa} \quad \text{after } /y/; \text{Decrement} 
-\text{-at} \quad \text{after } /l, n/; \text{cooccurs with the Durative} 
-\text{-m} \quad \text{after a long vowel; Decrement} 
-\text{-mq} \quad \text{after a vowel or a consonant} 
-\text{-aq} \quad \text{after } /l/; \text{sometimes with Decrement} 
-\text{-ataq} \quad \text{after } /l/; \text{sometimes with Decrement} 
-\text{-w} \quad \text{after a vowel; cooccurs with the Durative} 
-\text{-w} \quad \text{after a long vowel; cooccurs with the Durative; Decrement} 

Several of the environments overlap, reflecting the considerable amount of idiosyncracy in the choice of the Plural Act allomorph; for example, while -\text{-aq} occurs only after /l/, several other suffixes are possible there and for any verb ending in /l/ the choice of suffix must be lexically specified.\textsuperscript{4} There are also suppletive cases where the singular and plural are unrelated, or only partly resemblant (e.g.  \text{\textit{raš-}} ‘miss (sg), \text{\textit{rəc\textsuperscript{a}laq-}} ‘miss (pl)’).

I have found the Plural Act separated from the verb root only by the Semelfactive, in an irregular form -\text{-wata}: 

(8)  
\text{\textit{b-cam\textsuperscript{a}c-wata-ič-?}} \quad \rightarrow \quad \text{\textit{cám\textsuperscript{a}ciwata?}} \quad \text{‘shrink (pl)’ [3.16]}

Since the Class III suffixes precede the Semelfactive, one might expect to find them preceding the Plural Act as well, but I have not found any examples. Unlike the suffixes in level 2, the relevant Plural Act allomorphs trigger (and undergo) Debuicalization. I place

\footnote{\textsuperscript{4} The limited data given by Oswalt (1961) do not justify two -\text{-w} suffixes, but I include both here for consistency with his work.}
the Plural Act in level 3 and turn on Debuccalization at that point.

The Plural Movement suffix, indicating plural persons or objects moving, has more modest allomorphy than the Plural Act. It is an infixed [h] before a root-final consonant, and suffixed -ht after a vowel. It takes the special form -t after a vowel when the next suffix is the anomalous Distributive -muc', suggesting a pormanteau -tmuc' (see below). With certain verbs, the Plural Movement is optionally -t before a Directional beginning with /m/; its restriction to a subset of verbs indicates lexicalized choice of the allomorph. There are also certain suppletive pairs (e.g. wa- 'go (sg), p'ila- 'go (pl)'). The Plural Movement and Plural Act do not cooccur, though either can occur with the Plural Agent under the appropriate semantic circumstances. The Plural Movement may belong earlier in the derivation than Oswalt puts it, since it precedes the Essive:

\[(9) \quad \text{ht-ht-m?-} \rightarrow \text{tētēm} \quad \\
\text{move the feet above the ground'} \quad [158]\]

I assume, therefore, that -ht is a level 2 suffix. It is less clear whether the other forms should be added at the same level: if [h] is a debuccalized version of infixed /t/, as suggested in §3.2.1, it must be added after Coronal Debuccalization turns on in level 3 (I have no data which shows the ordering of this allomorph and a level 2 suffix). In fact, the infixed allomorph of the Plural Movement is identical to an allomorph of the Plural Act, suggesting that it may be the same suffix with a consonant-final stem. The Plural Movement is simply a more specific version of the Plural Act — it has the same meaning but is used only with verbs of movement — and in this case there may be no special Plural Movement suffix. That is, while a vowel-final stem can take -ht in level 2, the only way for a consonant-final stem to receive plural marking is to take the more general Plural Act -t- infix in level 3.

If -ht is added in level 2, we must distinguish it from the irregular Semelfactive -hci. They differ in that -ht is not sufficient to create a disyllabic base for Syllable Extrametricality, unlike -hci as illustrated above. My solution is that the Semelfactive is in
fact -hci, with a phonemic vowel, while the Plural Movement is -ht, with a vowel inserted by Epenthesis. The latter fact is clear from the data given in §6.3.1, but I have not been able to obtain relevant data on -hci; what we need is a following suffix which begins with a vowel other than /i/. My analysis requires that Syllable Extrametricality precede Epenthesis, and not reapply after it, but this is also necessary to account for the data in (9), where Syllable Extrametricality cannot reapply after the second level 2 suffix -m is added (which itself follows Epenthesis).

We have mentioned the three markers of the plural in Kashaya verbs; I briefly lay out their relationships here. The Plural Act indicates that ‘the act is plural, either because the object that is undergoing the action is plural or because the act is performed on the same object more than once’ (Oswalt 1961:168). The Plural Agent means that the agent of the verb is plural. This ‘agent’ can be the subject, but need not even correspond to a grammatical relation of the verb; for example, it can be an unexpressed, inanimate cause such as a fire:

(10)  a. mu-p'o-t-aî-  ‘they keep boiling over (on one fire)’ [154]
    b. mu-p'o-t-ač-  ‘they keep boiling over (on several fires)’ [154]

In (b) the Plural Agent cooccurs with the Plural Act -r, which refers to the fact that more than one pot is boiling over; the Plural Agent refers to whether these pots are over a single fire or several different ones.

The Plural Movement indicates that more than one person or object is moving. It generally supplants the Plural Act for verbs of movement (at least in the post-vocalic context), but is found with the Plural Agent when those moving do so of their own will:

(11)  a. mo-h't-aî-  ‘they run along (caused by some outside force)’ [154]
    b. mo-h't-ač-  ‘they run along (of their own will)’ [154]

In (11a) the fact that the subject is plural (shown by the Plural Movement -ht) and the agent is singular (shown by the absence of the Plural Agent) means that the agent is different
from the subject; the verb could be used to describe objects such as marbles which are set in motion by some unmentioned person.

7.2.3. The Middle Group Suffixes

We turn now to the Middle Group. These suffixes can all occur more than once in the same verb; specific examples are given in (17). All are also subject to the effects of Iambic Lengthening and Mora Elision (where the structural description is met). In my analysis, all of the Middle Group belongs to level 3 of the lexicon, along with part of Class IV from the Inner Group.

The first set of suffixes is Position Class V, the Directionals. Most belong to Class Va, listed here:

(12)  
-ay    ‘against’
-an    ‘along, here’
-anic  ‘afar, away to a distance’
-am    ‘across, past’
-mul   ‘around’
-man    ‘in enclosed or defined place’
-manic ‘arrive, as far as’
-mac    ‘in from here, south or east from here’
-maq    ‘in here, south or east to here’
-aq    ‘out from here, north or west from here’
-aqُ    ‘out here, north or west to here’
-aqac   ‘up from here’
-alocَ   ‘up here’

All and only the vowel-initial Directionals trigger the Decrement (§6.5.3). Just one of these suffixes has allomorphy: -m ‘across’ occurs as -ma or -man with a few verbs. As Oswalt (1961) points out, a certain amount of decomposition is possible in the Directionals. For example, the segment /q/ is associated with the meaning ‘to here’ and /c/ with ‘from here’, but they cannot be completely isolated as productive morphemes. I argue in §3.5.2,

5 The suffix -alocَ has unusual behavior with regard to vowel length, but I do not have enough data on it to give a thorough description or propose an analysis.
however, that the suffixes which surface in the singular as -aduc and -maduc should be treated as complex -(m)an’ plus -ic as shown in (12), with application of [+round] Insertion across the morpheme boundary. I suggest that these suffixes are morphologically complex but semantically unitary, i.e. the rules adding the two suffixes necessarily apply in conjunction to express a single meaning. This is comparable to other cases where a single category is associated with more than one exponent, such as the German past participle which takes the prefix ge- and suffix -en. It happens in the Kashaya case that the two affixes are adjacent. In §6.5.3 I suggest similar decomposition of initial /m/ from the rest of each suffix.

The two other Directionals belong to Class Vb. They have an Inchoative meaning in addition to their directional meaning, and can cooccur with a member of Class V (a or b) when they have the Inchoative meaning:

(13)  
-ìníc  ‘up, away’
  -ala  ‘down’

The restriction is that an Inchoative suffix cannot follow itself, even if the first occurrence of the suffix is directional. These, like all vowel-initial Directionals, trigger the Decrement.

Class VI includes the Reflexive and Reciprocal. The Reciprocal is always of the form -muć. The Reflexive is more complicated, and has several allomorphs, all ending in /ć/. The Reflexive is -yić after most vowel-final roots, and -ić after suffixes and consonant-final roots. With some vowel-final roots, however, it is -iće or -će. After the Directional -ala it is -meć. And after certain consonant-final stems it is -yiće or -yiće (differing in the presence of [+high]), and -će can be used for -iće (for examples see §3.3.5). As mentioned above, the Semelfactive and Reflexive together express a Retractive meaning (‘back with a quick movement’). In this case the special Semelfactive -cc is used after a vowel-final stem (the normal -c occurs after a consonant-final stem). Neither member of Class VI can directly follow the other or the same Class VI morpheme, but if another suffix of the Middle Group
intervenes, a member of Class VI can occur more than once in a single verb.\(^6\)

Class VII includes the Causative only. There is some ambiguity in the analysis of its allomorphy. After a vowel it is clearly \(-hqa\); the incremental /h/ is justified by the metrical facts described in §6.4.3. After a consonant, what surfaces is [qa], but it is conceivable that the underlying form of the suffix is still \(-hqa\) and the increment is lost by independent rules. If the /h/ merges with a preceding obstruent, it will be identical to the effect of Coda Aspiration (§3.1.7); and if it mergers with a preceding sonorant, it will then be deleted by Cluster Deaspiration (§3.1.6). If Glottal Merger is blocked by the presence of underlying laryngeal features on the preceding consonant, the /h/ must be stray erased. Thus the /h/ could never surface between a consonant and /q/ even if it were present underlyingly.

There are rare cases of -qa after a vowel:

(14) pùpu-qa-w  →  pùpuqaw  ‘defecate [baby word]’ [206]
    nà-qa-ìc-?  →  daqà?  ‘like, want’ [334]

The appearance of [qa] in a place where no rule will eliminate /h/ suggests that -qa exists as an allomorph, normally post-consonantal but also possible post-vocalically in idiosyncratic cases.

Class VIII is the Locomotory, indicating movement, intermittent movement, or gradual change. Its two basic forms are -\(\text{a\(ñ\)ani}\) and -\(\text{a\(ñ\)an\(ñ\)ani}\); after a consonant-final stem, the allomorph is chosen such that the suffix ends in ...\(\text{a\(ñ\)ani}\) after Iambic Lengthening: that is, two syllables if the preceding nucleus is short, three syllables if it is long. After a vowel-final stem, either -\(\text{a\(ñ\)an\(ñ\)ani}\) or -\(\text{wa\(ñ\)ani}\) can be used. An interesting property of this suffix is that the final /\(\text{a\(ñ\)i}\)/ is truncated when a Directional or Distributive suffix follows. The Locomotory can be repeated in succession, in which case the allomorphy rules always choose -\(\text{a\(ñ\)ani}\) for the second instance (since the last vowel of the first Locomotory will be short). There may be some cause to treat this as multiple applications of a rule which

\(^6\) Similar constraints on the repetition of a suffix are described for Chichewa by Hyman and Mchombo (1992).
suffixes -\textit{ani}, but I have not explored this possibility.

Class IX is the Durative, which has the most complicated rules of allomorphy of any suffix (the Plural Act has more forms, but they are largely idiosyncratic). After a vowel-final stem, two allomorphs occur: -\textit{cici} if the visible stem is monosyllabic,\textsuperscript{7} otherwise -\textit{meni}. When the stem ends in /i/ which is part of a suffix (rather than the root), the Durative is -\textit{iceni}.\textsuperscript{8} After any consonant except the alveopalatals /c, \dot{c}/, including the case of /i/ at the end of a root, the Durative is -\textit{ani}.

The alveopalatal affricates /c, \dot{c}/ impose complex conditions on the choice between the suffixes -\textit{ini}, -\textit{(i)wan}, and -\textit{eni}. When the Plural Agent feature is present in the verb, the form of the Durative after an alveopalatal affricate depends on whether it is glottalized or not. After /c/ it is -\textit{ini}, after /\dot{c}/ it is -\textit{(i)wan} (isomorphic with the Distributive below). When the Plural Agent feature is not present, the choice is between the nearly identical suffixes -\textit{ini} and -\textit{eni}; their allomorphy rules are the same for both affricates (glottalized or not). The Durative is -\textit{ini} if the stem consists of a single syllable, modulo Syllable Extrametricality. It is also -\textit{ini} after the Directional -\textit{mac} as long as the syllable containing that suffix — the stem-final syllable — is short, i.e. it has not undergone Iambic Lengthening. In other cases where the stem is longer than one syllable, the Durative is -\textit{eni}.

Finally, although the normal rules choose -\textit{meni} after the Causative suffix -\textit{hqa} (since its presence means that the visible stem is more than one syllable long), there is the option of using the Durative -\textit{wan} after the Causative. The Durative suffix can be repeated in succession, with a habitual meaning. Since all Durative allomorphs end in /i/, the second occurrence of the Durative takes the form -\textit{iceni} when the Plural Agent is not present. When the Plural Agent is present, however, there is a complication: -\textit{iceni} occurs if the first

\textsuperscript{7} That is, the stem can consist of a monosyllabic root which did not undergo Syllable Extrametricality, or a disyllabic base which did undergo that rule; in neither case can there be a suffix which results in an additional syllable being constructed.

\textsuperscript{8} If the Plural Agent happens to be present in a verb to which -\textit{iceni} is added, it becomes -\textit{iyic} by three rules: Palatalization, /c/ Raising, and Nonlocal Sonorization.
Durative suffix contains /a/ (that is, -an' or -(i)wan\textsuperscript{\textcircled{d}}), but -(i)wan\textsuperscript{\textcircled{d}} occurs if the preceding suffix contains /i/. If another vowel is present, either -(i)wan\textsuperscript{\textcircled{d}} or -icen\textsuperscript{\textcircled{d}} is possible, though the latter is favored.

The final suffix of the Middle Group is Class X, the Distributive, which indicates that ‘the action takes place in different places or moves in a haphazard manner’ (Oswalt 1961:219). It has two forms, and their selection appears to depend on metrical structure.

The suffix is -iwan\textsuperscript{\textcircled{d}} after a stem ending in a branching iamb:

\begin{equation}
\begin{array}{l}
(15) \quad (x) \\
\text{ke la' \texttt{<n>}} \quad \rightarrow \quad \text{ke\~l\textsuperscript{\textcircled{d}}i\texttt{wa \texttt{<n>}}}
\end{array}
\end{equation}

It is -wan\textsuperscript{\textcircled{d}} elsewhere, i.e. after a nonbranching iamb or an unfooted syllable:

\begin{equation}
\begin{array}{l}
(16) \quad (x) \\
\text{mo' \texttt{<n>}} \quad \rightarrow \quad \text{mo\textsuperscript{\textcircled{d}}i\texttt{wa \texttt{<n>}}}
\end{array}
\end{equation}

\begin{equation}
\begin{array}{l}
\quad (x) \\
\text{mo mu' la' \texttt{<n>}} \quad \rightarrow \quad \text{mo\textsuperscript{\textcircled{d}}u\textsuperscript{\textcircled{d}}\textsuperscript{\textcircled{d}}a\textsuperscript{\textcircled{d}}i\texttt{wa \texttt{<n>}}}
\end{array}
\end{equation}

Like the choice of -in\textsuperscript{\textcircled{d}} after unlengthened -mac just described, this alternation supports the cyclic creation of metrical structure; in this case the feet must be there for the allomorphy rule to refer to. The distribution ensures that the initial /i/ of the suffix never undergoes Iambic Lengthening (the vowel cannot be inserted by Epenthesis, since the potential cluster it breaks up is completely well-formed, as illustrated in (16)). The Distributive follows only the Locomotory, the Durative, and the Directional -an\textsuperscript{\textcircled{d}} ‘along’; it can also follow a sequence of a Directional containing /q/‘to here’ and the Reflexive -ic\textsuperscript{\textcircled{d}}. This sensitivity to the /q/ element of Directionals could be taken as additional evidence for decomposing those suffixes into their component parts, as mentioned above.

The following various orderings of the Middle Group suffixes are illustrated by Oswalt (1961:228ff); he notes that the list is not comprehensive:

319
(17) a. Directional – Reflexive
   Reflexive – Directional
   Directional – Reciprocal
   Reciprocal – Directional
   Directional – Reciprocal – Directional
   Reciprocal – Directional – Reciprocal
b. Directional – Causative
   Causative – Directional
c. Directional – Locomotive
   Locomotive – Directional
d. Directional – Durative
   Directional – Durative – Distributive
   * Durative – Directional
   * Distributive – Directional
   ? Durative/Distributive – Reflexive/Reciprocal – Directional
   ? Durative/Distributive – Causative – Directional
e. Reflexive – Causative
   Causative – Reflexive
   Reciprocal – Causative
   Causative – Reciprocal
f. Reflexive – Durative
   Durative – Reflexive (no meaning difference)
g. Causative – Durative
   Durative – Causative
   Durative – Causative – Durative
h. Reflexive – Causative – Durative – Durative
   Reflexive – Durative – Durative – Causative
   Causative – Reflexive – Durative – Durative
   Durative – Durative – Causative – Reflexive

These possibilities show that the members of the Middle Group ought to be placed in a single level of the lexicon, to avoid the need for a 'loop' (K.P. Mohanan 1982). Since they all seem to have the same phonological characteristics — I am aware of no rule which applies to one which does not also apply to the others — this is unproblematic.

Although Oswalt does not comment on it,³ it appears from his data that when a vowel-initial Directional follows another level 3 suffix which ends in a vowel, the Directional takes an initial /w/. For example, in (18a) below the suffix -ala takes the form -wala when

³ Elsewhere (Oswalt 1961:208) he alludes to a -w Movement suffix which precedes the Directionals, but there is no explicit discussion of it.
it follows the Causative -ḥqa, another level 3 suffix. A similar pair is given for Inchoative -(w)limic in (b):

(18) a. mo-ala-ḥqa-
    → mo'lahqa-
    ‘drive down’ [229]
    mo-ḥqa-wala-
    → mohqawa'la-
    ‘drive while going down’ [229]

    b. c'i-ne-limic-
    → c'idebic-
    ‘start to carry, lift up’ [194]
    caq'am-ala-wimic-
    → caq'amawilbic-
    ‘start to cut downward’ [194]

On the other hand, there are cases of a /w/-initial suffix occurring directly after a verb root:

(19) ?ia-wala-we-yã-e-
    → dawalawye-
    ‘I'm starting to want (NPV)’ [235]
    qohq'o-way-ac-?
    → qohq'owarya?
    ‘keep standing against (pl)’ [213]

And with at least two verb roots both forms of the suffix are possible:

(20) a. mihca-way-?
    → mihcaway
    ‘toss to someone (pl)’ [D]
    mihca-ay-?
    → micay
    same (but rarer) [D]

    b. ?ine-ay-?
    → bey
    ‘hold a long object against’ [D]
    ?ine-way-?
    → beway
    same [D]

The difference in the application of the Decrement which is evident in (20a) suggests that -w is a separate suffix which blocks the Decrement in the manner outlined in §6.5.3. Its occurrence in sequences of Directionals, then, might be related to the ordering restrictions on Class VI mentioned above: members of Class V cannot occur in immediate sequence, but if the ‘Movement’ suffix -w (whatever its function otherwise) intervenes there is no problem. Many vowel-initial Outer Group suffixes take a /w/ after any vowel, but that is not the same as what we see here, where the /w/ can be found after a consonant:

(21) cu-ne-aq-way-muč-?
    → cunehwarmu
    ‘hold against one another’ [D: ʔbam]

The data in (18) also indicate some dependence on the preceding morphological context, arguing against a purely phonological solution as is appropriate for the Outer Group. In the Middle Group, this pattern may not be restricted solely to Directionals: recall that there is an optional Durative allomorph -wan̂ after the Causative -ḥqa. This might be thought of as the
normally post-consonantal Durative allomorph -an\textsuperscript{i} with the same inserted -w due to a preceding level 3 suffix.

The Middle Group provides two related examples of portmanteau morphemes. When the Plural Agent is present, the Directional -an\textsuperscript{i} 'along' and the Distributive -(i)wan\textsuperscript{i} take the special form -ahmu\textsuperscript{c}. When in addition the Plural Movement (usually -ht or -t-) is present, the entire set of suffixes appears as -tmuc\textsuperscript{i}. The first case is simple to account for since both the Directionals and the Distributive are level 3 suffixes. But since the Plural Movement belongs to level 2 of the lexicon, the portmanteau cannot be added in level 3. If -ht is added in level 2, and Epenthesis applies to make -hui, we would expect the output -htimuc\textsuperscript{i} at best. I propose to add -tmuc\textsuperscript{i} in level 2, and by the Elsewhere Condition it blocks the normal exponents of these categories (cf. Anderson 1986).

7.2.4. The Outer Group Suffixes

The Outer Group contains the largest number of suffixes, most of which have minimal allomorphy. With two exceptions (the Defunctive and Remote Past), each can occur only once in a verb. They never vary in their order relative to each other, so that we are free to separate them into separate levels for phonological purposes — which in fact we must do in at least one case. None of the Outer Group suffixes undergoes Iambic Lengthening or CV Adjunction, indicating that these rules turn off at the end of level 3 (§5.5.1). Another characteristic of the Outer Group suffixes is that only they can follow the defective Assertive verb =\textsuperscript{=}P (no prefixes are possible either); following the approach of Inkelas (1991), this suggests that the Assertive comes prespecified with the prosodic domain associated with the output of level 3. A complication is that there is actually one Middle Group suffix, the Causative, which can occur after the Assertive, but this is only when the Optative also follows it, suggesting a lexicalized form =\textsuperscript{=}P^hqa-s meaning 'I hope' (which

322
surfaces as *ʔəs or *ʔhəs depending on the preceding context [248]).\footnote{I have followed Oswalt (1961) in treating the Assertive as a clitic, but I am not certain whether this is correct. While Klavans (1979, 1983, 1985) argues for inflected clitics, this is a rare phenomenon subject to reanalysis (e.g. Inkelas 1989). The markedness of a clitic which can take suffixes is not the only reason to reconsider this analysis, since it raises language-internal difficulties. Especially problematic are the facts of Epenthesis, which depend on the prosodic properties of the word to which the Assertive attaches. Also, if Causative allomorphy depends whether the preceding segment is a consonant or vowel, the alternation *ʔəs / *ʔhəs just mentioned is difficult to account for postlexically. In addition, the Assertive can be attached to a bare verb root, which is not a well-formed word. I suspect that the best analysis would treat the Assertive — at least in its inflected form — as a level 4 suffix which attaches to any part of speech and creates a verb. The details of such a claim remain to be worked out, however, including the implications for the syntax. The most important difficulty of this new analysis for the phonology is the fact that Desonorization does not apply before the Assertive; instead we get Onset Simplification, which is explained if the Assertive is a clitic and Desonorization is lexical. There are also problems with Epenthesis under the suffixal analysis: the final \( CP \) cluster which includes the supposed Assertive suffix must trigger Epenthesis, even though a similar \( CP \) cluster including the first part of the Future suffix -\( k^e \) does not trigger it. I leave the resolution of these questions for later research.}

Class XI is the Defunctive, -\( \text{r}-e\'), which marks an action performed by someone who is now dead. It can occur twice if the agent is inanimate and 'the action has gone on for many generations' (Oswalt 1961:233). With the Plural Agent it is realized as -\( \text{r}-ic'\), the result of Palatalization and /e/ Raising. Notice that Sonorization does not apply (*-\( \text{r}-ic'\)), showing that the rule turns off after level 3.

Class XII is the Negative. It takes the form -\( r^* \) before a vowel, -\( r^*i \) before a consonant, and -\( r^*i \) before an Imperative suffix. The rightward dependency on phonological structure is a problem for a restrictive theory of allomorphy (e.g. Carstairs 1986), but it does not appear that the [i] can be treated as epenthetic.

Class XIII has three suffixes. The First-Person Object -\( w-e \) cannot occur with the Negative, and must be followed by either the Visual Evidential -\( y\d \) or the Imperative -\( i \). In the former case, /e/ Raising applies, changing -\( w\text{e}y\d \) to -\( w\text{i}y\d \). The Remote Past -\( m\i \) can, like the Defunctive, be used more than once with perhaps a slight increase in emphasis. It too must be followed by the Visual. Finally, the Inferential -\( m\i \) occurs most often before the Absolutive, though can also be followed by the Circumstantial -\( q\d \), Quotative -\( h\d \), or Inferential Subordinative -\( n\a \).

Class XIV has a special status. Not only does it contain the greatest number of
suffixes, but it is also obligatorily filled. Oswalt gives six subclasses. The Futures and the Absolutive cannot follow the Negative (one must use the Negative clitic =t̥n instead). The Evidentials can precede any member of Class XV. The Modals can precede only 15v. The Imperatives, Futures, Absolutive, and Adverbializers cannot be followed by Class XV, except that the Singular Imperative and Performative Intentive can take the Responsive.

In Oswalt’s classification, the term ‘Evidentials’ refers to the following suffixes, which often pattern together in their cooccurrence with other morphemes:

(22) a. -ño QUOTATIVE: known by hearsay
   -innā AURAL: heard sounds of action
   -qā CIRCUMSTANTIAL: ‘must have, seem to, evidently, apparently’
   -yā VISUAL: saw perfective action
   -(w)ā FACTUAL: saw or see imperfective action; general truth
b. -mela PERFORMATIVE COMPLETE: perfective action by speaker
   -(w)ela PERFORMATIVE: imperfective action by speaker

I use the term Evidentials to refer only to the suffixes in (a); those in (b) I refer to as Performatives. As a cover term I simply use Evidential-Performative. There are two reasons for this distinction. First, semantically, the (true) Evidentials describe the source of information on the part of the speaker in describing the actions of another, while the Performatives refer to action by the speaker. Second, phonologically, the vowel /ā/ at the end of the Evidentials is deleted when no other suffix follows, but the final /a/ in the Performatives is never deleted (§6.3.2).

The next subset of Class XIV consists of the Modals, which show no allomorphic variation:

(23) -iś OPTATIVE: ‘I hope’
    -še SPECULATIVE: ‘I wonder’
    -inś SUPPOSITIONAL: ‘I suppose, probably, may, might, could’
    -išnā CONDITIONAL: ‘would, could’
    -išna POTENTIAL: ‘can, could’ (archaic)
I suggest a special representation for the Suppositional -ins in §6.3.2 which reflects the fact that it is the only potentially word-final suffix which ends in a consonant cluster.

The Imperative class has four members. The Singular Imperative consists of the suffix -i on the verb. It is accompanied by the sentence-final clitic =? when the verb is not final in the sentence, or the Negative -t?u or First-Person Object -we is present (regardless of the position of the verb); but if the Responsive suffix -em is on the verb the clitic is not used.\footnote{A possible explanation for this pattern is that an Imperative element must be final in the sentence; if a word or suffix separates -i from that location, the clitic =? is placed there (which may or may not be the same as the Assertive). The Responsive apparently cancels this requirement.} The Plural Imperative is similar: it always includes the suffix -me, and also =? regardless of the position of the verb; but again, the clitic is absent if the Responsive is present. The Formal Imperative is simply -im. The Indirect Imperative is -iya after the Negative or Assertive; elsewhere it is -iy plus =?. I refer to the Singular and Plural Imperatives as the 'Direct Imperatives', since they are the only ones used exclusively for expressing a command to the addressee.

Oswalt gives six suffixes in the Future subset, with very limited allomorphy. The Performative Intentive refers to an action planned by the speaker, and takes the form -te? when the verb is final in the sentence, otherwise -te; the glottal stop here is perhaps the same as the sentence-final clitic =?, but with opposite conditions on its use. The General Intentive marks a main verb ('intend to, be about to') or a complement ('in order to'), and is always -ti. The Independent Intentive is actually a clitic =? which cooccurs with -ti. Like the Assertive, it can take verb suffixes, such as the Non-Final Verb suffix -e', the Performative -ela, and the Factual -a. It can undergo Palatalization (so if it is a suffix, as the Assertive may be, it is level 4). The Unfulfilled Intention is also a clitic, =?hu, which takes Evidentials-Performatives (except -ela), the Absolutive, and Class XVv, but not Palatalization (so it would be a level 5 suffix). The Mandatory -saw shows no variation. The (Simple or General) Future -?e is also unvarying.
The next subset consists of one suffix, the Absolutive, which shows significant, but easily described, allomorphy. It is -w after a vowel, -i after /i/ (with [+round] Insertion), and -I elsewhere. The Absolutive form of a verb ending in /ï/ is always identical to the Singular Imperative, which is also -i. It is possible here to use a rule of referral (e.g. Zwicky 1985) stating that for such verbs, the Absolutive simply borrows the form of the Singular Imperative, though there is no obvious benefit from such a move.

The final subset of Class XIV, the Adverbializers primarily mark switch reference on subordinate verbs. Allomorphy is minimal:

<table>
<thead>
<tr>
<th>(24)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-in</td>
<td>same subject simultaneous</td>
</tr>
<tr>
<td>-(w)em</td>
<td>different subject simultaneous</td>
</tr>
<tr>
<td>-ma</td>
<td>same subject sequential</td>
</tr>
<tr>
<td>-li</td>
<td>different subject sequential</td>
</tr>
<tr>
<td>-p'i</td>
<td>same subject future sequential</td>
</tr>
<tr>
<td>-p'ila</td>
<td>different subject future sequential</td>
</tr>
</tbody>
</table>

The two suffixes -in and -ma do not vary; -(w)em has the /w/ after a vowel, otherwise not. The variation of -li resembles the Absolutive: it is -wlii after a vowel,\textsuperscript{12} -i'li (with [+round] Insertion) after /ï/, and -li elsewhere. There are two reasons not to treat these suffixes as including the Absolutive, however: Class XIV is normally filled by exactly one suffix, rather than the Absolutive plus an Adverbializer; and the presence of length in -i'li is not predicted by simple addition of -li to the Absolutive -i. The resemblance is not chance, however: these forms are identical to what one finds when =(')li 'with, at' is added to an Absolutive verb, and no doubt that is the historical origin of this switch reference marker. Synchronically I treat this allomorphy as lexicalized separately from the Absolutive. The two suffixes -p'i and -p'ila are optionally -c'i and -c'ila following an alveopalatal affricate; the dialectal variants -hi and -hila also exist. Oswalt groups two other suffixes with the Adverbializers which are not switch reference markers: -(w)eti 'although' and Inferential

\textsuperscript{12} Actually, due to Glide Deletion we cannot be certain that the segment preceding the /i/ here is /w/ rather than /y/ or an unspecified glide; but the parallel with the Absolutive suggests it is /w/.
Subordinative -\textit{na}. The latter occurs only after Inferential -\textit{mi}.

Class XV\textsc{v} contains three suffixes which create verbs from verbs. The Nonfinal Verb -\textit{e}\textsuperscript{*} marks a verb with an Evidential, Performative, or Modal which is not final in the sentence. The Responsive -\textit{em} indicates that the speaker is responding to a previous utterance; it follows Evidentials, Performatives, and Modals, as well as the Direct Imperatives and the Performative Intentive. Whether the Interrogative -\textit{wa} exhibits allomorphy is a matter of interpretation: it always takes the form -\textit{wa} except after a stem ending in /w/, where either the Interrogative is -\textit{a} or the two /w/’s simplify to a single one. The latter solution is more explanatory, but requires a degemination rule which does not seem to be attested elsewhere. When the Interrogative is added to the Assertive, it often cooccurs with the Responsive (=\textit{Avam}). Both the Interrogative and the Responsive are associated with a rising intonation at the end of the sentence; when the Responsive is used together with the Plural Imperative, its sole realization is intonational; the segmental content -\textit{em} is absent from the verb.

Class XV\textsc{n} creates nouns from verbs. It consists of the Subjective -\textit{em}(/u) and the Objective -\textit{el}.	extsuperscript{13} The forms -\textit{em} and -\textit{emu} are in free variation. Both nominalizers must be preceded by an Evidential, unless they are suffixed to the Assertive, in which case they act as case markers on nouns.

Class XV\textsc{b} consists solely of the Explanatory -\textit{e}, which creates a subordinate clause explaining the reason for a command elsewhere in the sentence. It can be added to an Evidential (where it prevents /\textit{a}/ Deletion, but then is elided; §6.3.2), a Performative, or the Assertive.

\textsuperscript{13} Oswalt (1961) treats the /\textit{el}/ of these two suffixes as a Nominalizer suffix, which occurs only before the Subjective -\textit{m} or Objective -\textit{l}. This seems to me an unnecessary division, especially considering that there is evidence for treating the Objective as -\textit{el} even when it is added to a noun (which has no need for a Nominalizer, and the /\textit{el}/ is unexplained). For example: \textit{mi-cad-el} ‘your child’s parent-in-law (Obj)’ [122].
7.3. Level Ordering

In this section I summarize all the conclusions I have come to with respect to the location of the rules of phonology and morphology in the lexicon and the postlexical component. There are five levels in the Kashaya lexicon, based primarily on phonological criteria. If levels (or their equivalent) were used to express the notion of position class, as in the approach of Inkelas (1991), we would require significantly more morphological levels. For the purposes of this study, however, I assume that there are separate principles determining the ordering of suffixes which belong to the same level.

The morphology is distributed as follows:

(25) Level 1
Prefixation: Instrumental prefixes; kinship possessive ʔa-
Reduplication
Template association
Aphesis

Level 2
Suffixation: Class III, Class IV (Semelfactive, Plural Movement)
Prefixation: kinship possessives mi-, ma-, miya-

Level 3
Suffixation: Class I, Class IV (Inceptive, Plural Act), all of Middle Group (Classes V to X)

Level 4
Suffixation: Classes XI to XIII

Level 5
Suffixation: Classes XIV and XV

Most phonological rules in Kashaya obey the Strong Domain Hypothesis (Kiparsky 1984); that is, they are in effect from the beginning of the lexicon until some point where they turn off. Rules marked with * have a morphological trigger which limits their application. For a large number of rules there is no need to restrict them to a particular level of the lexicon, but they do not apply postlexically. I take that to be the default category.
| Levels 1-4 | /e/ Raising            |
|           | Root Elision           |
| The entire lexicon | The Decrement* |
|               | Morphological Shortening* |
|               | Palatalization* |
|               | Initial-Syllable Lengthening* |
|               | /a/ Deletion |
|               | Desonorization |
|               | Final Shortening |
|               | Mora Elision |
|               | Final-Consonant Extraprosodicity |
| Me | [+back] Insertion |
| | [+round] Insertion |
| | [-round] Spreading |
| | Cluster Desapiration |
| | Fricative Aspiration |
| | Uvular Assimilation |
| | Uvular Raising |
| | Increment Delinking |

| The entire phonology | Morification |
|                      | Foot Construction |
|                      | Foot Extrametricality |
|                      | Glottal Merger |
|                      | Glottal Transfer |
|                      | Onset Simplification |
|                      | Pre-Assertive Raising |
|                      | Coda Delinking |
|                      | Epenthesis |
|                      | Coda Aspiration |
|                      | Word-Final Debuccalization |
|                      | Verb-Final Debuccalization |
The following rules (and constraint) seem not to obey the Strong Domain Hypothesis, although they do conform to the Stratum Domain Hypothesis (K.P. Mohanan 1982) since the levels in which they apply constitute continuous blocks:

(27) Level 2 and on Syllabification
    Level 3 only Nonlocal Sonorization
    Levels 3 to 5 Coronal Debuccalization
                     Uvular Debuccalization
                     Local Sonorization
    Postlexical only Glide Deletion
                     Syllabic Licensing Constraint

The different domains of, for example, Local and Nonlocal Sonorization do not necessarily argue against an analysis in constraint-based terms (§4.3). In this case we could say that the rule of Sonorization turns on in level 3, but the Nonlocal Palatal Constraint is active only until the end of that level, while the Local Palatal Constraint is active until the end of the lexicon.
Chapter 8
Morphological Details

This chapter discusses several morphological patterns and the phonological rules with which they interact. In §8.1 we see the advantage of applying the principles of templatic morphology in a limited portion of the grammar. §8.2 illustrates the use of infixation in certain suffixes, and proposes an analysis in terms of Prosodic Circumscription. §8.3 describes the two main processes of reduplication and motivates an analysis where the two elements constitute separate phonological constituents in a compound-like structure. §8.4 illustrates and formulates the rule of Aphesis, and §8.5 deals with compounding, again motivating a structure with two phonological words. §8.6 outlines the special morphology of the kinship system, providing further examples of reduplication as well as morphological processes unique to kinship terms.

8.1. Templatic Morphology

As in most languages, the basic type of morphological operation in Kashaya is simple concatenation, i.e. prefixation and suffixation. The vast majority of affixes in Kashaya are suffixes, which are subject in some cases to considerable allomorphy and complex interrelationships (§7.2). The suffixes are divided among several levels of the lexicon, and the numerous phonological rules which they undergo depend on those levels.

On the other hand, all verb prefixes, with one potential exception, belong to the set of instrumental prefixes and are added in level 1 of the lexicon (for noun prefixes, see §8.6). In addition to the instrumental prefixes, there is one apparent prefix which occurs idiosyncratically with five verbs, where it marks Plural Act. In Oswalt's (1961) notation
the prefix is represented \( \|v\| \), where \( \|v\| \) is a morphophoneme which is identical to the vowel of the following syllable. It occurs in the following forms:

<table>
<thead>
<tr>
<th>(1)</th>
<th>SINGULAR</th>
<th>PLURAL</th>
<th>GLOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-( i^* )-</td>
<td>-( li^* )-</td>
<td>‘bend’ [175, 2.114]</td>
<td></td>
</tr>
<tr>
<td>-( sa^* )-</td>
<td>-( la^* )-</td>
<td>‘break’ [72]</td>
<td></td>
</tr>
<tr>
<td>-( ja^* )-</td>
<td>-( la^* )-</td>
<td>‘break so that insides come out’ [175, 2.114]</td>
<td></td>
</tr>
<tr>
<td>-( io^* )-</td>
<td>-( lo^* )-</td>
<td>‘peel’ [175]</td>
<td></td>
</tr>
<tr>
<td>-( cu^* )-</td>
<td>-( lu^* )-</td>
<td>‘break in two’ [72]</td>
<td></td>
</tr>
</tbody>
</table>

Interestingly, in all cases the verb root to which the prefix attaches begins with a coronal ejective without an increment, followed by a long vowel and no closing consonant. Given its severely limited occurrence, the form of the prefixal vowel could simply be part of the lexical representation of the verb. This solution is quite reasonable since there are well over a dozen disparate allomorphs of the Plural Act given in Oswalt’s grammar, and it is often not possible to predict which form will occur with a particular verb, so that they must be listed anyway; for example, alongside -\( lo^* \)- ‘peel’ is the alternate plural form -\( lo^* \)-.  

Still, it is possible to express the small generalization about these forms by means of a word formation rule which serves as a redundancy rule (cf. Aronoff 1976). If we simply posit a prefix with an unspecified vowel, essentially \( li^* \), and spread the features of the following vowel onto it, we fail to capture the considerable shared phonological structure of the roots. Further, since the intervening consonant in each case has place features, the nature of the vowel spreading is problematic: we cannot appeal to a rule like Translaryngeal Harmony (§3.4.1). In addition, since all of the roots in (1) also take an instrumental prefix, these would be the only roots that take more than one prefix of any type (e.g. \( da-lu^* \)- ‘break in two with the hands (pl)’). It seems more appropriate to treat the forms in a templatic manner:

---

1 I use CV notation here for clarity, but in fact I assume that morphological templates should be expressed formally by means of prosodic constituents (McCarthy and Prince 1986). The templates given here can easily be converted into syllables and moras (and the plural in (2) is actually in the form of an iamb).
Information about the nature of the coronal consonant could also be included in the template. Due to the simple nature of these roots, the ordering of consonants and vowels is not contrastive. I suggest that, in line with the templatic nature of this pattern, the vowel and consonant features should be represented on different planes. McCarthy (1989a), in an attempt to restrict the use of separate vowel and consonant planes, argues that this ‘planar V/C segregation’ should be permitted only when the relative order of consonants and vowels is not lexically specified in the morpheme itself. This circumstance arises when the vowels and consonants belong to separate morphemes (as in Semitic); in a rigid CV syllable structure; and when templatic morphology provides a CV skeleton. If these verbs have templates, as their shared syllabic structure suggests, the consonants and vowels can be segregated.

The advantage of this segregation is that association of the vowel features of the root with the vowel slot in the prefix is unimpeded by the consonantal features. Simple left-to-right association of the consonant and vowel generates the correct forms:

(3) ‘break (sg)’: /sə/  
   \[ a \]
   \[ C \ ^  \ V \ V \]
   \[ ! \]
   \[ š \]

   ‘break (pl)’: /lašə/  
   \[ a \]
   \[ C \ ^  \ V \ C \ V \ V \]
   \[ ! \]
   \[ ! \]
   \[ š \]

Since /a/ and /š/ are on different planes, the spreading of /a/ across the consonant is possible. Although most of Kashaya morphology is concatenative and no planar segregation is necessary (or in fact permissible by McCarthy’s criterion), in certain isolated cases a templatic approach is appropriate. One of these is in the small set of verbs in (1), where the identical syllable structures and unusual spreading of vowel features motivate a
template with separate consonant and vowel planes. Even in Semitic, the prototypical example of templatic morphology, there are words which do not participate in any templatic patterns, and for them there is no justification for V/C segregation. I suggest that Kashaya embodies the converse: most of the morphology is concatenative, but a limited set of forms is generated by templates.

In addition to the more straightforward reduplications of a mora or a stem (§8.3), Kashaya has two types of reduplication which actually appear to be templatic. One pattern derives adjectives, most relating to facial appearance:

\[
\begin{align*}
(4) & \quad a. \text{ qa-bo'š-} & \rightarrow & \text{ qa'bóšbošo} & \text{‘having puffed up cheeks’ [D]} \\
& & \rightarrow & \text{ p'i-bóšbošo} & \text{‘swollen-eyed’ [D]} \\
& & \rightarrow & \text{ p'u-bóšbošo} & \text{‘inflated by air (balloon, skirt)’ [D]} \\
& b. \text{ qa-bu'š-} & \rightarrow & \text{ qa-búšbušu} & \text{‘having puffed up cheeks’ [D]} \\
& c. \text{ p'i-bu'k-} & \rightarrow & \text{ p'i-búkbušu} & \text{‘having puffed up cheeks’ [D]} \\
& & \rightarrow & \text{ qa-búkbušu} & \text{‘having puffed up cheeks’ [D]} \\
& d. \text{ qa-bo'ʃ-} & \rightarrow & \text{ qa'bóʃboʃo} & \text{‘having an angry face’ [2.110]}
\end{align*}
\]

Two changes occur here. The first is that the initial syllable is lengthened. No template is really necessary for this change, since simple insertion of a mora has the same effect; further, we see in §8.6 that the same lengthening applies in the kinship system as well, and does not appear to be sensitive to the morpheme located in the first syllable. For that reason I treat the lengthening of the first syllable by a separate rule of Initial-Syllable Lengthening, given in (83).

The second change is that the root is mapped to a template of the shape CVCCVCV. As with the Plural Act in (2), the spreading of vowel features across a consonant is evidence for planar V/C segregation. Notice that the two root consonants each appear twice (bošbošo); we do not have rightward spreading of the last root consonant (*bošbošo). One

---

2 These forms are not discussed in Oswalt (1961). I have found examples only in the B section of Oswalt (1990), and just for three roots, though with varying instrumental prefixes; (4d) was volunteered by Bun Lucas as an alternate while I was asking about the other forms. This limited source explains why the first consonant of each root is /b/, but note also that the vowel of the root is long and round in each case. A related form which shows some of the same changes is qa-tu'įj ‘nickname for an angry person’ [2.110]. The initial stress may reflect vocative case, as found in kinship terms (Oswalt 1961:91).
way to account for this fact is by associating the melody independently to two separate templates (CVC and CVVC), which are then linearized. Because of the difficulty of representing the distinct consonant and vowel planes on a single sheet of paper, I show them separately:

(5) \[
\begin{array}{c}
\text{Consonant Plane} \\
\text{Vowel Plane}
\end{array}
\]

\[
\begin{array}{ccc}
C & V & C \\
\hline
b & \^s & \\
C & V & C
\end{array}
\]

\[
\begin{array}{ccc}
C & V & C \\
\hline
\_ & o & \\
C & V & C
\end{array}
\]

This approach is similar to that proposed by Clements (1985c) and Mester (1986) in a somewhat different context. Another possibility is that the melody is separately associated to the two templates, each of which can be treated as a phonological word.\(^3\)

(6) \[
\begin{bmatrix}
o \\
C & V & C \\
\hline
b & \^s
\end{bmatrix}
\begin{bmatrix}
o \\
C & V & \_ \\
\hline
b & \^s
\end{bmatrix}
\]

A reason to favor the two templates in (6) is that the initial CVC template seems to occur independently in different forms with similar ‘face’ semantics:

(7) di-be’i\- qa-bo’$\-$ \rightarrow di’bel’be qa’bôšbo ‘having a sagging long thin face’ [D] ‘having puffed up cheeks’ [D]

The word qa’bôšbo is simply an alternate of qa’bôšbo. In (7) we seem to have the CVC template plus CV Reduplication (§8.3.1). Initial-Syllable Lengthening applies as well. In di’bel’be we see the effect of Glottal Transfer (§3.1.4), which is not evident in Stem Reduplication (see (44)).

\(^3\) The different spreading behavior of consonants and vowels suggested in §6.6 makes possible another solution where the template is a single CVCCVC. The vowel can spread over all the V-slots, but since the final consonant cannot spread, the entire consonantal melody is reduplicated and each consonant is singly associated to the remaining C-slots.
A second type of templatic reduplication bears a certain resemblance to the adjective template in (6). It marks the Plural Act of a few verbs:

(8) SINGULAR  PLURAL  

-θq'αt-  -q'ař q'ařa-  ‘rip open’ [69, 1.84]  

-θk'w∫-  -k'w∫ k'w∫i-  ‘choke’ [176]  

-θqōs-  -qos qošo-  ‘spill’ [177]  

-θbol-  -bol' bohol-  ‘turn upside down’ [177]  

In a general way, these plural forms fit the [CVC][CVCV] template, including the need for planar V/C segregation, but there are several complications. First, the Decrement seems to apply to remove the laryngeal increment which is present in the singular. Second, in -θq'αt- the final stop glottalizes in the plural. Third, a new increment (or simple glottal segment) is inserted before the final consonant in the CVCV template: /l/ before an ejective, otherwise /l/. An attempt to formulate these other changes is unlikely to yield much benefit, since their restriction to so few roots makes it difficult to determine what the correct generalizations are. Whatever the ultimate resolution of these issues, we can take the overall patterns in (8) as supporting evidence for the [CVC][CVCV] template.

8.2. Infixation

Several different infixes are used to mark the Plural Act form of the verb; they are marked here by the symbol ।।. In all cases the morpheme is placed after the last vowel of the root, i.e. before whatever consonant may be at the end of the root. Concomitantly, the Decrement often applies to remove any laryngeal increment present in the root (§6.5), as

---

4 For example, it may be that the glottalization in -θq'αt- is part of a rule which applies to all of the root-final consonants: vacuously to -θk'w∫- and -θqōs- since they are already glottalized, and only partly successful in -bol' bohol- since the second /l/ undergoes Onset Simplification. If true, this suggests that the insertion of the increment follows this glottalization rule. On the other hand, the /l/ in -bol' bohol- may be the result of Glottal Transfer (which raises complications about the presence or absence of word boundaries). In addition, the /l/ could be derived by infixation of Plural Act -l- which then aspirates and debuccalizes (§3.2.1), but if affixation occurs on a base like -bol' bol-, we would expect suffixation rather than infixation. On the other hand, the base should not be -bol' bol-, since regular Epenthesis cannot generate [o] after /l/ (§3.3.1).
well as Morphological Shortening, which removes vowel length (§6.8).

The first Plural Act infix is -t-. When the following consonant is not a coronal, the -t- undergoes the expected Coda Aspiration (§3.1.7):

(9) \[ p^\circ a\text{-nelt}l\text{-m-w} \rightarrow p^\circ a\text{-n}\acute{e}t\text{-maw} \quad \text{‘hit with the fist (pl)’ [170]} \]

\[ p^\circ i\text{-ly}a\text{-tiq-w} \rightarrow p^\circ i\text{-ya}\acute{a}\text{-qaw} \quad \text{‘recognize (pl)’ [170]} \]

\[ p^\circ a\text{-c}o\text{-tiq}^\times\text{-w} \rightarrow p^\circ a\text{-c}\acute{o}\text{-qow} \quad \text{‘stab (pl)’ [170]} \]

Following McCarthy and Prince (1990) and Lombardi and McCarthy (1991), I analyze infixation as concatenation mediated by PROSODIC CIRCUMSCRIPTION — the formal exclusion of some prosodic constituent from the base on which some morphological operation is carried out. In this case, that constituent is the consonant, so in effect we have suffixation to the final vowel. The infixation thus proceeds as follows:

(10) BASE \[ [p^\circ anem] \]

CIRCUMSCRIPTION \[ [p^\circ ane] \quad \text{m} \]

SUFFIXATION \[ [p^\circ anet] \quad \text{m} \]

RECONCATENATION \[ [p^\circ anetm] \]

OTHER RULES \[ [p^\circ anet\acute{e}maw] \]

The same infix often occurs as a suffix on vowel-final roots:

(11) \[ n^\circ a\text{-c}^\circ a\text{-t-i} \rightarrow dac^\circ at \quad \text{‘grab them!’ [168]} \]

\[ n^\circ a\text{-k}^\circ a\text{-t-i} \rightarrow dac^\circ at \quad \text{‘knock them over!’ [168]} \]

\[ s^\circ is\text{-a}^\circ ri\text{-i} \rightarrow sisan\acute{a}\text{-du} \quad \text{‘leach (pl)’ [169]} \]

\[ qawa\text{-a}^\circ ri\text{-i} \rightarrow qawat\acute{a}\text{-du} \quad \text{‘chew (pl)’ [169]} \]

In this instance the circumscriptio of the final consonant is vacuous, since no such consonant is present in the base:

(12) BASE \[ [dac^\circ a] \]

CIRCUMSCRIPTION \[ [dac^\circ a] \quad \emptyset \]

SUFFIXATION \[ [dac^\circ at] \quad \emptyset \]

RECONCATENATION \[ [dac^\circ at] \]

The relation between the cases in (9) and (11) is parallel to that between consonant- and vowel-initial words in a language like Tagalog, where VC infixes occur before the first
vowel of the word, whether or not a consonant precedes that vowel (McCarthy and Prince 1990).

In at least one case -t occurs as a suffix after a consonant; that is, it irregularly fails to undergo the expected circumscription.

(13)  hόmic-t-an-i  →  hōbįtadu  ‘have more (work) to do (pl)’ [D]

This form shows the effect of Sonorization (§3.5.1) and Glide Deletion (§6.7). The root _hόmic- must simply be marked as taking an exceptional suffix which does not trigger circumscription.

Another form of the Plural Act is [h], which occurs almost exclusively before coronal consonants. As argued in §3.2.1, this is derived from -t- by Coronal Debuccalization:

(14)  a.  šu-talit-t-w  →  šutąhtiw  ‘twist (pl)’ [172]
      si-hwalt-it-w  →  siwáltitiw  ‘sag from being wet (pl)’ [172]
    b.  qa-hultit-t-w  →  qalúhtįw  ‘fail to bite off (pl)’ [172]
      pi-hciltit-m-ʔ  →  picńhtįh  ‘be overhanging (pl)’ [D]
      na-ʔkolttįt-t-w  →  dąkόhliw  ‘spill (pl)’ [172]
    c.  qa-mo‘ltš-w  →  qabońššiw  ‘cheeks be puffed up’ [D]
      curultš-w  →  cubųššiw  ‘sprout (pl)’ [D]
      tumnltš-w  →  tubųńciw  ‘get up (pl)’ [D]
      máh-šaltic-w  →  masńńciw  ‘be damp-dry (pl)’ [172]
      mánti-tic-w  →  mabńciw  ‘make a face (pl)’ [D]
      cono-tltic-w  →  cōbńciw  ‘attach nonlong objects to’ [D]

Deriving this [h] from -t- by the regular process of Coronal Debuccalization explains not only their relative distributions, but also why [h] never occurs after a vowel-final stem the way -t- and -ta- can: it is a phonological alternate possible only before a coronal. I have found a pair of verbs, basically variants of each other, which take the -h- infix but do not end in a coronal:

(15)  SINGULAR  PLURAL
  -mόki-  -mónk-  ‘swell up’ [D]
  -muk-  -muhk-  ‘be swollen’ [D]
The presence of [h] in the Plural Act may be due to analogy with -miṣ- ‘be puffed up’ in (14), which has nearly the same meaning and does trigger Coronal Debuccalization. At any rate, the forms in (15) cannot be derived by Debuccalization of -t-. I treat them as belonging to the significant class of verbs with irregular Plural Act forms, in this case a true -h- infix.

One allomorph of the Plural Movement suffix is also [h] infixed before the final consonant of the stem:

(16) SINGULAR    PLURAL
    kel-      kehl-          ‘peer’ [178]
    -mil-    -miηl-        ‘send away’ [D]
    -kiṣ-     -kiηs-      ‘scratch’ [178]
    -miŋ-    -miəŋ-      ‘rain to fall (pl)’ [D]

In the examples of this infix that I have found, it occurs only before a coronal, just as with the Plural Act [h]. I treat this as a -t- infix which also undergoes Coronal Debuccalization:

(17) kelt-i-il-a-w → këhlalaw        ‘peer down (pl)’ [178]
    ŋu-miηl-anηc-? → dubηhladu?   ‘send away (pl)’ [D]
    ŋu-kiηs-m-? → dukηhsηm    ‘scratch across (pl)’ [178]
    ŋi-miŋt-e-ay-? → dibυhca’y    ‘rain to fall repeatedly’ [D]

As suggested in §7.2.2, this form of the Plural Movement may in fact be the Plural Act suffix.

The second infix which marks the Plural Act takes the form -ta-, and triggers the Decrement and Morphological Shortening as well. It is found as an infix before /q, m, c/:

(18) a. šiηyηatalq-? → šiηiyáta?  ‘get dwarfed (pl)’ [171]
    qašøtalq-? → qašøta?       ‘get well (pl)’ [171]
    sima-ηtalq-? → simaʔ?      ‘go to sleep (pl)’ [171]

b. šiweyatalm-? → šiweyátaʔm  ‘renew (pl)’ [172]
    mi-λaηqatalm-? → bilaqátaʔm  ‘feed (pl)’ [171]

c. nuqøtalq-? → duqøtaʔ?  ‘get lost (pl)’ [171]
As with -ɾ-, there is an apparent suffixal use, but in this case the placement of the affix depends on the nature of the final consonant, rather than the simple presence of a consonant. It is suffixal after /l, n, n', r, c/:

(19)  
\[\text{ni-hāqōt-aw} \rightarrow \text{daqōtāw} \quad \text{‘fail to do (pl)’ [170]}\]
\[\text{ma-mīt-aw} \rightarrow \text{mabītāw} \quad \text{‘turn in a circle with the foot (pl)’ [D]}\]
\[\text{ni-jān-aw} \rightarrow \text{dišāntāw} \quad \text{‘bruise by dropping (pl)’ [170]}\]
\[\text{šu-pānt-aw} \rightarrow \text{šupāntāw} \quad \text{‘pull closed (pl)’ [170]}\]
\[\text{nu-hīn-aw} \rightarrow \text{dulūtāw} \quad \text{‘pick (berries)’ [170]}\]
\[\text{ni-yēc-aw} \rightarrow \text{dayētāw} \quad \text{‘press the hand against (pl)’ [170]}\]

These forms show Coronal Debuccalization in dulūtāw and dayētāw (§3.2.1), as well as Cluster Deaspiration of /n/ in šupāntāw (§3.1.6). We could distinguish the suffixal use of -ta from the infixed use by stipulating that with this formative prosodic circumscription fails to apply when the final consonant is a coronal sonorant — except that the obstruent /ć/ also causes suffixation, but /c/ does not. However, since I have only one example of each of these affricates occurring with -ta, dayētāw may simply be an exception.\(^5\)

While there are a number of other Plural Act allomorphs that I will not discuss here (§7.2.2), it is worth mentioning one more in this context. With certain roots ending in /t/ or /l/, there is no segmental realization of the Plural Act, simply the application of the Decrement and Shortening:

(20)  

<table>
<thead>
<tr>
<th>SINGULAR</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>-fāmu't-</td>
<td>-fāmu't-</td>
</tr>
<tr>
<td>-c'ār-</td>
<td>-c'ār-</td>
</tr>
<tr>
<td>-hīmat-</td>
<td>-hīmat-</td>
</tr>
</tbody>
</table>

Synchronically, this allomorphy is not phonologically determined, since we see in (14) that other stems ending in /t, t/ can take the -t- allomorph (which becomes [h]). Historically the

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\(^5\) The rule of Palatalization, which changes /h/ to [ć] to mark Plural Agent (§3.5.2), establishes a connection between /ć/ and the coronal sonorants, but since the precise plural meanings of these two morphemes differ, it is not possible to say that both are present in dayētāw and that the underlying root-final segment is /h/, which prevents circumscription. Additionally, the underlying /ć/ surfaces in the singular form. Before -ta, Coronal Debuccalization destroys the distinction between /h/ and /ć/ — a fact which could play a crucial role in explaining these facts.

340
lack of an overt affix in (20) is perhaps the result of affixation of -t- and subsequent
degemination, but since both allomorphs occur before these stops the alternation has
entered the realm of morphology and is not the result of a productive phonological rule in
the synchronic grammar. Since the Decrement and Morphological Shortening are normally
triggered by an affix, it would be most consistent to assume that there is a -Ø allomorph of
the Plural Act here which triggers the rules.

8.3. Reduplication

Two main types of reduplication exist in Kashaya. In CV Reduplication, the copy and
sometimes also the root are reduced to the minimal CV mora (§8.3.1). Stem Reduplication
copies the entire morphological stem present at that point in the derivation (§8.3.2). Both
these types of reduplication occur in level 1 of the lexicon.

8.3.1. CV Reduplication

There are many examples in Kashaya of reduplication which consists of a copy of the last
syllable of the stem, reduced to CV if the syllable is longer than that. Since it operates in
level 1, where the laryngeal increment is linked to the same mora as the following
consonant (§6.4.2), it treats the incremented consonant as a single segment. CV
Reduplication is productive in a subclass of verbs (marking Iterative aspect), where the
base is also reduced to CV:

(21)    BASE       ITERATIVE
       ḫlu-       ḫluʔlu-       'wrap' [155]
       ḫ̣e-       ḫ̣e-ḥe-       'spread out' [155]
       ḫwẹn-       ḫwẹhwe-       'shake' [155]

There is no Aspirate Dissimilation in -ḥe-ḥe- because the first stop in not word-initial
(§3.1.5). An instrumental prefix does undergo Aspirate Dissimilation, since it is initial:

(22)  ḫu-ḥe-ḥe-w → puḥ̣eḥ̣ew        'be spread out by the wind' [155]
To account for the nonapplication of Aspirate Dissimilation to the root-initial consonant in such forms as $pu\cdot h\rlap{\text{e}}\text{.} h\rlap{\text{e}}\text{.}$, we can assume that the prefix is present before CV Reduplication. The derivation is then parallel to that in (25) below.

Notice that the vowel length and final consonant in $\text{hwe}n$- are lost in both parts of the Iterative form, resulting in single moras. To preserve the underlying linking of the increment in the reduplicated element, I assume that CV Reduplication consists of copying the entire final syllable and reducing it to the strong mora.\(^6\) The maintenance of the prespecified morification of the increments provides evidence for Steriade's (1988a) theory of reduplication, where prosodic structure as well as melodic elements are copied. If only the melody were copied, the exceptional linking of the increment to the same mora as the following consonant would be neutralized.\(^7\) The trimming of $\text{-hwe}n$- is as follows:

\[
\begin{array}{c}
\mu \: \mu \\
\text{/} \text{/} \\
\text{hwe} \text{<n>} \\
\text{/} \text{hwe}
\end{array}
\]

Loss of the second mora automatically removes vowel length. There are two ways of dealing with the fact that both the original and reduplicated elements are reduced to CV: either the last syllable of the verb is shortened to CV and a copy of that reduced syllable is suffixed to the base, or the entire base is copied and trimming applies to both parts. We consider these options further below.

A number of verbs occur only with CV Reduplication (often the semantics requires iteration). Some such roots are monosyllabic like the ones in (21). The posited underlying stem is given in parentheses to indicate that it does not surface as such:

\[\text{\ldots}\]

---

\(^6\) Although there is no syllable structure per se in the phonological representation in level 1, I assume that morphological operations can impose prosodic structure on a representation that does not already include it for the purposes of selecting a piece of the string. This is similar to the use of the bimoraic foot template in Japanese (e.g., Poer 1990), and is consistent with a more general distinction between (metrical) stress feet and (morphological) parsing feet (McCarthy and Prince 1986, Hammond 1989).

\(^7\) The data showing the need for this distinction are given in §6.4.1.
(24) \(-\text{ʔ}h\text{a}-\)  \(-\text{ʔ}h\text{a} \text{ʔ}h\text{a}-\)  ‘bother’ [176]
     \(-\text{ʔ}lo-\)  \(-\text{ʔ}lo \text{ʔ}lo-\)  ‘do imperfectly’ [176]

In the examples seen so far the base which undergoes reduplication is monomoraic, and we cannot tell whether the entire root is copied, or some part of it. Often, however, the base is more than one syllable long, and from these longer bases we see that it is truly just the last syllable which survives in the copy:

(25) \(\text{hi} \text{ʔla}-\)  \(\text{hi} \text{ʔla} \text{ʔla}-\)  ‘gossip’ [176]
     \(\text{ʃo} \text{ʔyo}-\)  \(\text{ʃo} \text{ʔyo} \text{ʔyo}-\)  ‘tickle’ [68]
     \(\text{ʃu} \text{ʔmi}-\)  \(\text{ʃu} \text{ʔmi} \text{ʔmi}-\)  ‘glimmer’ [156]
     \(\text{ʃi} \text{ʔmo}-\)  \(\text{ʃi} \text{ʔmo} \text{ʔmo}-\)  ‘break up clods’ [156]
     \(\text{ʃu} \text{ʔla}-\)  \(\text{ʃu} \text{ʔla} \text{ʔla}-\)  ‘be shiny’ [176]

In all of these examples, like most verbs I have found in reduplicated form, the final syllable of the base is already minimal and there is no overt evidence to show reduction to CV: this is expected if the forms never occur without CV Reduplication and its concomitant trimming. Direct evidence for trimming comes from \(\text{ʃ} \text{we} \text{n}-\) and the forms that we consider next.

The greatest variety of syllable structures is found in nouns, where CV Reduplication occurs idiosyncratically and can be understood as a redundancy rule to express a widespread pattern in the vocabulary. Here we find reduplication of CV, but there is no reduction in the size of the base, unlike in the verbs. In this first set of examples in (26), the final syllable of the posited underlying base is already of the shape CV, so the effect of CV Reduplication appears to be the same as with the verbs:

(26) a. (la)  lala  ‘goose’
     (ʃo)  ʃoʃo  ‘tube’
     (k’i)  kiki’  ‘gill cover’

b. (huba)  hubabá  ‘bulb species’
     (biʃi)  biʃiʃi  ‘shooting star (flower)’
     (baʃi)  baʃiʃi  ‘spotted skunk’
     (qala)  qalalá  ‘swallow (bird)’

343
Notice that in *kik’* Aspirate Dissimilation has applied to the first consonant, since it is initial in the word.

A long vowel which is final in the posited base is copied as a short vowel, but the original long vowel is unaffected. This shows that the base is not reduced, and is what we expect from trimming to CV in the copy only: 8

| (27) | a. (to’) | to’to | ‘dance movement’ |
|      | (lo’)   | lo’lo | ‘pipe, tubing’   |
|      | (ko’)   | ko’ko | ‘taboo’          |
| b.   | (kolo’) | kolo’lo | ‘concave’       |
|      | (biye’) | biye’ye | ‘sunflower’   |
|      | (šaq’-) | šaq’a’qa | ‘valley quail’ |
|      | (k’ulu’) | naya k’ulu’lu | ‘thrasher’ (naya ‘manzanita’) |
|      | (čica’) | čica’ca | ‘mountain quail’ |
|      | (tolo’) | tolo’lo | ‘dimple’        |
|      | (qasi’) | qasi’si | ‘elk’           |
|      | (pili’) | pili’li | ‘hoop, wheel’   |
|      | (p’ali’) | p’ali’li | ‘paddle’       |
|      | (polo’) | polo’lo | ‘spherical’  |
|      | (č’ipu’) | č’ipu’pu | ‘blood-filled tick’ |
|      | (ku’u’) | q’a ku’u’u | ‘whelk’ (q’a ‘water’) |
|      | (ko’o’) | ko’o’o | ‘acorn musical instrument’ |
|      | (p’ali’) | p’ali’li | ‘paddle, oar’  |
|      | (kiš’-) | kiš’si | ‘rustling’ [Os91] |
| c.   | (beheja’) | beheja’ja | ‘manroot (plant)’ |

---

8 Notice that by far the majority of bases are disyllabic, with a smaller number monosyllabic and only one trisyllabic; (27c) may in fact consist of *behe* ‘bay nut’ and a reduplicated monosyllabic base *la*-.

Sometimes the full form is a compound of more than one word, in which case the meaning of the nonreduplicated word (or, at least, a word which has the same form) is given after the gloss. Occasionally it is unclear what the other word in the compound means, or whether it even exists as a free form, but often it is obvious. For example, *q’*o *k’ut’u* ‘whelk’ includes *q’o*, the aphthized form of *k’a* ‘water’ (§8.4). The word *maka* ‘monkey’, no doubt borrowed from Spanish *macaca*, coincidentally has the same shape as these reduplicated forms.
Final consonants are also lost, again as expected by trimming to CV:

<table>
<thead>
<tr>
<th>(28)</th>
<th>(šív)</th>
<th>šíwši</th>
<th>‘chick’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(tu)́</td>
<td>tó́tu</td>
<td>‘sugar’</td>
</tr>
<tr>
<td></td>
<td>(woł)́</td>
<td>wó́lwo</td>
<td>‘badger’ [47]</td>
</tr>
<tr>
<td></td>
<td>(may)́</td>
<td>má́yma</td>
<td>‘separate, apart’</td>
</tr>
<tr>
<td></td>
<td>(lík)́</td>
<td>líklí</td>
<td>‘sparrow hawk’</td>
</tr>
<tr>
<td></td>
<td>(luʔ)́</td>
<td>luʔlu</td>
<td>‘kidney’</td>
</tr>
<tr>
<td></td>
<td>(šaʔ)́</td>
<td>šaʔša</td>
<td>‘dirty, nasty’</td>
</tr>
<tr>
<td></td>
<td>(boj)́</td>
<td>ňúy bojbo</td>
<td>‘gnat’ (ńúy ‘eye’)9</td>
</tr>
<tr>
<td>b. (hopom)́</td>
<td>hopómpo</td>
<td>‘smokehole’</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ćiʔiʔ)́</td>
<td>ma cćiʔiʔi</td>
<td>‘millipede’ (cf. ma ‘sinew’)</td>
</tr>
<tr>
<td></td>
<td>(košoʔ)́</td>
<td>košóšó</td>
<td>‘salal berries’</td>
</tr>
<tr>
<td></td>
<td>(šutuy)́</td>
<td>p’a šutuytu</td>
<td>‘stink ant’ (p’a ‘excrement’)</td>
</tr>
<tr>
<td></td>
<td>(dócom)́</td>
<td>p’a dócomó</td>
<td>‘sparrow species’ [44]</td>
</tr>
<tr>
<td></td>
<td>(ćoboć)́</td>
<td>cóbóćbo</td>
<td>‘grouse’10</td>
</tr>
<tr>
<td></td>
<td>(bukwuʔ)́</td>
<td>q’a búk’uʔk’u</td>
<td>‘isopod’</td>
</tr>
<tr>
<td></td>
<td>(holónm)́</td>
<td>holómlo</td>
<td>‘small bumblebee’</td>
</tr>
<tr>
<td></td>
<td>(tinaʔ)́</td>
<td>qahca tinaʔna</td>
<td>‘bat’ (qahcáʔna ‘western harvest mouse’)</td>
</tr>
<tr>
<td></td>
<td>(kojóʔ)́</td>
<td>kójóyó</td>
<td>‘bulb species’11</td>
</tr>
<tr>
<td></td>
<td>(bošoʔ)́</td>
<td>šina bóšóʔo</td>
<td>‘cabezón’ (šina ‘head’)</td>
</tr>
<tr>
<td></td>
<td>(sijaʔ)́</td>
<td>q’áʔbe sijaʔa</td>
<td>‘rockfish’ (q’áʔbe ‘rock’)</td>
</tr>
<tr>
<td></td>
<td>(pišʔ)́</td>
<td>q’a píšli</td>
<td>‘plover’</td>
</tr>
<tr>
<td></td>
<td>(ćeʔoʔ)́</td>
<td>q’a čćeʔko</td>
<td>‘scaup (bluebill duck)’</td>
</tr>
<tr>
<td></td>
<td>(naʔá’áy)́</td>
<td>q’a c’úlí’ naʔá’áy’a</td>
<td>‘starfish’</td>
</tr>
<tr>
<td></td>
<td>(kusúʔ)́</td>
<td>kusúšu</td>
<td>‘small abalone’</td>
</tr>
<tr>
<td></td>
<td>(haqoh)́</td>
<td>haqóhqo</td>
<td>‘crazy’ [2.105, Os91]</td>
</tr>
<tr>
<td>c. (šibiláʔ)́</td>
<td>šibiláʔla</td>
<td>‘western skink’</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(sik’oloʔ)́</td>
<td>sik’oláʔlo</td>
<td>‘Calochortus bulb’</td>
</tr>
<tr>
<td></td>
<td>(kobičiʔ)́</td>
<td>kobičiʔči</td>
<td>‘small gray bird (sparrow sp.?)’ [D]</td>
</tr>
</tbody>
</table>

The presence of initial stress in several of the words in (28a) shows that Syllable Extrametricality has not applied. A natural way to derive this result is to treat the base and

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9 Oswalt (1990) suggests a relation to joʔboʔbo- ‘sound indistinct’. There is a longer word for ‘gnat’, huʔšíʔboʔbo, which exhibits irregular syllable structure and is surely borrowed at least in part; húyboʔbo probably represents a simplification to fit the native syllable structure and reduplication pattern.

10 Oswalt (1990) notes that this pattern resembles the third-syllable syncope common in Southern Pomo, from a hypothetical form čóboćóbo which is unknown to his Southern Pomo consultants; this would be the result of Stem Reduplication rather than Mora, but since the syncope is not a rule of Kashaya it is not tenable as a synchronic analysis.

11 Oswalt (1975) gives the compound pasí kóyoʔyo ‘cocoon, cocoon rattle’, from an apparent base kóyoʔ combined with pasí ‘poison’. Bun Lucas has the form pasí kóyoʔyo with an ejective [2.115], making the stem identical with that for ‘bulb species’, and in fact accepts the use of kóyoʔyo by itself to mean ‘rattle’ also. Note that the verb stem kóyo- means ‘rattle’. 

345
the copy as separate phonological words, each one syllable long in these cases, so that the Non-Exhaustiveness Condition blocks the application of Extrametricality. That is, in a word such as [šį́w]/šį/ the initial syllable is a separate word, and since an entire word cannot be marked extrametrical, it remains visible and takes the stress. Reduplicated forms of the same structure which do not take initial stress, such as likli, may be lexicalized as single phonological words and therefore subject to Syllable Extrametricality.

In one case that I have found, it appears that the underlying base contains a VVC rime, similar to hwen:

(29) (pʰɛɾm) pʰɛɾmːtė ‘symphysis’

The fact that stress does not fall on the second syllable, which is closed, suggests that it is underlyingly long. Foot Extrametricality has applied to it, followed by Closed-Syllable Shortening. The reduction of /ɛɾm/ to /e/ in the final syllable is parallel to (23).

The rule of CV Reduplication is clearly motivated in verbs and makes an important generalization about the patterns found in Kashaya nouns. In addition, some of the nouns have related, unreduplicated forms which support the existence of the underlying stems. For example, kolo- posited for kolo:lo ‘concave, hollow’ in (27b) is found in kolom- ‘a hollow in the ground’ [2.71]. In other cases it is less clear: Bun Lucas recognizes (but could not define precisely) a verb hopom- [2.72] related to hopompo ‘smokehole’ in (28b).\(^\text{12}\)

The main difference between CV Reduplication in nouns and verbs is that in verbs both the last syllable of the base and the copy are reduced to CV. This can be accounted for in at least two ways. First, suppose that one rule circumscribes and copies the last syllable, and another rule reduces the copy to CV. In nouns the following derivation holds:

\(^{12}\) In four words there is a repeated vowel plus /l/ at the end: sǐl ‘fisher’, tbił ‘Cooper’s hawk’, čalál ‘hedgehog mushroom’, nači:tő ‘deer-head disguise’. These few words do not fit the general pattern, and do not justify the creation of a new rule.
(30) CIRCUMSCRIPTION ho [pom]
COPYING ho [pom][pom]
TRIMMING ho [pom][po]

In verbs, however, the opposite ordering of rules generates the correct result. Recall that we must include instrumental prefixes in the base which undergoes CV Reduplication, so that circumscription of the last syllable is necessary here as well. We can use da[hwe'n]- ‘shake with the hand’ as an illustration:

(31) CIRCUMSCRIPTION da [hwe'n]
TRIMMING da [hwe]
COPYING da [hwe][hwe]

Whether it should be possible to order these rules differently for different parts of speech is uncertain.

An alternative is to maintain the same ordering, but to give the Trimming rule wider scope for verbs. That is, it applies to both constituents rather than just the last:

(32) CIRCUMSCRIPTION da [hwe'n]
COPYING da [hwe'n][hwe'n]
TRIMMING da [hwe][hwe]

I am not aware of any empirical difference between these two analyses, since there is no rule which intervenes between Copying and Trimming. Even if Circumscription, Copying, and Trimming are seen as a single process whose internal ordering is fixed, the different possible outcomes in (30) to (32) show that something more needs to be said about the scope of Copying.

In a few cases we seem to have the pattern in (27) or (28), except that the first syllable of the base is reduplicated and reduced to CV, without affecting the final syllable:

(33) (lu'muʔ) lu' lumúʔ ‘type of dance’
(qašša) qašqaša ‘lupine’
(k'omlo) k'omk'olo ‘river eel’
(čamra) čamcaša ‘blackbird’
This is essentially infixed reduplication, and can be derived by the same rule of CV Reduplication which is already well-attested in Kashaya, with an additional stipulation for these words: prosodic circumscription of the final syllable. For example:

(34) BASE [lu'muʔ] [qalša]  
CIRCUMSCRIPTION [lu'] mu? [qal] ša  
CV REDUPLICATION [lu][lu] muʔ [qal][qa] ša  
RECONCATENATION [lu'][lumüʔ] [qal][qaša]  

The placement of stress on the initial CVC syllables in (33) shows that Syllable Extrametricality has not applied, supporting an analysis where the reduplicated element is a separate phonological word. In a structure such as [qal][qaša], the Non-Exhaustiveness Condition blocks Extrametricality. The circumscribed syllable /ša/ must join with the reduplicated CV sequence preceding it, since the original base qalša is now discontinuous. In [lu'][lumüʔ] Syllable Extrametricality is blocked, but Foot Extrametricality is free to apply postlexically to /lu', resulting in stress on the second foot.\textsuperscript{13}

8.3.2. Stem Reduplication

Another type of reduplication marks the Frequentative verb. Here the entire base present at level 1 of the lexicon — the root plus a potential instrumental prefix — is reduplicated:

(35) BASE da-hwen- FREQUENTATIVE dahwen dahwen-na- GLOSS 'shake the hand' [68]  
qa-be'l- qabel qabe'l- 'chew with the lips moving back and forth' [D]  
hanoy- hanoy hanoy- 'limp' [157]  
mane- mane mane- 'dance, stamp feet' [2.49]  
čer- čel čer- 'fall' [2.113]  
kel- kel kel- 'peek' [2.69]  

In Stem Reduplication, a long vowel in the base ends up as a short vowel in the reduplicated portion, which precedes the original base. I propose that only the melody is

\textsuperscript{13} The form k'omk'olo demonstrates that Aspirate Dissimilation does not apply when the second consonant bearing the feature [asp] is separated from the first by more than a vowel. This in turn favors an analysis of the root 'do perfectly' as -m'mi- rather than -mhm-, as discussed in §2.3.2.
copied (without moraic structure), and this accounts for the loss of vowel length, which can be seen in the placement of stress:

\[(36) \text{da-}^{h} \text{wen-} \text{da-}^{h} \text{we}^{n-i} \rightarrow \text{dahwéndahwémi} \quad \text{‘shake and shake your hand!’} [68]\]

If the underlying long vowel were still long, Foot Extrametricality would apply, but here it has not. The distinction between incremented consonants and clusters is lost as well when prosodic structure is not copied, but this distinction is never exploited in the first of two reduplicated elements, and the distinction is lost in level 2 anyway.

As with CV Reduplication, in some verbs the Stem Reduplication which marks the Frequentative is an inherent part of the verb and the base does not occur by itself:

\[(37) \quad (\text{šiti-}) \quad \text{ši}^{t} \text{i} \quad \text{ši}^{t} \text{i} \quad \text{‘twinkle’} [157]
\quad (\text{tolo-}) \quad \text{tolo} \quad \text{tolo-} \quad \text{‘rattle’} [157]
\quad (\text{tili-}) \quad \text{tili} \quad \text{tili-} \quad \text{‘roll’} [179]
\quad (\text{su}^{\text{fla-}}) \quad \text{su}^{\text{fla}} \quad \text{su}^{\text{fla-}} \quad \text{‘be slippery’} [68]\]

The application of Iambic Lengthening shows that the reduplicated element constitutes a separate phonological word. For example, if the following verb were a single domain for Lengthening, we would expect the results shown:

\[(38) \text{tili-tili-mac-i} \quad \text{‘roll in there!’} [2.116]\]

\[
(\text{x}) \\
(\text{.\ x})\ (\text{.\ x})
\]

\[*<\text{ti}>\text{li ti}^{c} \quad \text{li ma}^{c} \text{ci}]*

This, however, is incorrect; what actually happens is that the first (copied) \text{tili} is in a separate word from the original base \text{tili} and all suffixes that follow it; both words undergo Syllable Extrametricality (shown here as exclusion from the prosodic domain), but only the second word is long enough to receive a foot and undergo Lengthening:

\[(39) \quad (\text{.\ x})
\quad \text{ti [ li ] ti [ li ma}^{c} \text{ ci ]}\]

349
Postlexically, since the domain of Stress Placement is a phrase, only the extrametricality in the first word can persist, and the stress falls on the third syllable as in (38); but since Iambic Lengthening has turned off, the output is \textit{tilitlima'ci}, with a short stressed vowel:

(40) \begin{tabular}{c}
\(x\) \\
\(\ldots x\) \(\ldots x\) \\
\(\text{ti} [\text{li}] [\text{ti li ma' ci}]\)
\end{tabular}

This two-word structure is typical of Kashaya compounds (§8.5). Evidence from the Decrement also supports two words in Stem Reduplication, since the first syllable of the second word must be extrametrical for that rule to target the word-initial moraically licensed glottal:

(41) \begin{tabular}{c}
bu [hlu] bu [hlu] \\
\end{tabular}

\[\uparrow\]

Since the suffix which triggers the Decrement is added to the second of the two constituents, it is only that one which undergoes the rule. The following verbs exemplify that the Decrement, Iambic Lengthening, and Root Elision all respect the structure in (41):

(42) \begin{tabular}{ll}
a. \text{[mu}hlu][\text{mu}hlu-an-i] & \rightarrow buhlubulu'du \\
& \text{‘walk along hunched over’ [2.4]} \\
& \text{(Decrement, Root Elision)} \\
b. \text{[ma-}\text{ma][ma-}\text{ma-t-an-i]} & \rightarrow baba\text{baba'du} \\
& \text{‘bother by talking (pl)’ [176]} \\
& \text{(Decrement, Root Elision)} \\
c. \text{[hi}hla][\text{hi}hla-t-ac?-} & \rightarrow hihlahila\text{a} \\
& \text{‘gossip (pl)’ [176]} \\
& \text{(Decrement)} \\
d. \text{[si}hqa][\text{si}hqa-an-i] & \rightarrow siah\text{sia'qadu} \\
& \text{‘slide along’ [2.10]} \\
& \text{(Decrement, Root Elision)} \\
e. \text{[ma-ne][ma-ne-mul-ič-me=?-} & \rightarrow manem\text{nem\text{u}ličme} \\
& \text{'dance around it! (pl)’ [2.116]} \\
& \text{(Iambic Lengthening)} \\
f. \text{[ni}o\text{qo][ni}o\text{qo-mac-i]} & \rightarrow d\text{ohqođo'qoma'ci} \\
& \text{‘trot in there!’ [1.120]} \\
& \text{(Iambic Lengthening)} \\
g. \text{[ni}o\text{qo][ni}o\text{qo-an-i]} & \rightarrow d\text{ohqođo'qodu} \\
& \text{‘trot along’ [1.70]} \\
& \text{(Decrement, Root Elision)}
\end{tabular}
We can note at this point that there is some evidence that CV Reduplication results in two phonological constituents as well. This is based on the application of Root Elision:

(43) a. \[\text{hih} \text{hla-hla-an-i} \rightarrow \text{hih} \text{hla-an-du} \] ‘be gossiping’ [3.19]
    b. \[\text{na-} \text{hwe-} \text{we-an-i} \rightarrow \text{dahwe-hwe-du} \] ‘push over and over’ [3.19]
    c. \[\text{sohyo-} \text{y-} \text{an-i} \rightarrow \text{sohyo-an-du} \] ‘be tickling’ [3.19]

The presence of a long vowel is necessarily due to Root Elision, which applies only in the first syllable of a word (§6.6); this supports the bracketing shown. The syllable structure in these forms makes Iambic Lengthening a useless test for constituency. The remaining test is the Decrement, but I have no forms where a Decrement-triggering suffix clearly is present in CV Reduplication. The suffix in (43) appears, from the semantics, to be the Durative -an’, but that allomorph normally follows only consonants (as in (42b,c)). It might also be the Directional -an’ ‘along’; this suffix triggers the Decrement (as in (42a,d,g)) which is not seen in (43). The semantics of these forms lacks a clear element of movement, except for (43b) which implies pushing an object, watching it move, pushing it again, and so on; but this could follow from the Iterative and Durative. If the suffix in (43) is in fact the Directional, yet the Decrement does not apply, we have evidence that the Decrement is sensitive to a different constituent from Root Elision, and the two types of reduplication create different constituents. This position receives marginal support from the apparent application of Glottal Transfer across a CV Reduplication boundary in (7), contrasting with the lack of it in Stem Reduplication:

(44) \[\text{nahwen-} \text{hwe-n-i} \rightarrow \text{dahwe} \text{dahwe-} \text{n-} \text{i} \] ‘shake and shake your hand!’ [68]
    \[\text{nu?mal-} \text{mal-} \text{r-7} \rightarrow \text{du?bal-} \text{du?bal} \] ‘turn back and forth quickly’ [D]

One possibility is that the bracketing is different, related perhaps to the fact that Stem Reduplication copies (and preposes) a morphological constituent, while CV Reduplication

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14 The increment in this, Otis Parrish’s root for ‘tickle’, is different from that given by Oswalt, as shown in (25).
is phonologically defined (and suffixal). Both morphological (m) and prosodic (p)
domains are shown here, with invisibility as exclusion from the prosodic domain (§8.5):

(45) **STEM REDUPLICATION**

\[
\begin{align*}
[dahwe\text{-}n]_m & \rightarrow [dahwe\text{-}n]_m [dahwe\text{-}n]_m \\
[dahwe\text{-}n]_p & \rightarrow da[hwe]_p da[hwe]_p
\end{align*}
\]

**CV REDUPLICATION**

\[
\begin{align*}
[dahwe\text{-}n]_m & \rightarrow [dahwehwe]_m \\
[dahwe\text{-}n]_p & \rightarrow da[\text{hwe}[\text{hwe}]]_p
\end{align*}
\]

Under this analysis, the presence of two brackets at the left edge of the prosodic domain in
CV Reduplication would block the Decrement as shown in §6.5.3. Root Elision, on the
other, might look for adjacency to any left bracket. At present, however, the data on CV
Reduplication are too limited to permit a solid conclusion.

In all cases of Stem Reduplication we have looked at, the base is no longer than an
iamb, modulo Final-Consonant Extraprosodicity and the linking of the increment to the
onset. This means that the reduplication could be treated as prosodically defined by the
foot, rather than morphologically defined by the stem. There is one form which would
seem to favor the foot-based analysis:

(46) \text{hu}kulu- \text{hu}kulu \text{kulu-} \text{‘cough up’} [156]

Notice that /hu/ is not copied. This case is marginal, however, not only because it is the
only one I have found, but also because the stem \text{kulu}- exists independently with the
related meaning of ‘cough’:

(47) \text{kulu-} \text{kulu } \text{kulu-} \text{‘cough’} [21, 213]

Since there is no prefix \text{hu}-, I suspect that \text{hu}kulu- ‘cough up’ has a compound structure
[hu][kulu] and only the second constituent undergoes Stem Reduplication, with \text{hu}
perhaps an aphetized noun originally (§8.4). If necessary, we could treat Stem Reduplication as Lamb Reduplication and still maintain the position that syllables (and therefore feet) are not present at level 1 of the lexicon (as argued in §6.4.3) by assuming parsing feet rather than stress feet, just as we assumed parsing syllables for CV Reduplication. In that case, however, it would be more surprising that no prosodic structure is copied.

All the examples seen so far are verbs, but I have two examples of Stem Reduplication in other parts of speech:

(48) noph'yo- yow- noph'yonoph'yo yo'yo'w 'chief (man)'
     'former'

The base noph'yo occurs separately both as a verb ‘live’ and as a noun ‘family, tribe’. The word yowal, which also means ‘former’, is evidence of the separate status of the base yow-, which also exists in the clitic =yow of the same meaning. The first /w/ undergoes Glide Deletion (§6.7). In a small set of nouns, reduplication appears to apply to a final syllable, or monosyllabic foot, of the shape CVG, again with Glide Deletion. These nouns also take the Absolutive suffix -ʔ, which merges with the word-final glide:

(49) (sulə'ey) sulə'ə'ey 'swallowtail butterfly'
(ʃaqay)  ʃaq'əq'ay 'red cod'
(ʃuqay)  ʃuq'əq'ay 'water snake’ (cf. cumaʔ ‘squirrel’)

Syllable Extrametricality applies to each base, supporting a structure such as sul[tə]ʃ[tə'ey].

---

15 This compound structure seems to be morphological only: /hu/ undergoes Syllable Extrametricality, as the stress in (46) shows; if it were a separate monosyllabic phonological word, the Non-Exhaustiveness Condition would block extrametricality. I assume that this verb is the converse of productive compounds (§8.5), i.e. it is morphologically [hu][kula] and phonologically [husuʃu]. Since Stem Reduplication refers to a morphological category, it is sensitive to the morphological compound structure, and manipulates just the second of the two constituents.
8.4. Aphesis

As discussed briefly in §6.4.1, there is a process of Aphesis whereby the initial syllable is deleted from a noun or adjective in certain contexts. The most common context for Aphesis is compounding, as illustrated in the next section. The majority of examples I have found involve the deletion of an initial syllable beginning with a glottal stop:

(50)

<table>
<thead>
<tr>
<th>FULL</th>
<th>APHETIZED</th>
<th>GLOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ṭamà</td>
<td>mà</td>
<td>‘land, place’ [306]</td>
</tr>
<tr>
<td>ṭahay</td>
<td>hay</td>
<td>‘wood, stick, pole’ [307]</td>
</tr>
<tr>
<td>ṭaha</td>
<td>ha</td>
<td>‘mouth’ [307]</td>
</tr>
<tr>
<td>ṭic̀à</td>
<td>c̀à</td>
<td>‘spider’ [D]</td>
</tr>
<tr>
<td>ṭimo</td>
<td>mo</td>
<td>‘hole’ [1.123, Os91]</td>
</tr>
<tr>
<td>ṭimo</td>
<td>no</td>
<td>‘heat, fire, light’ [306]</td>
</tr>
<tr>
<td>b. ṭa̞h̞ʊà</td>
<td>h̞ʊà</td>
<td>‘water’ [306]</td>
</tr>
<tr>
<td>ṭa̞h̞ʊà</td>
<td>h̞ʊà</td>
<td>‘game, gambling’ [306]</td>
</tr>
<tr>
<td>ṭa̞h̞i̞iy</td>
<td>h̞i̞iy</td>
<td>‘hard’ [307]</td>
</tr>
<tr>
<td>ṭa̞h̞ɔà</td>
<td>h̞ɔà</td>
<td>‘fish’ [in ‘chub’]</td>
</tr>
<tr>
<td>ṭa̞h̞ɛcà</td>
<td>h̞ɛcà</td>
<td>‘house’ [D]</td>
</tr>
<tr>
<td>ṭa̞h̞p̞à</td>
<td>h̞p̞à</td>
<td>‘excrement’ [330]</td>
</tr>
<tr>
<td>ṭi̞h̞p̞uy</td>
<td>h̞p̞uy</td>
<td>‘grease, fat’ [309]</td>
</tr>
<tr>
<td>ṭi̞h̞yà</td>
<td>h̞yà</td>
<td>‘wind’ [129]</td>
</tr>
<tr>
<td>ṭi̞h̞yà</td>
<td>h̞yà</td>
<td>‘bone, strong’ [in ‘hip’]</td>
</tr>
<tr>
<td>ṭi̞h̞mi</td>
<td>h̞mi</td>
<td>‘real’</td>
</tr>
</tbody>
</table>

In (50a) the initial syllable is followed by a simple consonant, while in (50b) the next syllable begins with an incremented consonant. In the latter case the increment is untouched since, as I have argued, it is prelinked to the following mora. This shows that Aphesis is a level 1 process since it respects the distinction between increments and plain clusters. A much smaller number of aphetized syllables begin with /h/:

\[16\] Notice that in (50) and (51) the word-initial glottal and the first laryngeal feature of the next syllable — whether a full segment or an increment — are never the same. That is, if one is /h/ the other must be /h/. This statement is largely true of the Kashaya lexicon, although there are at least two exceptions: kahse ‘brush, bushes’, ṭaʔ ‘yet, still’.  

354
(51) a. huʔuy ʔuy ‘eye’ [O91]
    hoʔo ʔo ‘tooth’ [O91]
  b. hiʔda ʔda ‘road, path’ [306]

There are a few seeming examples of Aphesis which do not fit the pattern seen above in that they involve more than the deletion of a minimal syllable with a laryngeal onset:

(52) a. coʔšo ʔšo ‘hand’ [O91]
    b. ?acaʔ /ʔacəc/ ca ‘man’ [O91]
    c. maʔbi ʔi ‘here’ [D]

In ʔšo, the onset which is deleted has place features. The aphetized form is found only in lexicalized names, however, and does not appear to be used in productive compounding, so it may reflect an earlier state of the language. Similarly, ca from ?acaʔ occurs only in names; it is exceptional since the remaining syllable is also reduced (similar to CV Reduplication). Oswalt (1990) describes the relationship between maʔbi and ʔi — the first is a more formal or emphatic variant — as Aphesis, but it is doubtful whether this is appropriate. Not only would that be the only example of Aphesis applying to a CVC syllable, but the elements maʔ and ʔi also appear to be separate morphemes: ʔi occurs in hiʔbi ‘somewhere (visible)’ and haʔbi ‘there’, and maʔ is in several deixics (§3.4.1). The alternation between maʔbi and ʔi seems simply a matter of the optionality of the maʔ morpheme, and not true Aphesis.17

While it is not common for nouns to be used as verbs without any derivational affix to mark the change, there are a few examples of this. When the noun begins with a glottal consonant, it undergoes Aphesis to become a verb:

---

17 If this were treated as Aphesis, it would provide nice evidence for the distinction between the increment /ʔ/ and the segment /ʔ/: only the latter is deleted along with the initial syllable. Note that the deletion of an entire syllable is consistent with diachronic examples, where a CVV syllable can undergo aphesis, as in *ʔaʔma → ma ‘you (sg)’ (McLendon 1973). I have not seen a diachronic example where CVC is deleted.
(53) a. muʔa ‘cooked’ muʔa- ‘be cooked’ [129]
muʔqa ‘stiff’ muʔqa- ‘be stiff’ [129]
cahno ‘word, speech’ cahno- ‘speak, make sound’ [129]
b. ḫiʔya ‘wind’ ḫiʔya- ‘blow (of wind)’ [129]
hiʔda ‘road, path’ hiʔda- ‘extend’ [129]

This contrast between laryngeal and supralaryngeal consonants supports the position that Aphesis targets minimal syllables in which the onset contains no Place node. While the nouns in (53a) all begin with CV syllables, they contain supralaryngeal consonants and fail to undergo Aphesis.

The evidence presented, then, supports Aphesis as a morphological rule which deletes an initial mora, as long as the onset has no Place node:

(54) Aphesis

\[
\begin{array}{c}
\mu \\
RC \\
\uparrow \text{Place}
\end{array} \rightarrow \emptyset
\]

The mora and all features that it dominates are deleted. The vowel which heads the mora does not need to be included in the rule since Morification ensures that the initial consonant will be grouped with a vowel. Since Aphesis occurs in level 1, it precedes the application of Syllable Extrametricality and the initial syllable that it targets is truly initial.

8.5. Compounding

Compounding is a common process in Kashaya for forming new nouns. There is good evidence that each element of a compound constitutes a separate phonological domain, even though the two or more elements together function as a single morphological word (for example, they are placed in the syntax as a unit). We saw a similar situation for Stem Reduplication in §8.3.2. Inkelas (1989) refers to this type of process as Pcompounding, and represents it as follows:
The compound has two levels: on the morphological level (m), it is a single word and is inserted into the syntax as a unit. On the prosodic level (p), however, it consists of two words (or other constituents), with consequences for the operation of phonological rules. There are two rules in Kashaya which support the type of representation in (55).

The first is Final Shortening, which often shortens a final vowel in a compound, whether or not the vowel is in the last word of the compound:

(56) a. ʔacap
      ʔhỳa
→ ʔacap ʔhỳa
      ‘man’
      ‘bone, strong’
      ‘strong man’ [2.63]

b. ʔhỳu
    ʔimàt
→ ʔhỳu ʔimàt
      ‘ice, snow’
      ‘woman’
      ‘ice woman’ [2.63]

c. cuye
    q’ale
→ cuye q’ale
      ‘sugar pinecone’
      ‘tree’
      ‘sugar pine’

d. ʔic’ar
    c’iʔbulàr
→ c’a c’iʔbulàr
      ‘spider’
      ‘cobweb’
      ‘spider web’ [D]

The fact that the vowel which shortens need not be at the end of the compound itself — only one of the words within the compound — provides evidence for the internal bracketing. While the application of Final Shortening is made possible by the Pcompounding process, it is not obligatory, and whether it applies or not is to some degree lexicalized. For example, Oswalt (1961) reports that with some compounds either form is possible:

(57) a. šamo
      šaq’ala
→ šamo šaq’ala or šamo šaq’ala
      ‘fly’
      ‘green, blue’
      ‘blowfly’ [308]
With others only the short or long form is accepted:

(58)  

a. ئاماَر

قاوية

→ ئاماَر قاويَا

‘good thing’ [309]

b. ئاماَر

قاها

→ ئاماَر قاهَا

‘flint’ [309]

To some extent the difference seems surely to depend on whether the concatenation is morphological (in which case Final Shortening applies) or syntactic (in which case it does not). For example, the words in (57) may be ambiguous between the two (Kashaya follows the syntactic order Noun-Adjective), and are perhaps in the process of being lexicalized as compounds. We can contrast also the difference in semantic compositionality for the two examples in (58): in (a) the meaning is transparent, and there is no Shortening, both of which suggest simple syntactic concatenation; in (b), the unpredictability of ‘flint’ for ‘knife thing’, along with Shortening, suggest morphological compounding.

This explanation is not entirely adequate, however, since even in clearer cases of compounding — e.g. where Aphesis occurs, or the ordering is not Noun-Adjective — Shortening is not always seen:

(59)  

a. باَهَة

ئاماَر

→ باَهَة ماتَ

‘wide’ [307]

b. رُهَوَار

ئوهو

→ رُهَوَار هو

‘campfire’ [307]

In at least two cases Final Shortening applies only to one of the two words in a compound (in both cases, the first word):
(60) a. musu' 'log'
baco' 'boat'
→ musu baco' 'log raft' [D]

b. baço' 'back'
ibliya' 'bone'
→ baçohya' 'spine'

The important fact is that Final Shortening is POSSIBLE in compounds, which shows that
the bracketing in (55) is there, and available for use by the rule. As discussed in §6.8,
Final Shortening is obligatory in verbs. It applies optionally in nouns but it must be a
derived context such as that provided by Pcompounding. If it applied (even optionally) in
nonderived environments, we would expect final long vowels in general to be shortened at
least some of the time, but this is not the case.

It is often the case that compounds include ‘cranberry morphs’ (Oswalt 1961:90), i.e.
elements which have no apparent meaning independent of the compound:

(61) a. ?ahqa' 'water'
waila '?'
→ q'awalal 'great blue heron'

b. ?ohcom '?'
ibliya' 'bone'
→ ?ohcomiya' 'hip' (with Aphesis, Shortening, Glottal Merger)

Many of the compounds with reduplicated members listed in §8.3.1 contain such cranberry
morphs (though the element wašla is perhaps also in mawšla ‘throat’ and paši kuwašla
‘newt’). The form in (61b) shows that even when one element is of unclear meaning, the
operation of Pcompounding creates a derived environment and Final Shortening can apply.

Compounds with initial monosyllabic members provide further evidence for the
Pcompounding structure in (55). Here Syllable Extrametricality is blocked by the Non-
Exhaustiveness Condition, and stress placement reflects this fact:

359
(62) a. ?amaha
    sîme
    → [ha][sîme]
    ‘mouth’
    ‘fur, coarse hair’
    ‘beard’

b. ?aʰqʰa
    bútaqa
    → [qʰa][bútaqa]
    ‘water’
    ‘bear’
    ‘sea lion’

This stress is perfectly regular if the first member is a separate phonological word, as shown. Other examples can be seen in §8.3.2. These facts also suggest an analysis of apparent irregular stress in words such as hopʰúne ‘white-footed mouse’. It may simply be marked as an exception to Syllable Extrametricality (as proposed for other morphemes in §5.7.2), but it could also be treated as an opaque compound, [ho][pʰúne], which accounts for the blocking of Extrametricality. The compounding analysis is superior if Iambic Lengthening is permitted to apply in nonderived environments (an issue which is unclear), since simple exceptionality to Syllable Extrametricality would then predict hopʰúne.

There are a few examples of compounds consisting of more than two elements, with Aphesis the norm:

(63) a. ?aʰqʰa
    ban
    ?ahay
    → [qʰabánhay]
    ‘water’
    ‘?’
    ‘wood’
    ‘driftwood’

b. ?aʰqʰa
    či
    ?aʰpʰa
    → [qʰaciphʰa]
    ‘water’
    ‘?’
    ‘excrement, waste’
    ‘waste on beach’

Here again, it is not always clear what each element of the compound means, though for example the cranberry morph ban is cognate with Southern Pomo bana ‘drift pile’ (Oswalt 1990). There are too few such forms to generalize about the internal branching of the compounds. I also have no basis on which to suggest where in the lexicon compounding takes place.
8.6. The Kinship System

The Kashaya kinship system involves a number of morphological processes (Oswalt 1961), which I outline below. First, however, I list all the forms under consideration, using the Nominative case, which is unmarked except in the first person which takes the suffix -en’ (subject to Elision). The kinship terms can be divided into two groups based on the number of possessive inflections that exist for the word. In the first group, there are five inflectional forms:

| (64) | INFORMAL FIRST PERSON | ‘my, our’ (with connotations of ‘dad’, ‘mom’) |
| FORMAL FIRST PERSON | ‘my, our’ (with connotations of ‘father’, ‘mother’) |
| SECOND PERSON | ‘your’ |
| THIRD PERSON | ‘his, her’ |
| THIRD PERSON REFLEXIVE | ‘his, her own’ (possessor coreferential with subject?) |

Ten roots belong to this first group:

| (65) | 1st inf | 1st form | 2nd | 3rd | 3rd refl |
| ‘brother, older’ | ki’kúñ | ?ar’kúñ | miki | miyá’ki | maki |
| ‘father’ | pe’pén | ?arpén | meñe | miyá’mé | mañe |
| ‘father’s father’ | barbán | bašén | mibás | miyá’bás | mabás |
| ‘father’s mother’ | marmáñ | maršén | mimás | miyá’maš | mamás |
| ‘father’s sister’ | murnúñ | mušén | mimús | miyá’muš | mamús |
| ‘mother’ | te’téñ | fa’téí | mihté | miyá’te | mahé |
| ‘mother’s brother’ | tætúñ | cušén | micúš | miyá’cuš | macúš |
| ‘mother’s father’ | tætán | cašén | micás | miyá’caš | macás |
| ‘mother’s mother’ | ka’kúñ | qašén | miqás | miyá’qaš | maqás |
| ‘mother’s older sister’ | šu’šúñ | šušén | mišúš | miyá’šuš | mašúš |

The second group includes the same person categories but makes no distinction between formal and informal terms in the first person:

---

18 These words are also used for ‘father’s older brother’.

361
<table>
<thead>
<tr>
<th>Role</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>3rd refl</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘brother’s wife’</td>
<td>matámeni</td>
<td>mimatá</td>
<td>miyá’mata</td>
<td>mamatá</td>
</tr>
<tr>
<td>‘brother, younger’</td>
<td>kúni</td>
<td>mítikí</td>
<td>miyá’íiki</td>
<td>mákí</td>
</tr>
<tr>
<td>‘father’s younger brother’</td>
<td>ci̱kíni</td>
<td>mítči’ki</td>
<td>miyá’čiki</td>
<td>mace’ki</td>
</tr>
<tr>
<td>‘friend’</td>
<td>ka’číni</td>
<td>mítkání</td>
<td>miyá’kání</td>
<td>mákání</td>
</tr>
<tr>
<td>‘granddaughter’</td>
<td>q’adémeni</td>
<td>miq’adémeni</td>
<td>miyá’q’adémeni</td>
<td>maq’adémeni</td>
</tr>
<tr>
<td>‘grandson’</td>
<td>q’adéni</td>
<td>miq’adé</td>
<td>miyá’q’ade</td>
<td>maq’adé</td>
</tr>
<tr>
<td>‘husband’</td>
<td>t’a’qúni</td>
<td>miq’daq’áni</td>
<td>miyá’q’daq’áni</td>
<td>maq’daq’áni</td>
</tr>
<tr>
<td>‘mother’s younger sister’</td>
<td>tı̱kíni</td>
<td>miše’ki</td>
<td>miyá’šiki</td>
<td>maše’ki</td>
</tr>
<tr>
<td>‘mother-in-law’</td>
<td>tı̱leyé?</td>
<td>miša’r</td>
<td>miyá’ša’</td>
<td>maša’r</td>
</tr>
<tr>
<td>‘father-in-law’</td>
<td>tı̱leyé?</td>
<td>miba’r</td>
<td>miyá’ba’</td>
<td>maba’r</td>
</tr>
<tr>
<td>‘parent-in-law of one’s child’</td>
<td>cání</td>
<td>micán</td>
<td>miyá’cání</td>
<td>mákání</td>
</tr>
<tr>
<td>‘sister’s husband’</td>
<td>makóni</td>
<td>miko’ni</td>
<td>miyá’koni</td>
<td>makóni</td>
</tr>
<tr>
<td>‘sister, older’</td>
<td>dikkúni</td>
<td>mide’ki</td>
<td>miyá’diki</td>
<td>maked’ki</td>
</tr>
<tr>
<td>‘sister, younger’</td>
<td>šoméni</td>
<td>mítikí</td>
<td>miyá’jiki</td>
<td>mákí</td>
</tr>
<tr>
<td>‘son’</td>
<td>p’ákúi</td>
<td>mip’a’ki</td>
<td>miyá’p’aki</td>
<td>map’a’ki</td>
</tr>
<tr>
<td>‘son-in-law’</td>
<td>hitbaya’ya?</td>
<td>mihceyé</td>
<td>miyá’ceye</td>
<td>mahceyé</td>
</tr>
<tr>
<td>‘spouse’s brother’ 1</td>
<td>mahání</td>
<td>mihání</td>
<td>miyá’ha’ni</td>
<td>mahání</td>
</tr>
<tr>
<td>‘spouse’s brother’ 2</td>
<td>maha’kúi</td>
<td>miha’r</td>
<td>miyá’ha’r</td>
<td>maha’r</td>
</tr>
<tr>
<td>‘spouse’s sister’ 1</td>
<td>mahaméni</td>
<td>mihaméni</td>
<td>miyá’harméni</td>
<td>mahaméni</td>
</tr>
<tr>
<td>‘spouse’s sister’ 2</td>
<td>mahaméni</td>
<td>miha’r</td>
<td>miyá’ha’r</td>
<td>maha’r</td>
</tr>
<tr>
<td>‘wife’</td>
<td>t’ármeni</td>
<td>miq’daq’áni</td>
<td>miyá’q’daq’áni</td>
<td>maq’daq’áni</td>
</tr>
</tbody>
</table>

Note that there are two terms for a spouse’s brother and sister, with apparently no semantic difference.

We can now examine the morphological processes involved in the creation of these kinship terms. The most pervasive generalization involves the prefixes for the second and third person forms, which are always the same:

(67)  
SECOND PERSON  mi-  
THIRD PERSON   miya-  
THIRD PERSON REFLEXIVE ma-

The prefix *miya-* has two special properties. First, it fails to undergo Syllable Extrametricality, while *mi-* and *ma-* both undergo it (as can be seen from the stress facts).

As each example with *miya-* shows, Iambic Lengthening and stress placement behave as though the initial syllable is visible:

362
(68) \[ (\ x\ ) \ast (\ x) \]
\[ (\cdot\ x)(\cdot) \ast (\cdot\ x)(\cdot) \]
\[ \text{mi yá· ki} \quad <\text{mi}> \text{ ya ki} \]

On the other hand, \textit{mi}- and \textit{ma}- are invisible:

(69) \[ (\ x) \ast (\ x) \]
\[ (\cdot\ x) \ast (\cdot\ x)(\cdot) \]
\[ <\text{mi}> \text{ đa dé} \quad \text{mi đa dé} \]

There are three ways of deriving this difference. The first is to add the prefixes at different levels: \textit{mi}- and \textit{ma}- before Syllable Extrametricality has turned off (level 1 or 2), and \textit{miya}- at a later level (e.g. 3) when it has turned off. This has the disadvantage of complicating the morphology by placing prefixes which belong to the same position class in different levels. The second analysis is to add all the suffixes in a level where Syllable Extrametricality has turned off, and mark \textit{mi}- and \textit{ma}- as underlyingly extrametrical morphemes. Otherwise, however, I have found no need for underlying extrametricality in Kashaya. The third possibility is to add all the prefixes in the same level, where Syllable Extrametricality is active, but mark \textit{miya}- as an exception to the rule. This is the historical explanation: while second-person \textit{*mi-} is unchanged in Kashaya, third-person \textit{*hamiya}- has undergo Aphesis (McLendon 1973), whence the failure to undergo Syllable Extrametricality. It appears that one kinship root is also an exception to Syllable Extrametricality, as illustrated by \textit{madámen}=‘my brother’s wife’:

(70) \[ (\ x\ ) \ast (\ x) \]
\[ (\cdot\ x)(\cdot) \ast (\cdot\ x) \]
\[ \text{ma tá· me} <\text{ni}> \quad <\text{ma}> \text{ ta mé} <\text{ni}> \]

Other first-person forms, which take no prefix, show normal application of Syllable Extrametricality, so this irregularity is a property of the root \textit{mata}- and not attributable to, say, a zero prefix in the first person. Given the need for this lexical marking of exceptionality in a root, I adopt the same solution for the prefix \textit{miya}- (see also §5.7.2).
The second special characteristic of *miya-* is that it seems to be the only prefix in the language which triggers the Decrement. In cases where the stem begins with a laryngeal increment — evident in the *mi-* and *ma-* forms — the increment is missing from the *miya-* form (shown here before Iambic Lengthening):

(71)  

<table>
<thead>
<tr>
<th>WITH INCREMENT</th>
<th>WITHOUT INCREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>mi-$^h_\text{he}$</td>
<td>miya-$^h_\text{he}$</td>
</tr>
<tr>
<td>mi-$^h_\text{ceye}$</td>
<td>miya-$^h_\text{ceye}$</td>
</tr>
<tr>
<td>mi-$^2_\text{daq}^\text{han}_i$</td>
<td>miya-$^2_\text{daq}^\text{han}_i$</td>
</tr>
</tbody>
</table>

It is not possible to say that the prefix is underlyingly *miya-* and the long vowel causes loss of the increment, since as shown in §6.4 we expect preservation of the increment and shortening of the vowel. The fact that the Decrement can be triggered by a prefix confirms that it is an independent rule triggered morphologically, and is not the result of some segmental trigger (§6.5).

In a few cases — ‘sister’s husband’, ‘spouse’s brother’, and ‘spouse’s sister’ — the prefix *ma-* occurs in the first person. It has the same phonological properties there, i.e. it undergoes Syllable Extrametricality.

There are two types of suffixes to be seen in the basic forms of the kinship terms. One set is common also to Kashaya names, and the choice of suffixes depends on the gender of the referent (Oswalt 1991):

(72)  

<table>
<thead>
<tr>
<th>MASCULINE</th>
<th>-$^n_\text{ki}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEMININE</td>
<td>-$^n_\text{men}$</td>
</tr>
<tr>
<td>EITHER</td>
<td>-$^n_\text{yac}$</td>
</tr>
</tbody>
</table>

The first two suffixes are derived from *$^n_\text{ki- en}_i$* and *$^n_\text{me- en}_i$*, i.e. they include the Nominative suffix and undergo the expected changes in other cases. See below for a discussion of *-yac*.

When the Nominative follows the suffix *$^n_*$ its vowel surfaces intact. This *$^n_*$ is the sole representative of the second type of kinship suffix, and is found only with members of this
semantic class. Notice that the first group of kinship terms, in (65), can be split into two smaller groups: three of them — 'father', 'mother', and 'older brother' — take the prefix ʔa- in the first person formal, and the rest take -s in all but the first person informal (which is also the only reduplicated form):

(73)  
ki'-ki-í       ʔa'-ki-í       mi-ki       miyá'-ki       ma-ki
perpé-í       ʔa'-pé-í       me-ʔe       miyá'-me       ma-ʔe
teré-í         ʔa'-téré-í     mi-híʔe       miyá'-téré       ma-híʔe

(74)  
barbá-í       ba'-bá-í       mi-bá-í       miyá'-ba-í       ma-bá-í
marmá-í       ma'-má-í       mi-má-í       miyá'-má-í       ma-má-í
mu'mú-í         mu'-mu-í       mi-mú-í       miyá'-mu-í       ma-mú-í
turú-í         cu'-turú-í     mi-cú-í       miyá'-cú-í       ma-cú-í
tarú-í         ca'-tarú-í     mi-cá-í       miyá'-cá-í       ma-cá-í
kar'ká-í         qa'-kar'ká-í mi-qá-í       miyá'-qa-í       ma-qá-í
šu'šú-í          šu'-šú-í     mi-šú-í       miyá'-šu-í       ma-šú-í

These two sets of words share two rules: they have CV Reduplication in the first person informal, and have Initial-Syllable Lengthening in both first persons. The first set takes ʔa- in the first person formal, while the second takes -s as mentioned above. The location of vowel length in the first person provides good evidence that Initial-Syllable Lengthening applies to the first syllable of a form, whatever morpheme that syllable may contain.

Consider several derivations with different combinations of rules:

(75)  
BASE ki-
REDUPLICATION ki-
SUFFIXATION ki-ki-í  (after Mora Elision)
LENGTHENING ki-ki-í

(76)  
BASE ki-
PREFIXATION ʔa-ki-
SUFFIXATION ʔa-ki-í  (after Mora Elision)
LENGTHENING ʔa-ki-í

(77)  
BASE ba-
 SUFFIXATION ba-š-
 SUFFIXATION ba-š-éñ
 LENGTHENING ba-š-éñ

365
Every stem which undergoes reduplication is underlyingly CV:

(78)  -pe-  ‘father’
     -ki-  ‘older brother’
     -ba-  ‘father’s father’
     -ma-  ‘father’s mother’
     -mu-  ‘father’s sister’
     -m'e-  ‘mother’
     -tu-  ‘mother’s brother’
     -ta-  ‘mother’s father’
     -ka-  ‘mother’s mother’
     -šu-  ‘mother’s older sister’

The existence of Initial-Syllable Lengthening allows us to keep these simple underlying representations, and derive the length subsequently. And although the prefix ʔa- always surfaces as long, that fact follows from its location in the first syllable of a first person kinship term.

Two of the words in (73), namely ‘father’ and ‘mother’, exhibit stem allomorphy in the second and third persons:

(79)  

<table>
<thead>
<tr>
<th></th>
<th>1st</th>
<th>2nd, 3rd refl</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘father’</td>
<td>pe</td>
<td>ʔe</td>
<td>me</td>
</tr>
<tr>
<td>‘mother’</td>
<td>m'e</td>
<td>hʔe</td>
<td>hʔe</td>
</tr>
</tbody>
</table>

Although the two allomorphs for ‘mother’, m'e and hʔe, are very similar, the difference in increment and place cannot be derived by independent rules. Three words from (74) also have limited allomorphy:

(80)  

<table>
<thead>
<tr>
<th></th>
<th>1st inf</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘mother’s brother’</td>
<td>tu</td>
<td>cu</td>
</tr>
<tr>
<td>‘mother’s father’</td>
<td>ta</td>
<td>ca</td>
</tr>
<tr>
<td>‘mother’s mother’</td>
<td>ka</td>
<td>qa</td>
</tr>
</tbody>
</table>

It is interesting to note in these cases that the consonants in the first-person informal stems in (80) can be considered simplifications of those in the other forms; historically this may be related to children’s pronunciations in a vocative context. Oswalt (1961:320) gives the
interjection ta‘ti ‘sit down!’ which is used only with children and suggests that it derives from the normal imperative cahi; this shows the same t/c correspondence we find for two of the words in (80). First-person t‘e for ‘mother’ in (79) is perhaps a similar simplification of h+t‘e.19

Among the words in (66), several have suppletive first person forms but fit the typical kinship pattern in other respects:

<table>
<thead>
<tr>
<th>(81)</th>
<th>2nd, 3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ‘friend’</td>
<td>isi</td>
</tr>
<tr>
<td>b. ‘husband’</td>
<td>t‘aikan</td>
</tr>
<tr>
<td>‘wife’</td>
<td>t‘amin</td>
</tr>
<tr>
<td>c. ‘brother, younger’</td>
<td>kuń</td>
</tr>
<tr>
<td>‘sister, younger’</td>
<td>somen</td>
</tr>
<tr>
<td>d. ‘son-in-law’</td>
<td>hiʔbayyaʔaʔ</td>
</tr>
<tr>
<td>‘mother-in-law’</td>
<td>ʔile-yaʔ</td>
</tr>
<tr>
<td>‘father-in-law’</td>
<td>ʔile-yaʔ</td>
</tr>
</tbody>
</table>

While there is a strong resemblance between the stems kat‘in and kań for ‘friend’, there is no other example of a t‘(i) morph and, as in the case of ‘mother’, the similarity cannot be captured by rule. Since ‘husband’ and ‘wife’ differ only in the gender-based selection of the suffix in the first person, the stems actually mean ‘spouse’. Similarly, the stem ści should be defined as ‘younger sibling’, with more specific terms available in the first person only. The ‘in-law’ terms in (d) actually consist of hiʔbaya ‘man’ and ʔile ‘old’ plus an honorific use of the suffix -yac (with Word-Final Debuccalization). They fail to take the Nominative -n in the first person because -yac has special case-marking properties (Subjective -yac, Objective -yacol).

Finally, there is a small set of kinship terms with stems of the shape CVki where the first vowel alternates between short in some contexts and long, but also nonhigh, in others:

---

19 To say this suggests that the unmarked coronal articulation for Kashaya (alveolar, or apical) is not the unmarked coronal articulation for children (dental, or laminal).
(82)  
<table>
<thead>
<tr>
<th>'son'</th>
<th>1st, 3rd</th>
<th>2nd, 3rd refl</th>
</tr>
</thead>
<tbody>
<tr>
<td>p'aki</td>
<td>p'aki</td>
<td></td>
</tr>
<tr>
<td>'father's younger brother'</td>
<td>ciki</td>
<td>c'eki</td>
</tr>
<tr>
<td>'mother's younger sister'</td>
<td>siki</td>
<td>s'eki</td>
</tr>
<tr>
<td>'sister, older'</td>
<td>diki</td>
<td>d'eki</td>
</tr>
</tbody>
</table>

When the vowel in the short stem is /i/, it is /e/ in the long stem; assuming a morphologically triggered rule which inserts [-high], the low vowel /a/ is naturally unaffected. While it is true that the stem with a long vowel is found with the monosyllabic prefixes *mi*- and *ma*- , the length cannot be the result of their being exceptionally visible in these cases, since the stress (which would fall on the first syllable of the next word) indicates that the prefixes are extrametrical as expected; also, other roots fail to show this length alternation. In other examples showing lengthening, as in (73) and (74), it occurs only in the first person; here lengthening is seen in other forms instead. We can generate the alternation by the same rule of Initial-Syllable Lengthening if with these four roots it is morphologically triggered before prefixation of *mi*- and *ma*- (but after *2a*- , as necessary for (73)). Since Initial-Syllable Lengthening does not appear to respect extrametricality, even though it looks for the edge of the domain, it must apply in level 1, or level 2 ordered before Syllable Extrametricality. We can tentatively propose that *2a*- is added in level 1, where CV Reduplication also applies (both markers of first person here), and Initial-Syllable Lengthening is triggered in the same level. Since syllables are not available in level 1, we can formulate the rule as insertion of a mora after the first mora in the word:

(83)  

Initial-Syllable Lengthening

\[
\emptyset \rightarrow \mu / \left [ \mu \_ \right ]
\]

This is the same rule triggered by certain templates as discussed in §8.1. The prefixes *mi*- , *ma*- , and *miya*- are added in level 2, so that *mi*- and *ma*- are included in the base which undergoes Syllable Extrametricality (while *miya*- is an exception to the rule).
Chapter 9
Conclusions

This study has considered a wide range of phenomena in Kashaya from the perspective of modern formal theories of phonology and morphology. As the first analysis of the language in these terms, it has inevitably left some issues unresolved. But all the important patterns in the language have been examined, and there are a number of conclusions that we can draw from the results presented in the preceding chapters.

The advantages of including complex sonorants in the underlying segment inventory support the idea that features, not phonemes, are the basic elements of phonology (§2.3). In general the formulation of rules is consistent with Radical Underspecification, but there is little specific benefit in such an approach here, except in capturing the special behavior of the default vowel /i/ (§3.3.1, §3.5.1). Several facts could be interpreted as evidence for more fully specified representations: the explicit need for specification of Coronal in the lexical derivation (§3.2.1, §3.4.2); for Place in underlying representations (§3.4.1); and for the unmarked value of [back] in at least one rule (§3.5.1). The insights of feature geometry are important in many areas, but particularly in place assimilation (§3.3.2), place dissimilation (§3.2.1), and blocking of vowel harmony (§3.4.1). While constraints can capture some generalizations about rules and rule triggers, it seems impossible to recast the complexities of the entire phonology into a coherent system of constraints, calling into question the ultimate usefulness of this approach (§4.4).

One of the most striking things about Kashaya is the nature of its stress. The analysis that I have proposed to account for the data has two main implications. First, extrametricality assigned early in the lexicon can persist to the postlexical component
(§5.2). Second, peripherality should be defined hierarchically, to permit a limited type of cumulative extrametricality (§5.6). Other implications for invisibility are its relevance to nonmetrical phenomena that target a constituent at the domain edge — including elision (§6.6), morphological deletion of a segment (§6.5), and rules of allomorphy (§7.2) — or look at the span of a domain, as in Deforestation (§5.5) and a minimal word constraint (§5.7.1). Rules which make no reference to a domain span or edge seem to ignore invisibility (§5.5.4, §6.3.4). The rule of Foot Flipping, in correcting deviations from the canonical iamb, supports the central role of the foot in metrical phonology (§5.5.4).

Kashaya also gives evidence about the nature of the smaller prosodic constituents. While final consonants can be extraprosodic, this applies only to those which follow vowels, suggesting that its primary function is to express the indeterminacy of future syllabification (§6.3). The possibility of moraic licensing is supported by several phenomena, including laryngeal increments (§6.4) and closed-syllable shortening (§6.2). Further, prespecified linking to moras can be exploited as a principled means of encoding exceptionality in syllable structure, thereby avoiding arbitrary diacritics (§6.1.3, §6.3.2, §6.4.3, §6.7). There are also counterexamples to standard approaches to geminate inalterability (§2.3.3, §3.5.1).

The complicated morphological system of Kashaya is easier to understand in a framework that captures level ordering. Several major divisions can be seen in the lexical derivation, with clear diagnostics such as inclusion in the base to which extrametricality is assigned (§5.2.1) or participation in certain metrical rules (§5.5.1). The (non)application of other phonological rules gives evidence for further divisions (§3.3.6, §3.5.2). The need to restrict some of these rules so that they do not apply in earlier levels casts doubt on a strict interpretation of the Strong Domain Hypothesis (§7.3). Isolated patterns suggest a role for templatic morphology even in a language which is almost entirely concatenating (§8.1). Morphologically triggered rules interact in interesting ways with the phonology, including an apparent need for rules which apply to the stem before the triggering affix is
added (§6.5, §6.8). The similarities between complex morphological derivations can be captured by decomposing them into smaller rules, some of which are shared among different patterns (§8.1, §8.6).
References


374


Hayes, Bruce. 1991b. Weight of CVC can be Determined by Context. Paper presented at the Arizona Phonology Conference, University of Arizona, April 5-6.


378


380


383


Steriade, Donca. 1991a. Solution to Palestinian Arabic Stress. Class handout, University of California, Los Angeles.


Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BiLS</td>
<td>Proceedings of the Berkeley Linguistics Society</td>
</tr>
<tr>
<td>CLS</td>
<td>Papers from the Annual Meeting of the Chicago Linguistics Society</td>
</tr>
<tr>
<td>NELS</td>
<td>Proceedings of the Annual Meeting of the North Eastern Linguistics Society</td>
</tr>
<tr>
<td>WCCFL</td>
<td>Proceedings of the West Coast Conference on Formal Linguistics</td>
</tr>
</tbody>
</table>
Appendix

List of Verb Suffixes

Most of the derivations in the preceding chapters do not include morpheme-by-morpheme glosses, so the following list of affixes is provided for readers who wish to understand the make-up of particular verbs. No description of allomorphic conditions is given here, since that information can be found in chapter 7. After the gloss I indicate the lexical level where the affix is added. Since morphologically complex nouns rarely figure in unglossed examples, and noun affixes are more difficult to place in particular levels, they are not included in this list. Suffixes in this list which trigger the Decrement (§6.5) are the vowel-initial Directionals and many of the Plural Acts; the latter also trigger Morphological Shortening (§6.8).

-ahmuč Portmanteau: Plural Agent, 'along', Distributive [level 3]
-ala Directional: 'down', Inchoative [level 3]
-aloq* Directional: 'up here' [level 3]
-anì Directional: 'along, here' [level 3]
-anì Durative [level 3]
-anì-ic Directional: 'afar, away to a distance' [level 3]
-anìanì) Locomotory [level 3]
-aq Directional: 'out from here, north or west from here' [level 3]
-aq Plural Act [level 3]
-aqac Directional: 'up from here' [level 3]
-aq* Directional: 'out here, north or west to here' [level 3]
-at Plural Act [level 3]
-ataq Plural Act [level 3]
-ay Directional: 'against' [level 3]
-aì Factual Evidential [level 5]
-c Sernelfactive [level 2]
-c Terrestrial [level 2]
-cciè Retractive [level 2]
-ciì Directional: [level 3]
-c Reflexive [level 3]
-cù Adverbializer: same subject future sequential [level 5]
-cùla Adverbializer: different subject future sequential [level 5]
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Level</th>
</tr>
</thead>
<tbody>
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<td>Explanatory</td>
<td>5</td>
</tr>
<tr>
<td>-el</td>
<td>Objective</td>
<td>5</td>
</tr>
<tr>
<td>-ela</td>
<td>Performative</td>
<td>5</td>
</tr>
<tr>
<td>-em</td>
<td>Adverbializer: different subject simultaneous</td>
<td>5</td>
</tr>
<tr>
<td>-em</td>
<td>Responsive</td>
<td>5</td>
</tr>
<tr>
<td>-em(u)</td>
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<tr>
<td>-eri</td>
<td>Durative</td>
<td>3</td>
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<tr>
<td>-eti</td>
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<td>5</td>
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<td>Semelfactive</td>
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</tr>
<tr>
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<td>Adverbializer: same subject future sequential</td>
<td>5</td>
</tr>
<tr>
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</tr>
<tr>
<td>-hq’a</td>
<td>Causative</td>
<td>3</td>
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<tr>
<td>-ht</td>
<td>Plural Movement</td>
<td>2</td>
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<td>-i (=?)</td>
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<td>Absolutive</td>
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<td>3</td>
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<tr>
<td>-i-ic</td>
<td>Directional: ‘up, away’, Inchoative</td>
<td>3</td>
</tr>
<tr>
<td>-iyi-ć</td>
<td>Reflexive</td>
<td>3</td>
</tr>
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<tr>
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<td>Plural Act</td>
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</tr>
<tr>
<td>-mac</td>
<td>Directional: ‘in from here, south or east from here’</td>
<td>3</td>
</tr>
<tr>
<td>-man</td>
<td>Directional: ‘in enclosed or defined place’</td>
<td>3</td>
</tr>
<tr>
<td>-man-ć</td>
<td>Directional: ‘arrive, as far as’</td>
<td>3</td>
</tr>
<tr>
<td>-maq*</td>
<td>Directional: ‘in here, south or east to here’</td>
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<tr>
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<td>General Intentive</td>
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<tr>
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