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THE LEXICAL PHONOLOGY OF SEKANI

University of California, Los Angeles

Ph.D. 1985

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Los Angeles

The Lexical Phonology of Sekani

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Linguistics

by

Sharon Louise Hargus

1985
The dissertation of Sharon Louise Hargus is approved.

Bruce Hayes
Paul Kroskrity
Pamela Munro
Keren Rice
Alan Timberlake
William O. Bright, Committee Chair

University of California, Los Angeles
1985
In memory of my sister

ROBIN LYNN GOODMAN

1956-1983
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* Guy Lanoue generously allowed me to reproduce these two maps from his dissertation (Lanoue 1983).
** This map was provided to me by Jim Kari.
List of Abbreviations

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"The Default Rule Domain in Lexical Phonology." [Paper presented at LSA meeting, Baltimore, MD.]

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1983

ABSTRACT OF THE DISSERTATION

The Lexical Phonology of Sekani

by

Sharon Louise Hargus

Doctor of Philosophy in Linguistics
University of California, Los Angeles, 1985
Professor William O. Bright, Chair

This dissertation is a study of the phonology of Sekani, a northern Athabaskan language, within the framework of Lexical Phonology.

Chapters 1 and 2 provide introductory information about the Sekani language and the theory of Lexical Phonology, respectively. Chapters 3 and 4, and to some extent 6, form the descriptive core of this dissertation. In Chapter 3, I provide a level-ordered analysis of the verb prefixes and in Chapter 4, nominals and postpositions. The data discussed in these chapters provide strong support for the Lexical Phonology model. Derivations in which a phonological rule must apply before a word formation indicate that at least some phonological rules must apply in the lexicon. Chapter 4 also provides evidence for

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the loop.

Chapters 5-8 are oriented towards issues in Lexical Phonology. In Chapters 5 and 6, I argue that exceptions to the Bracketing Erasure Convention must be allowed. Several rules of the phonology which apply on level 3 or later refer to the left or right edges of the level 1 domain. I propose a weaker, Exceptionable version of the Bracketing Erasure Convention, in which exceptions to Bracketing Erasure are marked with labelled brackets. Only unlabelled brackets are erased level-finally. Sekani provides evidence for the segmental cycle, as well as evidence that cyclic and non-cyclic rules form two separate blocks. In Chapter 7 I present evidence that levels 1-2 are cyclic, and that level 4 and the post-lexical level are non-cyclic.

Several of the analyses proposed here are quite abstract. The Sekani rules of Diphthongization, Nasalization, a Raising and Glottal Stop Absorption pose a problem for the Strict Cycle Condition. In Ch. 8, I discuss possible resolutions of the problem, focussing on the rules of a Raising and Diphthongization. I conclude that structure-building rules must be allowed to create a derived environment for later phonological rules to apply in.

I have provided an appendix of the phonological rules discussed in this dissertation.
Chapter One

Sekani

1. Introduction

Sekani is an Athabaskan language. Together with Eyak, the Athabaskan languages form one branch of the Na-Dene family of languages (Krauss and Golla 1981):

\[
\begin{array}{c}
\text{Na-Dene} \\
\text{Tlingit} & \text{Athabaskan-Eyak} \\
\text{Eyak} & \text{Athabaskan}
\end{array}
\]

Sekani is spoken in the northern central interior of British Columbia, Canada. The territory of the Sekani-speaking peoples includes what were originally the Finlay and Parsnip River drainages of the Rocky Mountain Trench.\(^1\) See Maps 1 and 2.\(^2\)

Sekani is spoken in three communities: Ft. Ware, Ingenika, and McLeod Lake. Some lexical and phonological differences between the Sekani that is spoken in these communities are known.\(^3\) However, a more systematic study of the language spoken in these three sites is required before it is possible to speak of Sekani dialects in any but a geographical sense.

2. The position of Sekani within Athabaskan

Map 3 shows the location of Sekani with respect to neighboring Athabaskan languages.\(^4\)

There is abundant linguistic and historical evidence that
Map 2. (Lanoue 1983)
Sekani is most closely related to Beaver within the Athabaskan family. The impression of McLeod Lake Sekani speakers is that Beaver people speak "our language" or "the same language", whereas equally nearby Carrier is not at all mutually intelligible. Daniel Harmon, an explorer of this area in the early nineteenth century, suggested that the Sekanis:

"are a small part of a tribe who, but a few years since, came from the east side of the Rocky Mountains...The people who are now called Si-can-nies, I suspect at no distant period, belonged to the tribe called Beaver Indians" (Harmon (1957:130, 256)).

Records from the period of the earliest white-Sekani contacts indicate that Sekani people were forced west of the Rocky Mountains by Beaver and Cree Indians, who obtained firearms before the Sekanis did.

Although it is clear that Sekani and Beaver form a sub-grouping within Athabaskan, it is less clear which other languages are closely related to Sekani-Beaver. Jenness (1937) suggested that Sekani belongs to the "Beaver-Sarcee-Sekani branch" of the Athabaskan family. According to Denniston (1981:433), "northern Sekani could be called Kaska". Such statements are, of course, conjectural. As mentioned above, Sekani dialectology is poorly understood. I hope that one contribution of this dissertation will be to provide the beginnings of a better understanding of how McLeod Lake Sekani is related to other Athabaskan languages.

3. Previous studies of Sekani

Very little linguistic research on Sekani has been done,
despite the relative geographic accessibility of at least the McLeod Lake community.

A list of manuscripts which contain Sekani vocabulary can be found in Parr (1974) and in Helm and Kurtz (1984). Most of these manuscripts date from the nineteenth and early twentieth centuries. Some anthropological studies of the Sekanis contain lists of Sekani kinship terms; e.g., Jenness (1937), Honigman (1954), and Lanoue (1983).

In 1939, Robert Young and J.P. Harrington collected data from a Sekani woman, Makrit Dominique, at Ft. St. James, B.C. Since the Sekani woman spoke Carrier and Sekani but no English, the interview was conducted through Carrier by means of a Carrier-English bilingual. The resulting word list, Young (1939), has been regarded by most Athabaskan linguists as the most accurate source of Sekani data. However, perhaps as a result of the trilingual elicitation session, a few of the lexical items on this list more closely resemble Carrier than they do current McLeod Lake Sekani. Consider the following two forms: (In the following chart, phonetic forms are given in brackets, with the orthographic representations from which these phonetic forms have been interpreted given below the brackets.)

<table>
<thead>
<tr>
<th>Hargus fieldnotes</th>
<th>Young (1939)</th>
<th>Carrier dictionary</th>
</tr>
</thead>
<tbody>
<tr>
<td>'star' [sən]</td>
<td>[ŝUm]</td>
<td>[səm]</td>
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<tr>
<td></td>
<td>sUm</td>
<td>sum</td>
</tr>
<tr>
<td>'one (person)' [ɁɁ]</td>
<td>[ɁɁ̱On]</td>
<td>[ʔɁɁ̱On]</td>
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<tr>
<td></td>
<td>LiOn</td>
<td>'ilhoghun</td>
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</tbody>
</table>
Despite its superiority over previous materials, this list may have resulted in the attribution to Sekani of certain Carrier characteristics. For example, Thompson (1978) lists the human singular relative clause/nominalizing suffix in Sekani as -Un, rather than -x (cf. Young's Li'xun 'one (person)'). Similarly, Krauss and Leer (1981:67) group Sekani with Babine and Carrier as showing a rare reflex of Proto-Athabaskan *m as [m] in 'star'.

In the early 1960's, David and Kay Wilkinson of the Summer Institute of Linguistics did fieldwork on Sekani in McLeod Lake and Ft. Ware. Their work resulted in an unpublished phonemic analysis (Wilkinson and Wilkinson 1965) of the McLeod Lake dialect. A practical orthography and reader (Wilkinson and Wilkinson 1969a) and a book of bible stories (Wilkinson and Wilkinson 1969b) were developed for the Ft. Ware dialect. Despite their important work, however, certain aspects of Sekani have remained a mystery to the Athabaskan linguistic community. For example, Krauss and Golla (1981:72) note that the development of the PA vowels in Sekani is unclear, "due to fragmentary data".

4. The present study

The fieldwork on which the present study of Sekani is based was conducted at McLeod Lake during 1982-84. Although I refer throughout this dissertation to "the Sekani language", it should be understood that my remarks are claimed to be true only of the language which is spoken in McLeod Lake.
At McLeod Lake there are about fourteen fluent native
speakers of Sekani, ranging in age from approximately 45 to 75
years of age. (Many younger Sekani people understand spoken
Sekani but do not speak it fluently.) In this study I worked
with eleven of the fourteen speakers at one time or other.
However, more frequently I worked with one of three particular
speakers. (See Acknowledgements.)

Most of the data in this study are forms which were eli-
cited through translation of English to Sekani. All forms have
been checked with more than one speaker.⁸

5. Surface segments

A phonetic inventory of the consonantal segments of Sekani
is given in (2):

(2) **Consonants**

<table>
<thead>
<tr>
<th>Obstruents:</th>
<th>lab</th>
<th>alv</th>
<th>alv</th>
<th>alv</th>
<th>pal*</th>
<th>vel</th>
<th>lab-</th>
<th>glot</th>
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<td>voiceless unasp</td>
<td>p</td>
<td>t</td>
<td>ts</td>
<td>tʃ</td>
<td>tʃʰ</td>
<td>k</td>
<td>kw</td>
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<tr>
<td>voiceless asp</td>
<td>ph</td>
<td>tʰ</td>
<td>tʃʰ</td>
<td>tʃʰ</td>
<td>tʃʰ</td>
<td>kʰ</td>
<td>kʰ</td>
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<tr>
<td>ejective</td>
<td>ɾ'</td>
<td>t'</td>
<td>ts'</td>
<td>tʃ'</td>
<td>tʃ'</td>
<td>k'</td>
<td>kw'</td>
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<tr>
<td>voiceless</td>
<td>ɾ</td>
<td>s</td>
<td>l</td>
<td>ɹ</td>
<td>ʃ</td>
<td>ʃ</td>
<td></td>
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<tr>
<td>voiced</td>
<td>w</td>
<td>z</td>
<td>l</td>
<td>j</td>
<td>ɣ</td>
<td></td>
<td></td>
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<tr>
<td>sonorants:</td>
<td>m</td>
<td>n</td>
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<td>?</td>
<td>h</td>
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</tr>
</tbody>
</table>

* [ɻ] and [ʃ] are true palatals; [tʃ tʃʰ tʃʰ'] are palato-alveolar.
[pʰ] is found only in loan words.

The segment [l] is not a fricative, phonetically, as is [I]. However, the fact that [l] ~ [I] alternations exist, just as do [s] ~ [z], [ç] ~ [ʃ] etc., indicates that [l] is to be regarded as a fricative phonologically. See Continuant Voicing (Ch. 4, 4.3); Voicing Assimilation (Ch. 3, 3.2.1).

The segments [w w] lack an audible velar component. However, quite apart from pattern congruity, these segments are clearly to be regarded as labio-velar, rather than labial, segments. Several rules of the phonology (w Vocalization and Diphthongization, discussed in Ch. 3, and Nasal Assimilation, discussed in Hargus (to appear)) treat these segments as underlyingly labio-velar.

An inventory of the vowels is given in (3):

(3) oral:  nasal:

i     u     ĩ    ū

ė     o     ė    ō

ā

[ǣ] is an abstraction away from the phones [i æ myśl]. There is conditioned and sometimes free variation between these phones (see Hargus (to appear)).

All Sekani vowels have one of two pitches:

(4) Tones

high: ' low:`

There are several differences between the underlying and surface inventories of segments and tones, as will become clear
in subsequent chapters of this dissertation. For now, I will only list what I believe to be the inventory of underlying segments:

(5) **Underlying segments**

consonants:

\[
\begin{array}{cccccccc}
\text{p} & \text{th} & \text{ts} & \text{t} & \text{t} & \text{k} & \text{kwh} \\
\text{ph} & \text{t'h} & \text{ts'h} & \text{t'h} & \text{k'h} \\
\text{t}' & \text{ts'} & \text{t'j} & \text{t'j'} & \text{k'} \\
\text{s} & \text{l} & \text{c} & \text{x} & \\
\text{z} & \text{l} & \text{j} & \text{?} \\
\text{m} & \text{n} & \text{h} \\
\end{array}
\]

vowels:

\[
\begin{array}{ccc}
\text{i} & \text{u} \\
\text{e} & \text{a} & \text{o} \\
\end{array}
\]

6. Phonological representations

6.1 Ejectives, affricates and labio-velars

The ejective, affricate and labio-velars consonants are clearly single segments phonologically, rather than sequences of segments. Consider the following contrasts between true sequences and these complex segments:

(6) $\text{VC.PV vs. V.C'V}$

(a) $\text{kát .zálè} \quad \text{'spruce branch'}$

(b) $\text{ḿ.t'álè} \quad \text{'his, her zyphoid process'}$

(7) $\text{VC.ZV vs. V.CzV}$

(a) $\text{kát.záázlì} \quad \text{'prototypical spruce'}$

(b) $\text{ḿ.tsátè} \quad \text{'his, her lower leg'}$
(Syllable-initially, there is no contrast between \[s\ z\] / t\_.)  
(8) C.kuV vs. C.kwV  
(a) ʔs.s.k'āā  'roe'  
(b) tāghōs.kw'āt\[l\]  'I will stab [O]'  

Having established that labio-velars, ejectives and affricates are complex segments, the question then arises of how best to represent them phonologically. I adopt without further comment an autosegmental representation of syllabic, such as that defended in Clements and Keyser (1983), Steriade (1982), etc.\(^9\) Thus, the ejectives and affricates may be represented as in (9):

(9)  
\[\text{C} \quad \begin{array}{c} t \quad s \end{array} \quad \text{C} \quad \begin{array}{c} t \quad ? \end{array} \quad \text{etc.}\]

In fact, these kinds of representations are well motivated by the phonology of Sekani. In Ch. 3, 3.2.2 I discuss the D-Effect Rule. While this rule is cumbersome to state using SPE notation, it is easily expressed using CV representations of the complex segments:

(10) The D-Effect Rule

\[
\begin{array}{c}
\text{C} \\
\text{t} +\text{cont} \\
\text{C} \\
\text{t} -\text{son} \\
\end{array}
\]

This rule clearly requires a representation of the ejectives and affricates in which the stop and fricative or glottal segment may be represented as sequences at one level of representation,
as in (9).

I leave open the question of how best to represent the ejective affricates [ts' tʃ' tʃ']. However, one plausible representation is that given in (11):

\[(11) \quad \overset{C}{\text{t}} \quad ? \quad \overset{s}{\text{s}}\]

Most labio-velars are created by the rule of Diphthongization, stated informally in (12):

\[(12) \quad \text{velar} + \circ \quad \rightarrow \quad \text{labio-velar} + \varepsilon\]

One might represent the labio-velar which results from Diphthongization as in (13):

\[(13) \quad \overset{C}{\text{k}} \quad [\text{+round}]\]

However, other rules of the phonology (the D-Effect Rule and w Vocalization) require the representation in (14):

\[(14) \quad \overset{C}{\text{k}} \quad [\text{+round}]\]

Thus I suggest that labio-velars are represented as in (14).

The rule of Diphthongization itself should be formulated as in (15):

\[(15) \quad \overset{C}{\text{k}} \quad [\text{+round}]\]

6.2 Nasal vowels

An autosegmental treatment of the nasal vowels is well-
motivated for Sekani. Nasality survives vowel loss, as indicated by rules like Suffix Vowel Deletion (Ch. 5, 3.4) and Devocalization (Ch. 3, 7.2). Such rules indicate that nasal vowels should be represented as in (16):

(16) 

\[
\begin{array}{c}
\text{V} \\
\text{[+nasal]}
\end{array}
\]

Nasal vowels in Sekani are generally in complementary distribution with syllable-final [Vn] sequences. Alternations provide further evidence that nasal vowels are to be derived from /Vn/ sequences (see Chs. 4, 7, 8 and Hargus (to appear)) by the rule of Nasalization, informally stated in (17):

(17) 

\[ Vn \rightarrow \vec{V} / \_\_\_\_\_ (C) \] syll

An autosegmental formulation of this rule will simultaneously account for the absence of the syllable-final nasal consonant and the appearance of nasality on the vowel:

(18) 

\[
\begin{array}{c}
\text{6} \\
\text{V} \\
\text{C} \\
\text{[+nasal]}
\end{array}
\]

6.3 Distinctive features

In tables 1 and 2 I provide a distinctive feature analysis of the (non-complex) segments of Sekani. I have omitted the affricates, ejectives and labio-velars from the table of consonants, and the nasal vowels from the table of vowels, because as I have suggested above, these are best regarded as combinations
of feature matrices.

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<th>i</th>
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Table 1. Distinctive features of the vowels.\textsuperscript{12}
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</tbody>
</table>

Table 2. Distinctive features of the consonants.
The redundancy rule in (19) holds of all Sekani vowels:

\[(19) \quad [+\text{syll}] \rightarrow \begin{cases} +\text{cons} \\ +\text{son} \\ +\text{cont} \end{cases}\]

The redundancy rule in (20) holds of all Sekani consonants:

\[(20) \quad [-\text{syll}] \rightarrow [+\text{cons}]\]

To account for the phonetic form of the labio-velar fricatives \( [\text{w} \ w] \), I posit the rule in (21):

\[(21) \quad \text{Velar Loss} \]

\[
\begin{cases} +\text{cont} \\ +\text{round} \end{cases} \rightarrow \begin{cases} -\text{high} \\ -\text{back} \\ -\text{round} \\ +\text{ant} \end{cases}\]

7. Orthographic conventions

For typographical convenience, I will represent some of the segments of Sekani in a slightly modified way in the remainder of this dissertation. The orthographic representations of the consonants are given in (22):

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

\[
\begin{array}{cccccccc}
\text{b} & \text{d} & \text{dz} & \text{dl} & \text{j} & \text{g} & \text{gw} \\
\text{p} & \text{t} & \text{ts} & \text{tl} & \text{ch} & \text{k} & \text{kw} \\
\text{t}' & \text{ts}' & \text{tl}' & \text{ch}' & \text{k}' & \text{kw}' \\
\text{s} & \text{l} & \text{sh} & \text{x} & \text{wh} \\
\text{z} & \text{l} & \text{y} & \text{gh} & \text{w} \\
\text{m} & \text{n} & \text{?} & \text{h} \\
\end{array}
\]

As is customary in practical orthographies of Athabaskan languages, I have represented the voiceless unaspirated stops with the symbols for voiced stops, and the voiceless aspirated stops with the symbols for voiceless unaspirated stops. Sylla-
ble-finally, there is no three-way contrast between the voiceless unaspirated, voiceless aspirated, and ejective stops and affricates, as there is syllable-initially. Instead, only voiceless unaspirated stops and affricates [t ts tl tʃ k] occur. As these are phonetically voiceless unaspirated, I use the voiceless unaspirated phonetic symbols for the syllable-final stops and affricates:  t ts tl ch k.\textsuperscript{13} This is summarized in (23):

(23) \begin{tabular}{ll}
phonetic & orthographic \\
\hline
syllable-initially & t  \\
& th  \\
& d  \\
& t  \\

syllable-finally & t  \\
& t  \\
\end{tabular}

This results in purely orthographic alterations such as those in (24) and (25):

(24a) bät 'mittens'
(24b) səbədə 'my mittens'

(25a) chok 'frog'
(25b) chogəzi 'small frog'

All of the underlined segments are phonetically voiceless unaspirated.

Orthographic conventions for the vowels, tones, and vowel sequences are given in (26) and (27):
(26) **Vowels**

oral: \( i \) \( u \) \( i \) \( ü \)  
      \( e \) \( ø \) \( ø \) \( ö \)  
      \( a \) \( ä \)

(27) **Tones and vowel sequences**

\( V \) = high tone vowel  
\( \dot{V} \) = low tone vowel  
\( VW \) = vowel sequence  
\( \dot{W} \) = rising tone vowel sequence  
\( \ddot{W} \) = falling tone vowel sequence

Notes.

1. In 1968 the construction of W.A.C. Bennett dam at Hudson Hope, B.C., was completed. This dam caused sections of the Peace, Parsnip, and Finlay Rivers to flood, creating Williston Lake.

2. These maps are from Lanoue (1983). I am grateful to Guy Lanoue for allowing me to reproduce them.

3. For example, the rule of Palatalization exists in Ingenika and McLeod Lake Sekani but not in Ft. Ware (Krauss and Golla 1981). The rule of Schwa Lowering characterizes McLeod Lake but not Ingenika or Ft. Ware (Ray Izony, p.c.).

4. Map 3 was provided by Jim Kari.

5. During a brief visit to Ft. Ware in August 1982, I met many people who described themselves as Kaska rather than Sekani speakers. This can only mean that some sort of Kaska influence—linguistic, cultural, or both—exists in Ft. Ware.

6. I recognize that tremendous linguistic diversity exists within and between Athabaskan speech communities, and that some of the discrepancies between Young's and my data may be due to this sort of variation. However, Makrit Dominique was reported to be from McLeod Lake (Mills 1981).

7. The Carrier dictionary can be found in the References under
Carrier Linguistic Committee (1974). I assume that any vowel which is unmarked for tone in this dictionary has phonetic low tone.

8. My reliance on non-textual utterances might be a serious limitation in a syntactic or semantic study of Sekani. However, my primary concern in this study has been to account for phonological regularities within the lexicon, not to describe the pragmatic or semantic factors which govern the choice of one variant form over another.

9. I have adopted here a CV approach to the skeletal tier, largely for expository purposes. I recognize that a featureless skeleton has also been proposed (Levin 1983, Lowenstamm and Kaye 1983). Sekani does not provide evidence for one skeletal representation over another.

10. Some version of the D-Effect Rule is found in most Athabaskan languages. Stanley (1969), in his analysis of Navajo phonology, suggested that some sort of nonlinear formulation of this rule would be intuitively more satisfactory than his linear version.

11. Like tone, the nasal autosegment does not automatically spread to neighboring segments, thus providing evidence that the spreading of autosegments is not universal, as has been suggested by Pulleyblank (1983) and by Rice (1984).

12. In Ch. 8, 4.2 I will introduce an additional vocalic feature [tense].

13. In practice, this will be less confusing than it may seem now.

Representing the syllable-final stops and affricates with the symbols for the voiceless unaspirated phonetic symbols is traditional in Athabaskan practical orthographies, probably because of the influence of English phonetics and orthography.
Chapter Two

Lexical Phonology

In this chapter I provide a summary of evidence for the main features of the Lexical Phonology model. Some aspects of the model are quite controversial, as will be seen. Since this short discussion does not do justice to the complexity of the model, I hope that interested readers who are unfamiliar with Lexical Phonology will consult the sources mentioned throughout this chapter for further discussion.

1. Overview

For many years, the model of grammar proposed by Chomsky and Halle (1968) in the Sound Pattern of English (hereafter SPE) was widely assumed. This model is schematically represented in (1).

(1)

```
syntax \downarrow\downarrow
[properly bracketed surface structures]
readjustment rules
phonology
[phonetic representations]
```
In this model, the phonological rule component follows the lexicon and the syntax. Phonological rules do not apply until word formation is complete and fully formed words have been inserted into syntactic structures.

An alternative model of the organization of phonology and the lexicon has been proposed by Pesetsky (1979), by Booij (1981) and by Strauss (1982). Subsequent research on this model has resulted in the more or less standard Lexical Phonology model given in (2).

(2)

\[
\begin{array}{c}
\text{dictionary} \\
\text{lexicon (WFR's)} \\
\text{syntax} \\
\end{array} 
\rightarrow \ 
\begin{array}{c}
\text{phonology} \\
\text{[phonetic representations]} \\
\end{array}
\]

The major difference between the Lexical Phonology and SPE models thus concerns the location of the phonological rule component. In Lexical Phonology, a subset of the phonological rules apply in the lexicon after each operation of the morphological or word formation rules (WFR's) of the language. These are called "lexical" rules, as opposed to the "post-lexical" phonological rules, which apply in the syntax.
Lexical and post-lexical rules are predicted to differ in a number of ways (Kiparsky 1983b). One of the most important differences between the two types of rules concerns restrictions on the domains of the rules. Lexical rules are typically "boundary-sensitive" phonological processes, whereas post-lexical rules are not sensitive to word-internal structure and apply "across the board". Lexical and post-lexical rules do not necessarily form disjoint sets. As discussed by Kiparsky (1983a), the same rule may apply in both the lexicon and the syntax. However, the inputs to the rule may differ in the two components because the components are governed by different principles, some of which will be discussed below.

The Lexical Phonology model is a less constrained model than the SPE model: phonological rules are allowed to apply in two places in the Lexical Phonology model. It is obvious that some phonological rules must apply to forms in a syntactic context. The structural descriptions of sandhi rules and rules which apply within specific syntactic domains crucially refer to syntactic information. It is less obvious that phonological rules must apply in the lexicon, and thus that the extra power of the Lexical Phonology model is required. I now turn to the evidence which indicates that this is so.

2. "Lexical" phonology

A number of cases in which phonological rules must apply before word formation rules have appeared in the generative
phonological literature. Such cases are obviously problematic
for the SPE model, and were not satisfactorily resolved prior to
the introduction of the Lexical Phonology model. Three such
cases will be discussed in some detail in this section.

2.1 English -al nominalization

Ross (1972:264) drew attention to an interesting property
of the English nominalizing suffix -al which attaches to verbs.
Consider the list of verbs and derived nominals in (3):

(3) dismiss  dismissal  recite  recital
    disavow  disavowal  refuse  refusal
    arrive  arrival  reverse  reversal
    acquit  acquittal  rehearse  rehearsal
    transmit  transmittal  betrothe  betrothal
    transfer  transferral  betray  betrayal
    defer  deferral  bury  burial
    refer  referral  rent  rental
    rebut  rebuttal  confer  conferral
    try  trial  deny  denial

-al can only attach to verbs with stress on their final syl-
lables. Compare the following:

(4) fidget  *fidgetal
    promise  *promissal
    abandon  *abandonal
    develop  *developal

No verbs which lack final stress will accept -al.

However, not all verbs with final stress will accept-al.

Consider the examples in (5):

(5) accept  *acceptal
    resist  *resistal
    convince  *convinceal

Ross suggested that the verbs to which -al may attach must meet
the structural description in (6):^1

(6) [+voc]  [-voc]  [+cons]^1  [-cons]_0
The theoretical significance of this is not lost on Ross. He notes:

The noun-forming affix -al raises some problems of considerable theoretical interest...This situation suggests either that the affix must be added to a word after stress has been assigned...or that there must be phonetic output conditions on the well-formedness of words.

If the structural description of -al suffixation must include the information that the verb which -al can attach to is stressed on the last syllable, then English stress assignment must precede -al suffixation. This is a problem for the SPE model of grammar, as Ross implies.

2.2 Tagalog reduplication

Reduplication processes in which a phonological rule has "over-applied" to both the stem and the reduplication affix have been noted in the literature (Wilbur 1973, Aronoff 1976, Marantz 1982). Such cases pose a problem for the SPE model: the over-application of the phonological rule is most easily accounted for by allowing the phonological rule to precede the reduplication process.

One such problematic reduplication process is found in Tagalog, discussed by Anderson (1975:44). (Anderson presented a number of cases of problematic rule interaction of this sort, another of which will be discussed in 2.1.3.) Anderson noted that many Indonesian languages have a rule of Nasal Substitution:

which incorporates a morpheme-final velar nasal into a following root, merging it with an initial consonant into a nasal homorganic with the original consonant.
There may be language-particular restrictions on this rule, as mentioned by Anderson, but the autosegmental formulation in (7) will serve to summarize the general effect of this rule:

\[(7) \quad \begin{array}{c}
\text{C} + \text{C} \\
\text{+high} \quad [\gamma P] \\
\text{+back} \\
\text{[+nasal]} \\
P = \text{place of articulation features}
\end{array}\]

The application of this rule can be seen in the Tagalog forms in (8) and (9), which contain the nominalizing prefix /pap/.

\[(8) \quad /\text{pap}+\text{atip}/ \\
\text{nom} \\
[\text{papatip}] \quad \text{'roofing material'}
\]

\[(9) \quad /\text{pap}+\text{putul}/ \\
\text{nom cut} \\
[\text{pamutul}] \quad \text{'that used for cutting'}
\]

Anderson, following Bloomfield (1933), noted that Nasal Substitution must precede a reduplication process which, among other things, forms intensives. Thus the reduplicated form of /putul/ 'cut' is the intensive form [puputul] 'to cut repeatedly'. The nominal derived from this intensive stem is [pamumutul], which indicates that Nasal Substitution must apply before reduplication:

\[/\text{putul}/ \quad \text{'cut'}\]

Nominalization \quad \text{pap-putul} \quad \text{'that used for cutting'}
Nasal Substitution \quad \text{pa-mutul} 
Intensive Redup. \quad [\text{pamumutul}] \quad \text{'a cutting in quantity'}

Anderson's solution to the problem for SPE posed by this rule was to deny the morphological character of Tagalog redupli-
Anderson drew attention to this (and other) examples to support his proposed typology of phonological rules, in which phonological rules may be divided into three types, morpholexical, phonological, and phonetic. He suggested that these rules are not always ordered in what might intuitively seem their most natural order:

(10) morpholexical rules $\rightarrow$ phonological rules $\rightarrow$ phonetic rules

In support of his point, Anderson drew attention to a number of cases in which a phonetic rule (one whose output yields numerical, rather than categorical, feature values) must precede a phonological rule, and a phonological rule must precede a morpholexical rule. Tagalog reduplication is an example of the latter.

However, Anderson's solution raises its own theoretical problems, as summarized by Marantz (1982:458):

One problem with this solution is that reduplication has all of the properties of a regular word formation rule and regular word formation rules can be ordered to precede all phonological rules. Ordering reduplication after certain phonological rules implies that one can place a derivational or inflectional affixing rule somewhere in the middle of the phonology, an option that is, apparently, not otherwise needed.

Such an ordering solution, Marantz argues, will "loosen constraints on the organization of grammar." However, given the Lexical Phonology model, it is possible to accept this case on its face value: some phonological rules must precede word formation rules, and as will be seen below, this is not such a horrible result.
2.3 Danish imperative formation

Anderson (1975) provided another case in which a phonological rule must precede a morphological one.

Danish has both long and short vowels and consonants. Length often phonetically manifests itself in the presence of a glottal segment, the stød:

\[
\begin{align*}
\text{VV} & \rightarrow [\text{V}] \\
\text{CC} & \rightarrow [\text{C}] \\
\text{[+voiced]} & 
\end{align*}
\]

The rules in (11) are a rough approximation of the necessary rule: the presence or absence of stød is also apparently governed by other factors, such as stress. The contrast between long and short vowels and consonants can be seen by comparing the nouns in (12) and (13).

long stems:

\[
\begin{align*}
\text{(12a) /mæ:s/} & \quad [\text{mæ:s}] & \quad \text{'bother'} \\
\text{(12b) /spill/} & \quad [\text{spil}] & \quad \text{'waste'} \\
\end{align*}
\]

short stems:

\[
\begin{align*}
\text{(13a) /baÆ/} & \quad [\text{baÆ}] & \quad \text{'bath' (noun)} \\
\text{(13b) /spel/} & \quad [\text{spel}] & \quad \text{'game'} \\
\end{align*}
\]

Danish also has a rule of Lengthening, whereby stem-final vowels and consonants become long when followed by a vowel-initial suffix. The choice of whether a vowel or consonant undergoes Lengthening is predictable but the conditioning factors are quite complicated. One of the morphological categories in which the phonological requirements of Lengthening are
satisfied is the infinitive. Danish infinitives are formed by the suffixation of /ə/ to the stem. If the stem ends in a short vowel or consonant, Lengthening occurs. Compare the infinitive forms in (14)-(17) with the nominal forms in (12)-(13) above, which reflect underlying length:

long stems:
(14) /mæ:s-ə/
    [mæ:sə] 'to toil'
(15) /spill-ə/
    [spillə] 'to waste'

short stems:
(16) /bad-ə/
    [bædə] 'to bathe'
(17) /spel/
    [spellə] 'to play'

The imperative forms of verbs contain no suffix, yet imperatives always contain long vowels or consonants, regardless of whether or not the underlying stem is short or long. Compare the following imperatives with the nominals in (13).

(18) [bæθd] 'bathe!'
(19) [spel?] 'play!'

(The stdd indicates length.) These data suggest that the imperative is derived from the infinitival form by a rule which simply removes the schwa suffix marking the infinitive. The derivation of [spel?] given in (20) illustrates this analysis:
(20)  /spel/

infinitive formation  spel-ə
Lengthening  spell-ə
imperative formation  spell
stød insertion  spel?

Imperative formation is clearly a morphological process. The fact that Lengthening has applied prior to the formation of the imperative is thus a problem for the SPE model of grammar. The only alternative to allowing the phonological rule of Lengthening to apply in the lexicon is to consider Lengthening a morphological as well as phonological process. This ad hoc solution can be avoided in a model of grammar in which some phonology takes place in the lexicon.

2.4 Conclusion

Other cases which illustrate a problematic interaction between phonology and morphology could be summarized here: Luiseño reduplication (Munro and Benson 1973, Anderson 1975), other reduplication processes (Wilbur 1973, Aronoff 1976, Marantz 1982), the Abkhaz Epenthesis and agreement rules (Anderson 1975), and Dutch agentives and schwa deletion (Booij 1981), to name a few.

These cases are difficult to accommodate in the SPE model of grammar. A number of solutions have been proposed, one of which (Anderson's rule typology), I have already discussed. Aronoff (1976) proposed a slightly different solution. Instead of denying the morphological character of the WFR's in these cases, he allowed word formation rules to apply in the phonology. As a possible constraint, he suggested that WFR's might
only intervene in the phonology in a predictable number of places: before the cyclic rule component, between the cyclic and word-level rules, and after all word-level rules. Aronoff's solution insightfully allows phonological and word formation processes to interact. However, given the Lexicalist Hypothesis of Chomsky (1970), the Lexical Phonology model is to be preferred, since it does not allow word formation rules to apply outside the lexicon (in the syntax, for example).

The solution suggested by Booij (1981) was more along the lines of current proposals in Lexical Phonology. Specifically, Booij proposed a model of grammar in which:

...certain assumptions about the organization of grammars predict ordering relations between rules (Booij 1981:45).

Booij proposed that phonological rules apply in two places in the grammar: in the lexicon and following the syntax. In the lexicon, phonological rules may be ordered after word formation on any cycle, and the output of these phonological rules may then serve as the input to further word formation rules.

Sekani provides evidence for this central claim of the Lexical Phonology model. Throughout this dissertation, I will draw attention to derivations in which phonological rules must apply before morphological operations. Such examples, though problematic for the SPE model, are easily accounted for in the Lexical Phonology model.
3. The cycle

We have just seen how the Lexical Phonology model resolves a previously troublesome aspect of phonological theory: it accounts for the necessary orderings of phonological and word formation rules. In this section I will consider another problematic aspect of earlier phonological theory, the need for cyclic rule application, which the Lexical Phonology model also helps to explain in an insightful way.

In a cyclic derivation, rules apply in cycles to successively larger constituents which are defined by morphological or syntactic structure. Thus rules may apply more than once in a derivation. In a non-cyclic derivation, on the other hand, rules apply exactly once to the entire string.

The cycle has been a controversial topic in phonological theory. Proposed cyclic analyses have rarely stood the test of time. Nonetheless, I believe that good evidence for the cycle can be found, such as the following case in Catalán (Mascaró 1976).

3.1 An example of the cycle

Three rules will be relevant to the discussion of the cycle in Catalán. The first one, Glide Formation, derives the glides [y w] from unstressed high vowels /i u/:

(21) \[
\begin{array}{l}
\text{+syll} \\
\text{+high} \\
\text{-stressed}
\end{array}
\] \[\rightarrow\] \[\text{[-syll]} / \text{[+syll]} \ #_0 \]

This rules accounts for alternations like those in (22) and (23):

\[\text{31}\]
(22a) tórna
'he returns there'
(22b) tórna y
'return there!'
(23a) tórna
'he returns it'
(23b) tórna w
'return it!'

A second rule, Destressing, deletes all but the rightmost underlying stresses in a word: 6

(24) V --> [-stressed] / ## X ___ Y [+stressed] Q ##

Consider the forms in (25). The morphemes /bûλ/ 'boil', /i/ (thematic vowel), and /rîə/ 'conditional' are underlyingly stressed. When these morphemes are put together in a word, only the stress on the rightmost morpheme remains:

(25a) /bûλ- u/
boil pres
bûλu
'I boil'
(25b) /bûλ- i -m/
boil thm 1p
bûλîm
'we boil'
(25c) /bûλ- i -rîə -s/
boil thm cond 2s
bûλîrîs
'you would boil'

The third rule is Vowel Reduction:

(26) ə, o --> u /
a, ɛ, e --> ə / [-stressed]

The effect of this rule can be seen in (27)-(29) below:

(27) sák
'sack'
sénit
'small sack'

32
(28)  port  'harbor'
       purtuári  'related to harbor' (adj.)
(29)  pfil  'hair'
       palút  'hairy'

Now consider the necessary ordering relations between these rules. (30b) and (31b) below contain post-vocalic, unstressed high vowels [i u], rather than their glide counterparts. Notice that, in (30a) and (31a), these vowels are stressed. This suggests that Glide Formation must apply before Destressing removes the underlying stress on these vowels.

(30a)  raÍm  'grape'
(30b)  raimét  'small grape'

(31a)  saúc  'elder'
(31b)  sauquér  ?

Other forms indicate that Destressing feeds Vowel Reduction, since the output of Destressing undergoes Vowel Reduction:

(32a)  déw  'god'
(32b)  déÍzme  'deism'

(33a)  alzæbre  'algebra'
(33b)  alzæbráyk  'algebraic'

The necessary ordering of these three rules is given in

(34):

(34)  Glide Formation
      Destressing
      Vowel Reduction

However, a problem for this order of the rules arises. In some
forms, Glide Formation must apply to the output of Destressing.

Consider the following derivation of *[əwbrí(r)] 'to open':

(35) \[ /a#5brír/ \]

| Glide Formation | -- -- |
| Destressing     |     |
| Vowel Reduction | a u  |
|                 | *[əubrír] |

If the rules apply in the ordering given in (34), the wrong form will be produced, as in (35). The required order for this form is: Destressing, Vowel Reduction, Glide Formation, as shown in (36).

(36) \[ /a#5brír/ \]

| Destressing     |     |
| Vowel Reduction | a u  |
| Glide Formation | w    |
|                 | *[əwbrír] |

An ordering paradox has arisen. Compare (34) and (36).

This ordering paradox is easily resolved if the derivation proceeds according to morphological structure, as in a cyclic analysis. The string /a#5brír/ contains at least two morphemes, so its derivation will contain (at least) two cycles. Thus the well-motivated rule ordering in (34) can be maintained because on the second cycle, Glide Formation will be able to apply to the output of Destressing and Vowel Reduction, as required by the derivation in (36):

(37) \[ [a [5bír]] \]

cycle 1

| Glide Formation | -- |
| Destressing     |     |
| Vowel Reduction | u   |
cycle 2

Glide Formation
Destressing
Vowel Reduction

[œwbrír]

This cyclic derivation succeeds because the structural description of Glide Formation is not met until the second cycle.

3.2 Some questions concerning cyclic rule application

Given the need for the cycle, various questions arise: which rules are cyclic? how can the cycle be constrained? These questions have been asked ever since a theory of cyclic phonology was first proposed in SPE, and are still being asked in recent work on the cycle in Lexical Phonology.

In early generative phonology, various constraints on cyclic rules were proposed, the most persistent of which was the hypothesis that only rules which refer to stress may apply cyclically. (Notice that the Catalán case above does crucially involve stress.) This view of the cycle can still be found in recent articles, such as Anderson (1982a). Of course, this constraint seems ad hoc, but because of the scarcity of cyclic analyses, it seemed to be the strongest hypothesis consistent with the available evidence. In Ch. 7, I will present evidence against this hypothesis: certain segmental rules in Sekani must be allowed to apply cyclically.

In SPE, the question of which rules are cyclic receives a straightforward answer. Rules which apply below the level of the word are cyclic; rules which apply at the word level or to
constituents larger than a word are non-cyclic. There is no
discussion in SPE of why this division into cyclic and post-
cyclic rules should exist, or where it might come from. In 2.1
I summarized evidence from necessary orderings of phonological
rules before word formation rules which indicated that some
phonology is in the lexicon. Just as the Lexical Phonology
model easily accommodates such cases, it also provides a fairly
natural explanation for why some rules apply cyclically.

3.3 Where the cycle comes from--the Lexical Phonology answer

If phonology is in the lexicon, as it is in Lexical Phono-
logy, then the question arises of how the two major components
of the lexicon--phonology and morphology--interact with each
other. Pesetsky (1979) and Booij (1981) both proposed that the
phonological rules apply to the output of each application of
the WFR's, as represented in (38).

\[(38)\]
\[
\begin{align*}
\text{stem} \\
\text{WFR} & \rightarrow \text{P rule} \\
\text{WFR} & \rightarrow \text{P rule} \\
\text{etc.}
\end{align*}
\]

For example, the Lexical Phonology model derives [industrial-
ization] in the following way:

\[(39)\]
\[
\begin{align*}
\text{P rules: stress} \\
\text{stem} & \quad \text{industry} \quad \rightarrow \quad 1 \\
\text{industry} & \quad \rightarrow \quad \text{industry} \\
\text{WFR} & \quad \rightarrow \quad 2 \quad 1 \\
\text{industry-al} & \quad \rightarrow \quad \text{industry-al} \\
\text{WFR} & \quad \rightarrow \quad 3 \quad 1 \\
\text{industry-al-ize} & \quad \rightarrow \quad \text{industry-al-ize}
\end{align*}
\]
The stress rules reapply after each application of the word formation rules.

As Pesetsky and Booij both noted, this model of the organization of phonology and morphology accounts for the apparent need for some rules to apply cyclically to successive layers of constituent structure. In fact, the model also predicts that some rules apply non-cyclically, accounting for the cyclic/post-cyclic rule typology assumed by SPE. Specifically, the Lexical Phonology model of Pesetsky predicts that phonological rules which apply in the lexicon are cyclic, and that post-lexical rules are not cyclic. This model is motivated by theoretical considerations (no word formation rules are assumed to apply in the syntax), as well as empirical ones. Kiparsky (1982a:31) has observed that:

As far as I know there are no rules which have to apply cyclically from the innermost phrasal constituents out and the theory of lexical phonology predicts that.

3.4 Recent proposals concerning the cycle in Lexical Phonology

Several modifications of this model of the cycle in Lexical Phonology have recently been proposed.

One proposed modification concerns the possibility of allowing lexical derivations in which no word formation rule applies. As discussed in section 2, Lexical Phonology permits derivations in which a phonological rule precedes a morphological one. Kiparsky (1982b) has suggested that, in cases
where the structural descriptions of both a word formation rule and a phonological rule are met by some underived stem, the first rule that can apply to the stem will be the phonological rule, rather than the word formation rule. Thus Kiparsky has proposed that the model in (38) be modified to that in (40):

\[
\begin{align*}
&\text{stem} \\
\downarrow &\quad \text{WFR} \leftarrow P \text{ rule} \\
\downarrow &\quad \text{WFR} \leftarrow P \text{ rule} \\
\end{align*}
\]

etc.

In the Pesetskian model of the lexicon, each phonological cycle contains at least one word formation rule, whereas the model in (40) permits a restricted set of cyclic derivations which contain no word formation rule.

Kiparsky's proposal concerns the way in which levels are linked (see sec. 4), as well as how stems enter the lexicon. The evidence from English, Dakota and Welsh provided by Kiparsky (1982b) in support of the model in (40) has been criticized by Shaw (1983) and by Rice (1983c). However, Rice (1983c) has proposed that the model in (40) is supported by evidence from Slave. (See Ch. 6.) As will be seen in Ch. 8, the phonological rule of a Raising in Sekani must apply before the possessive suffixation. This ordering also provides support for Kiparsky's proposed model of rule interaction in (40).

A second major question about the cycle in Lexical Phonology concerns the extent of cyclic rule domains. The empirical motivation for the correlation between cyclic and lexical domains, given in (41), has been questioned.
(41) lexical rules cyclic
    post-lexical rules non-cyclic

Some evidence, which I will discuss in Ch. 7, indicates that post-lexical rules may apply cyclically in some languages. Other evidence suggests that some lexical rules may not apply cyclically. With respect to the latter possibility, Halle and Mohanan (1985) and Mohanan and Mohanan (1984) have proposed a very serious weakening of the Lexical Phonology model. In their proposed model, any lexical domain can be non-cyclic. Kiparsky (1983) and Harris (1983) have proposed a less drastic modification of the model to accommodate these cases. In the Kiparsky/Harris model, word level rules (rules at the end of the lexicon) and rules above the word apply non-cyclically, whereas rules which apply below the level of the word are cyclic.

The evidence from Sekani which I will present in Ch. 7 is consistent with the stronger, Kiparsky/Harris model of the cycle in Lexical Phonology. Sekani does not require the weaker model that has been proposed by Halle and Mohanan (1985) and Mohanan and Mohanan (1984).

4. Level Ordering

In Lexical Phonology, phonological rules apply in the lexicon, and in some versions of the model, lexical rule applications are cyclic. Turning now to the morphological side of the model, Lexical Phonology assumes the theory of level ordering proposed by Siegel (1974) and further modified by Allen (1978).
The central claim of the theory of level ordering is that word formation rules can be grouped into blocks, called "levels" (or "strata"), which have different phonological and morphological characteristics. Level ordering accounts for observed correlations between the domains of phonological rules and the order in which word formation rules apply.

4.1 An example of level ordering: the negative prefixes in English

The English negative prefixes in and un provide a classic example of the need for level ordering distinctions. Siegel observed that these prefixes have different phonological properties as well as different restrictions on which affixal operations they can follow.

First consider their phonological differences. The final nasal in in assimilates in place of articulation to a following stop and in manner of articulation to a following liquid:

\[(42)\]
\[
\begin{array}{l}
\text{imbalance} \\
\text{infinite} \\
\text{illegal} \\
\text{irrational}
\end{array}
\]

However, the final nasal of un does not assimilate:

\[(43)\]
\[
\begin{array}{l}
\text{unbalanced} \\
\text{ungrateful} \\
\text{unlawful} \\
\text{unrationalized}
\end{array}
\]

in and un also differ with respect to stress behavior. In many forms which contain in, stress falls on the prefix in itself, whereas it never falls on the prefix un:

\[(44)\]
\[
\begin{array}{ll}
\text{potent} & \text{impotent} \\
\text{pious} & \text{impious} \\
\text{finite} & \text{infinite}
\end{array}
\]
These data can be accounted for by assuming that \textit{in} is associated with a weaker boundary (+) than \textit{un} (#), and that Nasal Assimilation and stress placement do not apply apply across the stronger boundary.

Now consider the morphological differences between \textit{in} and \textit{un}. In general, \textit{in} and \textit{un} may attach to adjectives to form adjectives. However, an asymmetry exists between \textit{in} and \textit{un} with respect to which kinds of derived adjectives they may attach to. \textit{In} cannot attach to adjectives which are derived from nouns by stress-neutral suffixes such as -\textit{ly}, -\textit{like}, -\textit{ful}, -\textit{worthy}, -\textit{some}, and -\textit{ish}:

\begin{center}
\begin{tabular}{ll}
45) & unfriendly \hspace{2cm} *infriendly \\
 & unchild-like \hspace{2cm} *inchild-like \\
 & unfruitful \hspace{2cm} *infruitful \\
 & unsea-worthy \hspace{2cm} *insea-worthy \\
 & unwholesome \hspace{2cm} *inwholesome \\
 & unselfish \hspace{2cm} *inselfish \\
\end{tabular}
\end{center}

This is an important difference between the two affixes.

Level ordering provides a way of relating the phonological differences between \textit{in}- and \textit{un}- to their different combinatorial properties. Level ordering predicts that the word formation rules within a level are freely ordered, whereas those of an earlier level always precede those of a later level. This is the Level Ordering Hypothesis. (The version in (46) is from Pesetsky 1979:19.)

\begin{center}
(46) Level \textit{n} affixation precedes level \textit{n+1} affixation.
That is, level \textit{n} morphemes always occur "inside of" level \textit{n+1} morphemes.
\end{center}
In the standard level-ordered analysis of in- and un-, in-
prefixation is assigned to level 1, along with the other largely
Romance affixes which affect stress; un- is assigned to level 2,
along with other stress neutral affixes such as those in (45).

4.2 Overlap between levels

In the theory of level ordering described above, word
formation rules are assigned to a unique level. That is, level
ordering does not allow for a language that would be identical
to English except that the negative prefix in- occurs on two
levels. On level 1 it would have the phonological and morpholo-
gical properties discussed above, and on level 2 it would have
the properties described for un-.8

Unlike the situation in morphology, there are no con-
straints against phonological rules applying on more than one
level. In fact there is quite a bit of evidence that phonologi-
cal rules must be allowed to apply on more than one level or in
the syntax as well as the lexicon (Mohanan 1982, Rice 1982,
Mohanan and Mohanan 1984), suggesting that the phonological
component is a single system of rules with possible overlap
between the levels and/or the syntax. Other cases of phonologi-
cal rule overlap will be seen in Sekani, most strikingly for
levels 2 and 3 (Ch. 3, 5.2).

Mohanan (1982) observed that no languages permit a phonolo-
gical rule to apply on discontinuous levels. To account for
this fact, Mohanan proposed the hypothesis in (47):
(47) Continuous Stratum Hypothesis

The domain of a rule is specified as a set of continuous strata.

So far no counter-examples to this hypothesis have appeared. Thus to the extent that it is true, the Continuous Stratum Hypothesis is a fact about languages that could not be stated so easily without the Lexical Phonology model.

4.3 The loop

In the theory of level ordering sketched above, derivations proceed from level 1 to the post-lexical phonology:

(48) stems

level 1 word formation ←→ phonology

level 2 word formation ←→ phonology

...

post-lexical syntax → phonology

This is a powerful claim about rule ordering. However, as we have seen, it accounts for the different combinatorial properties of in- and un- in English, for example.

Mohanan (1982) has shown that the model in (48) is too strong. A weaker model, which permits a loop from one level of word formation back to an earlier level, is empirically required for some derivations:

(49) stems

level 1 word formation ←→ phonology

level 2 word formation ←→ phonology

The loop builds a certain amount of recursion into the Lexical

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Phonology model, but at the same time it represents a weakening of the Level Ordering Hypothesis.

Not surprisingly, the loop is controversial in Lexical Phonology. Kiparsky (1983b:21) regards the loop as a "serious compromise of level ordering". However, I believe that Mohanan (1982) and Rice (1983a) have demonstrated that the loop is empirically required.

Consider compounding in Malayalam, the case discussed by Mohanan (1982) in support of the loop. Two kinds of compounds occur in Malayalam, sub(ordinate) compounds and co(ordinate) compounds. These compound types differ in morphological as well as phonological ways.

The stems of a subcompound are in a modifier-head relationship:

(50) \([\text{kaat}: \text{məfam}]\)

\text{kaat}: \text{məfam} \quad \text{''forest tree''}

However, the stems in a cocompound are simply conjoined:

(51) \([[[\text{aat}:\text{maat}]]\text{kal}\)

\text{aat}: \text{maat}: \text{kal} \quad \text{''cattle''}

These two kinds of compounds differ phonologically with respect to a rule which geminates stem-final and stem-initial obstruents. An application of this rule can be seen in 'forest tree' (50). Notice that no geminates occur in (51) 'cattle'. The failure of gemination to apply to the stem-final \(t\)'s in 'goat' and 'cow' of the compound 'cattle' indicates that cocom-
pounds are formed outside of the domain of the gemination rule.

Mohanan provides evidence from affix order and phonological rule domains that the Malayalam lexicon contains four levels of word formation:

level 1 derivation  
2 subcompounding  
3 cocompounding  
4 inflection

He notes that this ordering of the word formation processes correctly accounts for the following facts: (1) derivational affixes cannot attach to compounds or inflected stems; and (2) compounds cannot contain inflected stems.

Evidence that cocompounds belong to a later level than subcompounds is provided by rules which assign stress. The primary stress in a word falls on its first syllable unless the first syllable contains a short vowel and the second syllable, a long vowel. In that case, the second syllable receives primary stress. Secondary stresses are placed on all remaining long vowels. Phonetically, the stress pattern is manifest through pitch. Primary stress is marked by a low tone and each secondary stress is marked by a high tone. In addition, the last syllable of every word receives a high tone. Subcompounds and cocompounds thus differ with respect to the number of primary stresses that can occur in each kind of compound. There can be only one primary stress in a subcompound:

(52) [mata] [vidwešam] 'hatred of religion'  
L       H H
religion hatred

However, each stem of a cocompound contains a primary stress:
(53)  [[acchan][amma]][maaře] 'parents'
       L  H   L  H
       father  mother  pl

This suggests that subcompounding precedes stress assignment, and that stress assignment precedes cocompounding. Cocompounds and subcompounds clearly belong to different levels.

Mohanan next shows that subcompounds may contain cocompounds, and vice versa:

(54)  [[[maatr] [sneeham]][[patni] [widweeṣam]][wikaařam]kaḻ]
       mother  love  wife  hatred  emotion  pl
       subcompound  subcompound
       cocompound
       subcompound

' the emotions of mother love and wife hatred'

(54) contains two subcompounds embedded in a cocompound, which is itself embedded in a subcompound. Mohanan concludes that a loop from level 3 to level 2 is necessary in order to allow the cocompounding stratum to be input to the subcompounding stratum. While the stronger level ordering model can predict that a cocompound may contain a subcompound, the fact that a cocompound can occur within a subcompound can only be accounted for by a loop from level 3 back to level 2.

The loop not only provides a way of accounting for these facts about affix order in Malayalam, it is also required to account for the phonological properties of the compounds. Mohanan notes that compounds of the sort in (55) and (56):
will have the same representation in terms of boundaries:

(57)  \[ X \quad +\quad Y \quad +\quad Z \]

where \[ +\] represents the boundary between stems joined in a cocompound, and \[ +\] the boundary between stems in a subcompound. However, these two structures have different stress patterns:

(58)  \[
\begin{array}{c}
\text{[[jaati] [mata]] [widwee\text{-}gam]}
\end{array}
\]
\[
\text{L H L H L H}
\]
\[
\text{caste religion hatred}
\]
\[
\text{cocompound}
\]
\[
\text{subcompound}
\]
\[
\text{'hatred of caste and religion'}
\]

(59)  \[
\begin{array}{c}
\text{[[kaamuka][[bhartr\text{-}e][sahooda\text{-}Fan]]][maar\text{-}e]}
\end{array}
\]
\[
\text{L H L H H H}
\]
\[
\text{lover husband brother pl}
\]
\[
\text{subcompound}
\]
\[
\text{cocompound}
\]
\[
\text{'lovers and husband's brothers'}
\]

A boundaries model will fail to distinguish (58) and (59) phonologically, whereas a derivation which respects constituent structure, as is provided by the loop and Lexical Phonology, correctly predicts the prosodic differences between these two
structures.

In Ch. 4 I will summarize additional evidence for the loop from Slave (Rice 1983a), as well as present new evidence for the loop from possessed derived nominals in Sekani.

4.4 The elimination of boundaries

The initial research on level ordering by Allen and Siegel was done within an SPE model of grammar, in which phonological rule applications follow the syntactic component. Phonological differences between levels were encoded by boundary symbols.

Pesetsky (1979) observed that allowing phonological rules to apply in the lexicon along with word formation rules has a striking theoretical consequence. If phonological rules as well as word formation rules can be level ordered, then different kinds of boundary symbols are not needed to mark the domains of phonological rules. Given the notorious problems associated with boundaries, as pointed out by Rotenberg (1978) and others, eliminating boundaries from phonological theory is a nice consequence of Lexical Phonology and level ordering.

5. The Bracketing Erasure Convention

As Kiparsky (1973a) has demonstrated, certain phonological rules are restricted to derived environments. The structural description of any such rule must include a boundary or some other device to indicate that the only forms to which it may apply are derived. Although Lexical Phonology has eliminated different kinds of boundaries, clearly some sort of notational
device is still required to distinguish derived from non-derived forms.

Since lexical rules have been assumed to apply cyclically in Lexical Phonology, the constituents to which lexical rules apply are marked with unlabelled brackets. Every word formation rule adds a new set of brackets, as shown in (60):

(60) underlying stem  [B]
    WFR        [A [B]]
    WFR        [[A [B]] C]

Chomsky and Halle (1968) proposed to constrain the amount of word-internal bracketing that phonological rules have access to by means of a universal Bracketing Erasure Convention, which stipulated that internal brackets are erased at the beginning of every cycle. In an SPE derivation of the structure [A [B]] in (60) above, the first rule to apply on the cycle defined by A is the erasure of the brackets surrounding B:

(61)  [A B]

The theory of Lexical Phonology also includes a Bracketing Erasure Convention, although the current version of this convention is considerably weaker than that proposed by SPE.

5.1 Why Bracketing Erasure is needed

Theoretically, a Bracketing Erasure Convention is well-motivated: it helps ensure that rule applications are local. Research in morphology (Siegel 1974, Allen 1978, Williams 1981) and in syntax (Chomsky 1970) has suggested that word formation rules and syntactic rules never need to manipulate or have
access to word internal structure. Pesetsky (1979:40) observed that if phonology is in the lexicon, then a single Bracketing Erasure Convention will do the work of these morphological and syntactic constraints by preventing such rules from having access to earlier layers of structure. As Pesetsky has observed, "obviously, one condition is better than two."

Theoretical motivation notwithstanding, it is a more important question whether there is any empirical evidence for the Bracketing Erasure Convention. Rules which apply at the edges of words clearly require the application of Bracketing Erasure. Otherwise, the notion of word-initial or word-final will be impossible to formalize in Lexical Phonology. Such rules will have contexts of the sort given in (62):

\[(62) \quad \_ \_ \quad \text{or} \quad \_ \_ \quad [ \_ \_ \_ ] \]

If internal brackets have not been removed at the point that the rule applies, the rule will overapply.

For example, consider the rule of Final Devoicing in Russian, as formulated by Kiparsky (1983:30 ff.):

\[(63) \quad C \rightarrow [-\text{voiced}] / \_ \_ \_ ]\]

This rule applies to forms like the following:

\[(64a) \quad \text{sat} \quad \quad \quad \text{'garden' (nom. sg.)} \]
\[(64b) \quad \text{sada} \quad \quad \quad \text{'garden' (gen. sg.)} \]

If there were no Bracketing Erasure Convention, then morphologically complex forms like \[[\_ \_ \_ \_ \_ \_ ]\] would meet the structural description of Final Devoicing, and Final Devoicing would incorrectly apply twice in this word:
(64c)  *sata

Word-internal Bracketing Erasure is clearly required to prevent rules which apply to word-initial or word-final domains from overapplying.

Other cases which presuppose some version of Bracketing Erasure will be discussed in Ch. 5.

5.2 Current versions of the Bracketing Erasure Convention

Pesetsky observed that the SPE version of Bracketing Erasure was inconsistent with another well-motivated principle governing cyclic rule application, the Strict Cycle Condition (sec. 6 below). He suggested the weaker version of Bracketing Erasure in (65) instead:

(65)  The last rule of any cycle is: erase internal brackets.

This version can distinguish new from old information on any cycle, as required by the Strict Cycle Condition.

Subsequent research by Kiparsky (1982a), (1983b), Mohanan (1982) and Rice (1982) has uncovered rules which require limited access to word-internal structure. I will postpone in-depth presentation and evaluation of this evidence until Ch. 5, but will note here that these cases all indicate that a version of Bracketing Erasure in which internal brackets are erased at the end of a level is required:

(66)  The last rule of any level is: erase internal brackets.

Sekani also requires level-internal (but not cyclic) Bracketing Erasure, but even the version in (66) is too strong. In Ch. 5 I will propose that exceptions to the Bracketing Erasure Conven-

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tion must be allowed in Sekani. Several rules which apply on level 3 or later apply at the left or right edges of level 1. If Bracketing Erasure removes all internal brackets on level 1, this information about the extent of level 1 will be lost. I will propose that certain level 1 brackets are labelled in Sekani, and that a revised version of Bracketing Erasure (the Exceptionable Bracketing Erasure Convention) does not apply to labelled brackets.

Exceptions to Bracketing Erasure in English have been observed posed by Kiparsky (1983b) and by Hammond (1984). In these cases, the exceptionality is associated with a particular word formation rule. The exceptions to Bracketing Erasure in Sekani are similar: only stems and classifier prefixes are exceptional.

6. The Strict Cycle Condition

In the standard (Pesetskian) Lexical Phonology model, word formation rules and phonological rules are interspersed in the lexicon. Each new layer of morphology creates a cycle for the phonological rules of that level to apply on, creating cyclic rule applications in the lexicon. However, as discussed in 3.2 above, this is currently a controversial hypothesis. Arguments about whether a certain rule applies cyclically frequently depend on whether or not it violates the Strict Cycle Condition.

The Strict Cycle Condition, first proposed as a constraint on cyclic phonological rules by Kean (1974), is an important principle of the Lexical Phonology model, and indeed of any
theory of cyclic rule application. Consider the version of the
Strict Cycle Condition given by Halle (1978):

(67) A cyclic rule \( R \) applies properly on cycle \( j \) only if either (a) or (b) is satisfied:

(a) \( R \) makes specific use of information, part of which is available on a prior pass through the cyclic rules, and part of which becomes first available on cycle \( j \). There are three separate cases subsumed under (a). \( R \) refers specifically to some \( A \) or \( B \) in:

(i) \([j \ X \ldots [j\ldots][j\ldots] Z]\);
(ii) \([j\ Z\ [j\ldots][B\ Y] \ X]\);
(iii) \([j\ X\ [j\ldots][A\ Y] \ [j\ldots][A\ Y] Z]\);

(b) \( R \) makes specific use of information assigned on cycle \( j \) by a rule applying before \( R \).

The Strict Cycle Condition prevents cyclic rules from applying to non-derived representations. If rules exist which apply to non-derived representations, it is argued that they cannot be cyclic. However, if such rules are clearly lexical—that is, sensitive to word-internal structure—then a problem for the Lexical Phonology model of the cycle has arisen (cf. Halle and Mohanan 1983, Mohanan and Mohanan 1984).

6.1 Why the Strict Cycle Condition is needed

There are two kinds of motivation for the Strict Cycle Condition. First, the Strict Cycle Condition helps maintain necessary rule orderings in cyclic derivations. Second, the Strict Cycle Condition acts as a constraint on the abstractness of underlying representations.

Consider first the argument from rule ordering. Suppose there exist two rules which apply in counter-feeding order in a derivation. We have seen an example of this in Catalán, dis-
cussed above in 3.1. The rules of Glide Formation and Destressing apply in counter-feeding order, and they must apply cyclically. Consider then a cyclic derivation of ru
o
o
s
i
s
im
 [ruinuzísim] 'very ruinous'. Two cycles will be required in the derivation of this form:

(68)  [[ruín]óz]
Glide Formation   --
Destressing   i

[[[ruín]óz]ísim]
Glide Formation   --  (blocked by the SCC)
Destressing   o
Vowel Reduction   u

[ruinuzísim]

Glide Formation must apply before Destressing on the first cycle to prevent the output of Destressing from undergoing Glide Formation. But Glide Formation could apply to [i] on the second cycle. A constraint against allowing rules to return to earlier cycles is clearly needed, which is what the Strict Cycle Condition does. Since [ruin] is not "derived" on the [oz] cycle, Glide Formation cannot apply to [ruin] because it does not make use of information contained on the [oz] cycle.

The second kind of motivation for the Strict Cycle Condition concerns its function as a constraint on abstractness in underlying representations. As seen in the Catalán case above, the Strict Cycle Condition prevents cyclic rules from applying to non-derived representations. This is encoded in the definition of the Strict Cycle Condition given in (67). One implica-
tion of this is that the Strict Cycle Condition will prevent any rule from applying on the first cycle to an underived stem. Something like this is also clearly required in phonological theory.

Kiparsky (1973a) first drew attention to rules which apply only in derived environments. Kiparsky observed that rules which obeyed the derived-only constraint were neutralization rules, and suggested that these rules had something in common that set them apart from other neutralization rules that could apply in non-derived environments: the derived-only rules were non-automatic neutralization rules. However, as discussed by Kiparsky (1982a), this attempt to characterize the derived-only class did not work: rules like Velar Softening in English are non-automatic and neutralizing but apply within non-derived stems, likeceive.

Mascaró (1976) made another attempt to define the derived-only class of rules. Mascaró observed that all of the non-automatic neutralization rules of Catalán applied cyclically, and suggested, as a more general principle, that all and only obligatory neutralization rules apply cyclically. This in turn led to the possibility that derived-only rules were cyclic rules. Mascaró proposed that the Strict Cycle Condition, a necessary constraint on cyclic rules, was also the principle which restricts certain rules to derived environments, under the assumption that the latter are all cyclic.

However, Harris (1983) has shown that Mascaró's attempt to
predict which rules are cyclic does not work. In Spanish, there exist cyclic rules which are obligatory but not neutralizing, such as the stress and syllabification rules; and there also exist post-cyclic neutralization rules, such as Aspiration.

The stress and syllabification rules in Spanish are thus problems for Mascaró's version of the Strict Cycle Condition. However, Harris (1982:76) has provided a possible explanation for the fact that these rules are cyclic and apply on the first cycle in non-derived environments:

One characterization of these rules that clearly sets them apart from garden-variety phonological rules is that syllable structure rules do not change features. Rather, they belong to the class of rules that assign features and/or prosodic structure that is lexically unspecified.

He further remarks that one of the "central tenets" of Lexical Phonology is that rules which assign lexically unspecified features and structures apply within the lexicon.

6.2 Structure-building vs. structure-changing rules

A systematic class of exceptions to the Strict Cycle Condition is currently recognized: structure-building rules. More precisely, a structure-building rule is any rule whose output creates a structure which is non-distinct from its input structure, where two representations are "distinct" if they contain contradictory feature specifications or contradictory structure.

Kiparsky (1982a) has suggested that if the Strict Cycle Condition is revised to restrict only structure-changing rules to derived environments, then the Strict Cycle Condition itself can be derived from the Elsewhere Condition (Kiparsky 1973b).
Consider the formulation of this condition given in (69):

\[(69) \quad \text{Rules A, B in the same component apply disjunctively to a form } \phi \text{ if and only if}
\]

(i) The structural description of A (the special rule) properly includes the structural description of B (the general rule).

(ii) The result of applying A to \( \phi \) is distinct from the result of applying B to \( \phi \).

In that case, A is applied first, and if it takes effect, then B is not applied.

Underived lexical items are considered to be in a disjunctive relationship with structure-changing rules, but not with structure-building rules, because the output of the latter will not create a structure which is distinct from the underlying representation of the underived lexical item. This accounts for the fact that the Strict Cycle Condition prevents only structure-changing rules from applying to non-derived representations.\(^{11}\)

Kiparsky (1982a, 1983a) has pointed out a further consequence of this hypothesis. Any rule which supplies lexically non-distinctive feature values can also be regarded as structure-building: rules which assign metrical structure are not the only possible structure-building rules. If rules are allowed to assign non-distinctive feature values, then, Kiparsky argues, feature matrices should be left unspecified for predictable feature values. However, a return to underspecified feature matrices leads to the problems raised by Stanley (1967). See Kiparsky (1982a) for discussion of possible solutions to these problems. Needless to say, the position that underlying features matrices should be underspecified is controversial.
As an argument for underspecification, Kiparsky (1983a) provided an analysis of Catalán Nasal Assimilation which makes crucial use of the underspecification of lexical entries. First note that Nasal Assimilation must apply cyclically, as Mascaró (1976) showed. Nasal Assimilation must apply before and after the rule of Cluster Simplification, in order to derive phrases like [btɾ bi m pans] 'I sell 20 loaves of bread':

(70) /bɾNk biNt pan+s/

Nasal Assimilation  p n
Cluster Simplification  Ø Ø

Nasal Assimilation
Cluster Simplification

[bɾ p bi m pans]

(N represents a nasal which is underlingly unspecified for place of articulation features.) If Nasal Assimilation is a cyclic rule, one would expect it to obey the Strict Cycle Condition. But notice that Nasal Assimilation must apply to non-derived forms like /biNt/. The fact that Nasal Assimilation is cyclic but not restricted to derived representations creates a problem for the Strict Cycle Condition similar to that of the Spanish stress and syllabification rules pointed out by Harris.

Kiparsky suggests that Nasal Assimilation is not a structure-changing rule and is thus unconstrained by the Strict Cycle Condition. Further support for this analysis comes from an additional observation: although Catalán has four underlying nasals /m n ŋ p/, only /n/ assimilates fully in place of articulation to a following consonant. /m/ assimilates only to a
following labio-dental, whereas /ñ p/ do not assimilate at all. To account for this fact, and to allow Nasal Assimilation to apply in non-derived environments, Kiparsky suggested that the coronal place of articulation is underlyingly unspecified for features. Nasal Assimilation can be formulated as an autosegmental feature spreading rule:

\[
\begin{array}{c}
\text{P} \\
\text{[+nas]} \\
\text{C}
\end{array}
\quad \begin{array}{c}
\text{P = place of articulation features} \\
\text{C}
\end{array}
\]

The underspecification of feature matrices correctly allows Nasal Assimilation to apply cyclically in non-derived environments only to nasals which are unspecified for place of articulation. Thus only the coronals fully assimilate in place of articulation to a following consonant, as predicted by underspecification and the Strict Cycle Condition.

The structure-changing/structure-building rule typology raises other issues. One is the question of whether rules are structure-preserving (sec. 7.1). Another is the possibility of allowing structure-building rules to create derived environments for later, structure-changing rules to apply in. Kiparsky (1983a) suggests that such derivations must be disallowed. He notes the potential problem for Trisyllabic Shortening in English. Trisyllabic Shortening applies only to derived representations, and only to long vowels which are followed by an unstressed vowel (cf. hypóthesis, hypocrite). If stress is part of the structural description of Trisyllabic Shortening, then
the prior application of the stress rules should create a derived environment for this rule to apply in. But this would lead to the possibility of Trisyllabic Shortening applying in non-derived environments like Rotenberg, nightingale.

In Ch. 8 I will discuss two Sekani rules, Diphthongization and a Raising, that must be allowed to apply on the first cycle. I note the problem for the Strict Cycle Condition that these rules cause and explore possible solutions. One solution makes use of underspecification: the rules may be reformulated as structure-building, rather than structure-changing, rules. However, this analysis raises a theoretical problem: the rule of e Raising is similar to a Raising, but e Raising obeys the derived-only restriction. Given underspecification, there is nothing to prevent a structure-building formulation of e Raising.

Another solution makes use of the fact that a Raising and Diphthongization are both syllable-based rules. Thus one way for them to apply in non-derived environments would be to assume that the prior application of the syllabification rules has created a derived environment. Unfortunately, this analysis would be inconsistent with the case of Trisyllabic Shortening pointed out by Kiparsky.

7. Predicting rule domains

So far we have encountered two principles which predict where rules apply. The Strict Cycle Condition predicts that any structure-changing rule which applies in non-derived envir-
onments is non-cyclic. In the standard Lexical Phonology model, this would entail that the rule is post-lexical, since all post-lexical rules are post-cyclic. The Continuous Stratum Hypothesis also predicts rule domains. If a rule applies on level n and also on level n+2, this hypothesis predicts that the rule also applies on level n+1.

Other hypotheses about rule domains have been proposed, which I will summarize in this section.

7.1 Structure-preservation

Kiparsky (1982a) has observed that the outputs of lexical rules are typically structure-preserving: lexical rules generally do not introduce non-distinctive features. Thus Kiparsky suggests that any rule which introduces non-distinctive features is post-lexical.

For example, rules which introduce aspiration in English are predicted to be post-lexical. No rules which are sensitive to word-internal structure manipulate values of this feature. Another example from English is the devoicing of sonorants. Phonetically, sonorants are typically voiceless when adjacent to voiceless obstruents, irrespective of word-internal structure. Structure-preservation predicts that any values of voicing for sonorants are introduced post-lexically since voicing is not distinctive for sonorants.

Kiparsky (1983a) has proposed that structure-preservation be formalized in terms of marking conditions, which are conditions on which features may be marked for some value. Marking
conditions are formulated at the underlying level of representation and are predicted to hold throughout the lexicon. Thus structure-preservation clearly presupposes the existence of underspecified feature matrices. Marking conditions for the two examples from English discussed above are given in (72):

(72) $^{*}[$+sonorant $]$ $^{*}[$spread glottis $]$

One issue in the theory of structure-preservation is whether the marking of non-distinctive features in certain contexts must be post-lexical. That is, we might need to distinguish between the two cases in (72). For example, voicing is distinctive underlyingly for certain segments; might it then be introduced on segments for which it is not distinctive somewhere in the lexicon? Data from Sekani indicate that the contextual marking of non-distinctive feature values is not necessarily post-lexical. An example of this is provided by the levels 2 and 3 rule of vocalization, discussed in Ch. 3. Rounding is predictable (i.e. non-distinctive) for [+high, +back] vowels in Sekani, suggesting that the feature [round] is not marked for high, back vowels. However, the output of vocalization is a high, back, round vowel. Thus the prohibition against marking high, back vowels for any value of [round] cannot hold throughout the Sekani lexicon.

Structure-preservation, like other hypotheses about rule domains, has implications for theories of learnability. Kiparsky (1983a:12) has observed that:
Structure-preservation greatly contributes to the restrictiveness of the theory since it determines point-blank that any rule which introduces specifications of lexically non-distinctive features must be post-lexical... From the viewpoint of learnability this is an important constraint because it means that the learner does not have to fix the domain of these rules by checking their ordering or other properties.

Structure-preservation is thus a desirable constraint to keep in the theory. However, as Kiparsky (1983a) has observed, the evidence for structure-preservation is largely negative: there do not seem to be rules which lexically introduce values of non-distinctive features. Looking ahead to the day when counter-examples might appear, Kiparsky has suggested that structure-preservation may have to be weakened by "turning off" somewhere in the lexicon.

In Ch. 3, 7. I will argue that the Sekani rules of Glottal Stop Absorption and Nasalization are problematic for structure-preservation. These rules lexically introduce prosodic features—tone and nasal vowels—which are not present underlyingly. Since these rules apply on level 1, they suggest that the lexical phonology of Sekani is not structure-preserving.

7.2 Rule domains and markedness theory

Kiparsky (1984:5) has also proposed the Strong Domain Hypothesis as a constraint on rule domains. Like structure-preservation, the Strong Domain Hypothesis reduces the required amount of marking of rule domains in language-particular grammars. According to this hypothesis:

...the grammar may stipulate merely where a rule ceases to apply...all rules are potentially applicable at the first level of the lexicon, and apply there provided only
that the principles of grammar permit it; at lower levels of the lexicon and in the postlexical phonology rules may be "turned off" but no new ones may be added.

This hypothesis has more theoretical than empirical motivation. Theoretically, it helps account for the historical tendency for rules to become lexicalized. The problem, as described by Kiparsky (1982a:45), is to account for why:

...obligatory absolute neutralization rules bequeathed to a language by sound changes that merge segments are reanalyzed out of it, and non-derived outputs of obligatory contextual neutralization rules are always lexicalized.

The Strong Domain Hypothesis predicts that phonological rules will turn out to be lexical rather than late rules of the surface phonology. The synchronic organization of grammars predisposes rules to become lexicalized.

As empirical support for this hypothesis, Kiparsky has observed that there are "few good cases of rules arbitrarily restricted to the post-lexical phonology, or to some non-initial level or levels of the lexicon." However, with a wider range of data, it is easy to show that a strong version of this hypothesis is not tenable. Some examples of Sekani rules which turn on at non-initial levels of the lexicon are given in (73):

(73)  Epenthesis  level 4
\[ \begin{matrix} 
\varepsilon & \text{Lowering} & \text{post-lexical} \\
\tilde{I} & \text{Lowering} & \text{post-lexical} 
\end{matrix} \]

Given these rules, the Strong Domain Hypothesis can only be interpreted as a statement about the markedness of non-initial rule domains.

With this interpretation of the Strong Domain Hypothesis in
mind, compare the predictions of the weakened Strong Domain Hypothesis with those of a competing proposal about the unmarked or default rule domain, the Principles of Domain Assignment (Halle and Mohanan 1983, Mohanan and Mohanan 1984):

(73) a. In the absence of counter-evidence, assign the smallest number of strata as the domain of a rule.

b. In the absence of counter-evidence, include the lowest possible stratum as the domain of a rule (where "highest" = stratum 1).

In defending this hypothesis on theoretical grounds, Mohanan and Mohanan (1984:578) note that:

The alternative would be to assume that the unmarked domain assignment is the maximal one. If we choose the Principles of Domain Assignment, the learner requires positive evidence in order to let a rule apply in the lexicon at some stratum. If we choose the second, a rule applies at all strata unless there is counterevidence. The choice is between assuming that evidence for the application of a rule in a morphological environment is easily available, and assuming that the evidence for its inapplicability in some morphological environment is easily found.

Mohanan and Mohanan "arbitrarily" assume that evidence for the applicability of a rule in a morphological environment is more easily available to the learner.

Since neither proposal is falsifiable, conceptual motivation becomes more important, though it could be argued that neither proposal is worth pursuing if not empirically based. It is not clear whether it is actually easier to learn where rules apply than where they do not apply. However, the lexicalization of phonological rules is apparently a real historical tendency. The Strong Domain Hypothesis accounts for the latter process, whereas it is not clear than the Principles of Domain Assignment
accounts for ease of learnability.

8. Summary

In this chapter I have summarized evidence for various features of the Lexical Phonology model:

--some phonology is in the lexicon

--phonology and word formation are interspersed, creating cyclic rule application

--morphology is level ordered

--morphology is recursive: level ordering requires the loop

--Bracketing Erasure is a necessary constraint on lexical (and syntactic) rules

--the Strict Cycle Condition is a necessary constraint on cyclic rules

Many of these claims are controversial. In later chapters of this dissertation I will discuss Sekani data which sheds light on some of the more controversial areas, as well as supports some of the more established aspects of this model.

Notes.

1. Ross notes that there are exceptions to the segmental conditions about which verb stems-al can attach to:

   rental  dispersal
   reversal  rehearsal

2. Anticipating a reanalysis of Tagalog reduplication as a word formation rule, Booij (1981:50) argues that reduplication is merely the phonological manifestation of some arbitrary feature; e.g. [+reduplication]. The feature itself marks the word formation rule. The strongest argument for this view of reduplication is that the same type of reduplication occurs in several word formation processes. However, assuming that morphological rules may reflect one-to-many and many-to-one mappings between morphological category and phonological formative (Anderson
1982b), then the argument that reduplication is a phonological process does not follow.

3. The analysis of stød implicit in Anderson (1975) is that it is predictable. However, other analyses (Clements and Keyser 1983) maintain that stød is phonemic.

4. See Anderson (1975) for discussion of the conditions under which Lengthening occurs. Booij (1981:51) notes that "Prof. Basbøll has informed me that he holds the opinion that lengthening is not a purely phonological rule, but morphologically conditioned." Obviously, one must know more about Lengthening before it is possible to decide whether or not Lengthening is a phonological or a morphological process.

5. There have been several recent proposals (Anderson 1982b, Thomas-Flinders 1983) that inflectional morphology is added in the syntax. Thus my criticism is controversial. For arguments against placing all inflection in the syntax, see Jensen and Stong-Jensen (1984) and Rice (1985).

6. In Mascaró's analysis, stress is phonemic. This analysis has been criticized by Kiparsky (1982a), who suggests that stress can be reanalyzed as a predictable property. In the absence of details about this alternative analysis, I have assumed the original analysis.

7. In some dialects, the nasal may only assimilate to labial stops.

8. Tunica (Hammond 1984) may be a language in which the same word formation rule applies on two levels.

9. In Mohanan (1982), the Continuous Stratum Hypothesis is called the Stratum Domain Hypothesis.

10. Actually, Kiparsky is not consistent on this point. According to Kiparsky (1982a:10), there is a need for "limited recursion from phrase level syntax back into morphology."

11. This hypothesis has been criticized by Mohanan and Mohanan (1984:592). Thus deriving the Strict Cycle Condition from the Elsewhere Condition is controversial.
Chapter Three

Level Ordering: Verb Prefixes

This chapter is a level-ordered description of the Sekani verbal prefixes. In Ch. 4, I discuss the level ordering properties of nouns and postpositions.

Within the verbal prefixes of Sekani, thirteen prefix positions (four levels) can be distinguished. The complicated phonology and morphology of Sekani provides a good test of the Lexical Phonology model. As will be seen, Sekani supports the central claims of the model. Certain phonological rules must precede morphological rules, providing strong support for a model in which some phonological rules can apply in the lexicon. Sekani also supports the Level Ordering Hypothesis: the positional restrictions on affixes generally correlate with the domains of phonological rules.

I have organized this chapter by level. In each section I provide a brief description of the morphology that is found on that level, illustrating affix order restrictions. Each section also contains phonological evidence for the particular level ordering distinctions which I claim. I begin this chapter with a brief discussion of the problems raised by earlier generative analyses of Athabaskan phonology, and the contribution that Lexical Phonology can make towards solving those descriptive problems.
1. Earlier generative studies of Athabaskan phonology

The phonology and morphology of the Navajo verb prefixes were the focus of most of the early generative research on Athabaskan languages. Kari (1976) and Stanley (1969, 1973) both recognized the need to restrict certain phonological processes in Navajo to a subset of the verbal prefixes. Such studies made it clear that the central descriptive problem in Athabaskan phonology is finding a way to encode morphological (mainly positional) information in the phonological rules. However, early generative theory provided no good way to do this other than with boundaries.

As it turned out, boundaries, or at least the standard inventory of boundaries, were not descriptively adequate for the job posed by Navajo. Ad hoc devices such as special boundary symbols, morphological features, and readjustment rules were required to restrict phonological rules to their proper domains. For example, Stanley posited seven boundaries of different strengths within the verb prefixes. Because his theory required that all boundaries had to be present in the representations that served as input to the phonological component, the representations that he posited were unnecessarily baroque.

Kari, while correctly rejecting the boundary hierarchy proposed by Stanley, was forced to encode positional information in other ways which were equally non-standard. Many of his rules make use of the symbol \textendash{} (marking the division between the classifiers and other prefixes), although Kari explicitly re-
marks that this symbol should not be interpreted as a boundary. Other rules are restricted to their proper domain by direct reference to prefix positions: STEM, ASPECT, etc.

As I hope to show in this chapter, and as Rice (1982, etc.) has already demonstrated for Slave, there really is no need for the extra theoretical apparatus of special rule types or boundary symbols in a level ordered analysis of Athabaskan phonology. Although it is not possible to eliminate morphological features entirely, most of the phonological rules are restricted to their proper domains by the principles of the model. The biggest difference between the lexical phonologies of Athabaskan languages and those of other languages is thus that more lexical levels are required in Athabaskan languages than are usually found in other languages. However, this is a natural extension of the model, not a forced departure from it. Moreover, it is an understandable departure, given the complexity of Athabaskan morphology.

2. An overview of the verb prefixes

In a standard generative model of the Athabaskan verbal prefixes, the positional properties of the affixes and the domains of phonological rules might be represented as follows:

| prefix: | postposition (P) | adverbial (adv) | stem (N, V) | position: | 1 | 2 | 3 |
|---------|------------------|----------------|-------------|------------|---------------------|
|         | distributive (dstr) | na (rev, C) | inceptive (incp) | 4 | 5 | 6 |
|         | % object (O, recp, refl, ar) | % subject (S) | % | 7 | 8 |
I follow Rice (1976) in adopting a model of the phonology which makes use of four boundary symbols: # % + =.

In a Lexical Phonology model, the verbal prefixes can be grouped into four levels of affixation:

```
<table>
<thead>
<tr>
<th>Level</th>
<th>Prefixes</th>
<th>Affixation Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>aspectual suffixes</td>
<td>Nasalization (1-4, post-lexical)</td>
</tr>
<tr>
<td></td>
<td>classifier prefixes</td>
<td>Diphthongization (1-4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a Raising (1-4)</td>
</tr>
<tr>
<td>Level 2</td>
<td>verb prefixes 9-12</td>
<td>Voicing Assimilation (levels 1-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palatalization (1-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D-Effect Rule (1-2)</td>
</tr>
<tr>
<td>Level 3</td>
<td>verb prefixes 7-8</td>
<td>L Deletion (level 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>s-Conjugation rules (2)</td>
</tr>
<tr>
<td>Level 4</td>
<td>verb prefixes 1-6</td>
<td>ŋ-Conjugation Fronting (level 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prefix Vowel Deletion (1-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conjugation Tone Mapping (levels 2-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>w Vocalization (2-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gamma Lowering (2-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schwa Deletion (post-lexical)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schwa Raising (post-lexical)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glottal Stop Insertion (post-lexical)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Devocalization (post-lexical)</td>
</tr>
</tbody>
</table>
```

As will be seen in the remainder of this chapter, the verbal prefixes generally occur in a fixed order relative to each other and to the verb stem. This is of some theoretical
interest. Pesetsky (1979) proposed that the word formation rules of a level are unordered with respect to each other, and that level ordering assignments are the sole means of accounting for restrictions on affix order. However, if this were true, it would be necessary to posit 14 lexical levels in Sekani to account for affix order restrictions. Alternatively, if phonological rule domains are made an essential criterion for level ordering, the Sekani lexicon can be reduced to four levels, which is surely a better result.

Having provided this level-ordered overview of the Sekani verbal morphology, I will now proceed to illustrate the correlation between phonological rule domains and restrictions on affix order. First, however, I would like to describe the way I will be glossing Sekani forms in this and subsequent chapters. The general format is given in (1):

\[
(1) \quad \text{pfx-pfx-pfx-stem-sfx} \quad \text{(underlying or intermediate reps)}
\]
\[
\text{asp S clf nom} \quad \text{(translation or category)}
\]
\[
9 \quad 12 \quad 13 \quad \text{stem} \quad \text{(prefix positions)}
\]
\[
\text{surface form} \quad \text{translation}
\]

In some examples, the surface form is identical to the underlying representation, and I have omitted the surface form. In most cases I provide intermediate, rather than underlying, representations of the prefixes and stems. I do this to suppress irrelevant phonological complexity, though I realize I do so at the risk of confusing the reader about the underlying shapes of morphemes.
3. Level 1

3.1 Morphology

Level 1 verbal morphology consists of the affixation of an aspectual suffix and/or a classifier prefix.

3.1.1 Aspectual stem suffixation

Verb stems are formed from roots through the addition of an aspectual suffix. In this section I provide only a brief summary of aspectual suffixation. For a complete discussion of aspect in an Athabaskan language see Rice (1983a) for Slave, Kari (1979) for Ahtna, Hardy (1979) for Navajo, or Leer (1979) for Proto-Athabaskan.

The suffixes divide verbs into categories like punctual, durative, conclusive, etc., suggesting that the suffixes are aspectual. It should be noted that the aspectual categories are not marked solely by these suffixes. Equally important is the choice of conjugation prefix (prefix position 10). In some cases a prefix from position 2, 4, 5, 6, or 9 occurs as well.

The phonological shapes of the suffixes of each aspectual category vary according to mode (see 4.1.2), and also according to the phonological shape of the verb root. Nasal-final and vowel-final roots often require a set of suffixes which is different from that required by obstruent-final roots to mark a given aspect.

Consider the following example. The perambulative aspect/customary mode suffix is phonologically -ts when suffixed to obstruent-final roots but -h when suffixed to vowel- and nasal-
final roots:  

(2)  /xe/  'pack'
     k'è-na-n  -d  -ghe -h
     per  C  2sS  clf  pack  rep/C
     2  5  12  13  stem
     k'ènqgeh  'you [sg] pack [O] around'

(3)  /shot/  'chase [O]'
     k'è-na-o  -n  -yot  -ts
     per  thm  2sS  chase  O  rep/C
     2  9  12  stem
     k'èniyots  'you [sg] chase [O] around'

I have illustrated three of the other aspects below using nasal- and vowel-final roots, in which the suffixes are phonologically more transparent.

**Conclusive.** This aspect marks verbs with a natural termination point. Typical examples are verbs such as 'shit', 'vomit', 'cook by boiling', etc. In the perfective, the conjugation prefix se is also required. In (4) I have listed the conclusive stems of the verbal root /xe/ 'kill [sg O]'. Notice that the phonological shape of the conclusive suffix varies according to mode, as mentioned above:

(4)  Imp  Pf  Fut  Op
    suffix:  -h  -n  -l  -l
    /xe/:  xeh  xì  xel  xel

**Durative.** Inherently durative actions like 'drink', 'eat', 'dance', 'pick berries', 'look at [O]', 'work' etc. require the conjugation prefix ghe in the perfective. By far the most common suffixation pattern for nasal- and vowel-final roots is
that given in (5):

(5) \[ \text{Imp Pf Fut Op} \quad -\emptyset \quad -^- \quad -^-l \quad -^-
\]

Some roots may lexically specify a different perfective suffix instead of 
\(^-^\), but this is rare. I have illustrated the suffixation pattern in (6) with the verbs /be/ 'pick berries' and /ta/
'look at [O]':

(6) \[ \text{Imp Pf Fut Op} \quad /\text{be/} : \quad b \quad bë \quad bël \quad bë
\text{/ta/} : \quad t \quad t \quad t\quad t\quad t\quad t\]

**Semelfactive.** Actions which are normally repeated are marked with the semelfactive aspect if performed exactly once. It is common for verbs such as 'poke', 'kick', 'slap', 'shoot', 'catch', etc., to have a repetitive as well as a semelfactive aspect derivation. Some verbs which inherently denote an action performed a single time, such as 'kindle fire', 'sneeze', have only a semelfactive aspect derivation. The aspectual prefix \( l \) occurs in the non-perfective modes. In the perfective, this prefix is absent and the conjugation prefix \( s\emptyset \) occurs instead. I have illustrated the suffixation pattern of the semelfactive aspect in (7), with the verbal root /k'an/ 'kindle fire':

(7) \[ \text{-h n l -} \quad /\text{k'an/} : \quad k\mathring{\text{q}}h \quad k'\mathring{\text{q}} \quad k'\mathring{\text{q}}l \quad k'\mathring{\text{q}}
\]

This aspectual suffixation process is unique in the verbal morphology: as will be seen, the verbal morphology is mainly prefixing. Consequently, affix order provides little evidence
for the place in the lexicon that aspectual suffixation occurs. Moreover, there is no evidence from phonological rule domains that the aspectual suffixes are added on level 1. Their role as stem-forming (and category-assigning) suffixes provides the best evidence for assigning these suffixes to an early level of the lexicon: they must be affixed before strictly verbal prefixes such as the level 2 subject prefixes.

It should be noted that the following data are consistent with an analysis in which these suffixes are added on level 1. The level 4 diminutive suffix -azi (Ch. 4, 3.2) may be added to verbal as well as nominal forms. The aspectual suffixes occur to the left of the diminutive suffix:

(8) chu gho-Id -d -dσ -` -azi 4
water Op 1dS clf drink dur:Op dim Op
11 12 13 stem

chu gho-dσazi 4 'we [du] have a little drink' Op

3.1.2 Classifier prefixes (prefix position 13)

The classifier prefixes are the rightmost of the verbal prefixes. They occur immediately to the left of the verb stem, as will be seen below. Evidence that the classifier prefixes belong on level 1, rather than level 2, is provided by the rule of Conjugation a Deletion (see Ch. 5, 1.3). I will describe the morphology of these prefixes in some detail here, since the form and function of the classifier prefixes is rather complex.

First, the traditional term 'classifier' is actually, as Krauss (1969) puts it, a "blatant misnomer". If anything, these prefixes mark verbal voice rather than noun classification.
Second, a brief comparative/historical note is in order. In Sekani, the classifiers are \( h \) and \( \_d \). In other Athabaskan languages (e.g. Navajo, Chipewyan), there are four classifier prefixes:

\[(9) \quad \emptyset, I, d, l\]

In Sekani, the \( h \) classifier is clearly a reflex of the \( I \) classifier. The \( \_l \) classifier is phonetically zero in Sekani, but it is useful to think of it synchronically as a voiced segment, as will be seen below. In the synchronic grammar of Sekani, there appear to be only the two classifiers \( d \) and \( h \). Many instances of the Sekani reflex of \( \_l \) are transparently derived from the classifier sequence \( d+h \), which suggests that all instances of synchronic \( \_l \) can be so derived.\(^3\) In glossing forms, however, I will sometimes use the abbreviation \( \_l \) for this classifier, where I am not illustrating its synchronic derivation from \( d+h \).

3.1.2.1 \( h \) (vs. \( \emptyset \)) classifier

In many forms which contain classifiers, the classifier appears to have no synchronic function, but is simply lexically specified. Compare the pairs in (10), (12), (14), and (15), which differ only in that an \( h \) classifier occurs in the \( (b) \) forms:

\[(10a) \quad \text{də -k'al} \quad 'he, she is white'\]
\[\quad \text{der be white}\]
\[\quad 9 \quad \text{stem}\]

\[\quad (10b) \quad \text{də -h -gās} \quad 'he, she is black'\]
\[\quad \text{der clf be black}\]
\[\quad 9 \quad 13 \quad \text{stem}\]
\[\quad \text{dahgās}\]

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(In (10b), the rule of Schwa Lowering has applied:

(11) \( a \rightarrow a \text{/}____\text{h}\text{]}\text{syll} \)

(12a) ni -de -i -n -?q
raise der der Pf handle compact 0
2 9 9 11 stem

\( \text{nid}i?q \) 'he, she lifted [compact 0]'

(12b) ni -de -i -n -h -tsž
raise der der Pf clf handle cloth-like 0

\( \text{nid}ihtsž \) 'he, she lifted [cloth-like 0]'

(In these latter forms, Prefix Vowel Deletion has applied:

(13) \( V \rightarrow 0 / ____ [V \)

See 5.2.1 for a more precise formulation of the rule.)

(14a) e -ghq
epen kill pl 0

\( \text{zahxh} \) 'he, she kills [pl 0]'

(14b) zə -h -xeh
thm clf kill sg 0
9 13 stem

\( \text{zahxh} \) 'he, she kills [sg 0]'

(15a) ì -gwæt
asp poke 0
9 stem

\( \text{ïgwæt} \) 'he, she pokes [0] once'

(15b) ì -h -t'æs
asp clf shoot 0 with bow and arrow
9 13 stem

\( \text{ïht'æs} \) 'he, she shoots [0] with bow and arrow once'

In the (b) forms above, the classifier \( h \) must be analyzed as part of the lexical entry of the verb.

In some forms, however, the surface classifier is synchronically derived by the morphology. For example, in the (b)
forms in (16), (17), (19), and (20), the classifier has a transitive or causative function:

(16a) ts'e-n -zit
    wake cnj wake up
  2  10 stem
    ts'eqzit  'he, she wakes up'

(16b) ts'e-n -h -sit
    wake cnj clf wake up
    ts'eqhsit  'he, she wakes up [O]'

(17a) nà -ne -n -ghêts
    down der Pf tree fall
  2  9  11 stem
    nânighêts  'a tree fell down'

(17b) nà -ne -n -h -xêts
    down der Pf clf tree fall
    nânîhxêts  'he, she pushed a tree down'

(The rule of Schwa Raising has applied in (17b):

(18) ə --> ɐ)

(19a) shêI se -ʔô
    trap cnj compact 0 be in position
  10 stem
    shêI seʔô  'a trap is set'

(19b) shêI se -i -h -ʔô
    trap cnj 1sPf clf compact 0 be in position
  10  12  13 stem
    shêI sihʔô  'I have a trap set'

(20a) chu -də -ne -ghe-n -məI
    water thm thm cnj Pf boil
  3  9  9  10  11 stem
    chudəneghîməI  'water boiled'
(20b) chu -de -nə -ghə-n -h -məl
water thm thm cnj Pf clf boil

chudənəgʰɨhməl
‘he, she boiled water’

In these pairs, no classifier occurs in the underlying representation; h is derived by a transitivizing word formation rule.

One rule which affects the h classifier should be mentioned. Phonetically, Sekani has no syllable-final consonant clusters.

(21) Cluster Simplification

C → ə / C __ l syll

The effect of this rule can be seen in the following forms:

(22a) chu -de -nə -s -h -məl
water thm thm 1sS clf boil
3 9 9 12 13 stem

chudənəsəməl
‘I boil water’

(22b) chu -de -nə -ah -h -məl
water thm thm 2pS clf boil

chudənahəməl
‘you [pl] boil water’

Compare (20b) with (22a-b) for evidence that the h classifier is present in these forms.

3.1.2.2 d classifier

When d classifier is prefixed to fricative- and glottal stop-initial verb stems, the following alternations occur:

(23) clf + stem-initial

d + ? → t'
d + z → dz
d + l → dl
d + y → j
d + gh → g

Most of these rules may be collapsed, of course. They are
referred to in the Athabaskan literature as the D-Effect Rule (Howren 1971). I will return to this rule in 3.2.2.

When $d$ classifier is prefixed to stem-initial consonants other than fricatives or glottal stop, it is deleted. Since the form of the classifier is often phonetically zero, it is not always obvious whether a verb contains an underlying $d$ classifier or not. However, several rules of the phonology are affected by $d$ classifier. Thus other rules help indicate whether /d/ is present underlingly. These other rules will be summarized in 3.1.2.4.

Like $h$ classifier, many instances of $d$ classifier are not predictable. In forms such as the following, $d$ classifier must simply be analyzed as part of the lexical entry of the verb in which it occurs. (As will be seen in 3.1.2.4, there are good reasons for not assuming that these verb stems are simply /gen/, /ts'e:t/ etc.)

(24) yidâ -ʔə -nə -s -d -ghì inside unspO cnj lsS clf pack O 2 7 10 12 13 stem
yidâʔənəsghì 'I packed something inside'

(25) nā -ghe -s -d -ts'e:t down cnj lsS clf.sg/du fall 2 10 12 13 stem
nâghësts'e:t 'I fell down'

(26) ʔə -ghe-s -d -bâ unspO cnj lsS clf children, animals eat 7 10 12 13 stem
ʔəghësbâ 'I ate something'
(27) ə -s -d -dli
epen cnj clf animate be cold
 10 13 stem
əsdli 'he, she is cold'

(28) ə -s -d -yq
epen cnj clf grow
 10 13 stem
əsjq 'he, she is old'

(29) ghə-s -d -shən
cnj lsS clf sing
 10 12 13 stem
ghəsən 'I sang'

In other forms, however, d classifier arguably has some sort of semantic function. Tenenbaum (1978) has suggested that the d classifier can be analyzed as a morpheme which marks action that reverses or turns back on itself. d classifier occurs in the following constructions:

- reflexives
- reciprocal forms
- intransitive forms containing na customary prefix
- intransitive forms containing nə 'back, again'
- passive forms

d classifier is perhaps a detransitivizing prefix. Some examples of d classifier in the constructions mentioned above are given below:

  reflexives:
(30a) ts'e-ʔənə-na -s -d -zit
  wake refl cnj lsS clf wake up
  2 7 10 12 13 stem
  ts'eʔənənəsdzit 'I wake myself up'

  cf.
(30b) ts'e-nə -s -sit
    wake cnj 1sS wake up
    ts'enəssit           'I wake up'

(31a) lə -gəa-ts'a-n -d -tsǔz
    recp P 1pS cnj clf handle cloth-like O
    1 1 8 10 13 stem
    lats'iitsǔz         'we gave each other [cloth-like O]'
    cf.
(31b) sə -gəa-nə -n -h -tsǔz
    1sO P cnj Pf clf handle cloth-like O
    1 1 10 11 13 stem
    sanɨhtsǔz           'he, she gave me [cloth-like O]'

(In (31), the gə-initial postposition has undergone the following rule:

(32) Gamma Loss
    gə --> ə/v [p ___ v]

The /ə/ of the object prefix is deleted by Prefix Vowel Deletion.)

reciprocal forms:

(33) ts'e-lə -gəa-nə -d -zət
    wake recp 3p cnj clf wake up
    2 7 8 10 13 stem
    ts'eIəghəldzət       'they woke each other up'
    cf. (30b)

(34a) ?əəə-zə -s -d -h -xɨ
    refl thm cnj clf clf kill sg O
    7 9 10 13 13 stem
    ?əəəɛəghxɨ          'he, she killed him-, herself'
    cf.
(34b) zə -s -h -xɨ
    thm cnj clf kill sg O
    9 10 13 stem
    zəhɛxɨ              'he, she killed [O]'
See 3.1.2.4 and 4.2.1 for a description of the rules which have applied in these forms (in particular, for an explanation of why /h/ but not /s/ surfaces in (34a,b)).

 na 'customary' and na 'back, again':

(35)  
\[
\begin{array}{c}
ts'e-na -n -d -sit  \\
\text{wake rev cnj clf wake up}  \\
2 & 5 & 10 & 13 & \text{stem} \\
ts'\text{enqdzit} & \text{\textquoteLEFT}he, she wakes up again\textquoteRIGHT
\end{array}
\]

(36)  
\[
\begin{array}{c}
ts'e-na-s -d -s\text{ets}  \\
\text{wake C 1sS clf wake up}  \\
2 & 5 & 12 & 13 & \text{stem} \\
ts'\text{enasdzets} & \text{\textquoteLEFT}I wake up habitually\textquoteRIGHT
\end{array}
\]

(In (35), the rule of a Raising (6.2.2) has applied:

(37)  
\[a \rightarrow o / \_\_ \_n\text{syll}\]

passive forms:

(38a)  
\[
\begin{array}{c}
na -nè -\text{ghè-s} -d -?àgh  \\
\text{rev thm cnj 1sS clf fool 0}  \\
5 & 9 & 10 & 12 & 13 & \text{stem} \\
nan\text{æghèst}\text{àgh} & \text{\textquoteLEFT}I was fooled\textquoteRIGHT
\end{array}
\]

cf. (38b)  
\[
\begin{array}{c}
da\text{en} na -sè -nè -\text{ghè-n} -?àgh  \\
\text{person rev 1sO thm cnj Pf fool 0}  \\
5 & 7 & 9 & 10 & 11 & \text{stem} \\
da\text{en nasènæghèt}\text{àgh} & \text{\textquoteLEFT}somebody fooled me\textquoteRIGHT
\end{array}
\]

(39a)  
\[
\begin{array}{c}
tl'\text{uL} na -nè -s -d -h -\text{xål}  \\
\text{rope rev thm cnj clf clf coil 0}  \\
5 & 9 & 10 & 13 & 13 & \text{stem} \\
tl'\text{uL} nan\text{ænhgåhèl} & \text{\textquoteLEFT}the rope is coiled\textquoteRIGHT
\end{array}
\]

cf. (39b)  
\[
\begin{array}{c}
tl'\text{uL} na -nè -s -h -\text{xål}  \\
\text{rope rev thm cnj clf coil 0}  \\
tl'\text{uL} nan\text{ænxåhèl} & \text{\textquoteLEFT}he, she coiled the rope\textquoteRIGHT
\end{array}
\]

To summarize, d classifier must be analyzed as part of the

84
lexical entry of some verbs. In other cases, however, the classifier can perhaps be regarded as marking semantically "detransitive" actions.

3.1.2.3 \( d+h \) (*1) classifiers

In examples like (39) above, the classifier sequence \( d + h \) surfaces as zero, phonetically. However, following Rice (1983a), I suggest that a phonologically voiced segment is created from this sequence instead:

\[
\begin{array}{c}
C \\
[+\text{voice}]
\end{array}
\]

As noted above, this segment is cognate with the \( l \) classifier in certain other Athabaskan languages. In 3.2.1 I will present evidence for the voiced nature of this segment.

Like the classifiers \( d \) and \( h \), many instances of the classifier sequence \( d+h \) must be regarded as part of the lexical entry of the verb in which it occurs. Some examples of such verbs are given in (41)-(47):

(41) \( i\ -s\ -d\ -h\ -y\!\!otl \)
\( \text{asp} \ isS\ clf\ clf\ swell\ up\)
\( \text{\(\&\)sy\!\!otl} \quad \text{"I swelled up"} \)

(The rule of \( i \) Lowering (4.1.4) has applied in (41):

(42) \( i \rightarrow e / \_{\{s\} \sim \{gh\}} \)

(43) \( n\!\!a^\* -n\!\!e -s\ -d\ -h\ -?i \)
\( \text{cont} \ \text{der} \ \text{cnj} \ \text{clf} \ \text{clf} \ \text{sneak around} \)
\( 2 \quad 9 \quad 10 \quad 13 \quad 13 \quad \text{stem} \)
\( \text{n\!\!n\!\!e\!\!h?i} \quad \text{"he, she sneaked around"} \)
(44) tà-s -d -h -tla
   up cnj clf clf sg/du run
   2 10 13 13 stem
   tàhtla 'he, she ran uphill'

(45) ka-nà -s -d -h -dzët
   P cont cnj clf clf hunt
   1 2 10 13 13 stem
   -kanàhdzët 'he, she hunted for [0]'

(46) ts'ë u -s -d -h -gët
   P asp cnj clf clf crawl
   9 10 13 13 stem
   -ts'ë ñhgët 'he, she crawled to [0]'

(47) ?ë -dø -s -d -h -gûge
    unspO thm 1sS clf clf squat
    7 9 12 13 13 stem
    ?ëdëhgûge 'he, she squats'

Like d classifier, the sequence of d+h classifiers is more often
than not phonetically zero. However, it is possible to ascer-
tain whether a verb has underlying d+h from its effects on rules
whose structural descriptions refer to one or the other of these
classifiers. I would now like to turn to these rules.

3.1.2.4 Phonological effects of the classifiers

The surface forms of three prefixes, /s/ first person
singular subject, /ah/ second person plural subject, and /se/
conjugation, vary according to which classifier prefix is pre-
sent.

3.1.2.4.1 /s/ 1s and /ah/ 2p subject prefixes

The 1s and 2p subject prefixes /s/ and /ah/ do not occur in
the perfective of verbs which contain h or Ø classifier. In-
stead, prefixes of the shape [i] and [a], respectively, occur:

\[
\begin{align*}
\{s \rightarrow i\} & \quad /{[+\text{Pf}]\ [\text{stem}]} \\
\{\text{ah} \rightarrow \text{a}\}
\end{align*}
\]

Compare the perfective forms in (49) and (50) with those in (51) and (52). In (49) and (50), the subject prefixes are uniformly [s] and [ah]:

\(\text{d} \text{ classifier:}\)

(49a) gə̞-s -d -shən
cnj 1sS clf sing
10 12 13 stem

ghə̞sgə̞n 'I sang'

(49b) ghahə̞ŋ 'you [pl] sang'

\(\text{d+h} \text{ classifiers:}\)

(50a) kə-nə -sə -s -d -h -dzət
P cont cnj 1sS clf clf hunt for O
1 2 10 12 13 13 stem

-kanə̞sə̞dzə̞t 'I hunted for [O]'

(50b) -kanə̞sə̞hdzə̞t 'you [pl] hunted for [O]'

However, in the \(\emptyset\) and \(\text{h}\) classifier forms below, the variants [i] and [a] occur instead:

\(\emptyset\) classifier:

(51a) gə̞-i -tə̞gh
cnj 1sPf cry
10 12 stem

ghitsə̞gh 'I cried'

(51b) ghatsə̞gh 'you [pl] cried'
h classifier:

(52a) ghɛ-i -h -t'ɔch
  cnj lSpF clf suck on O
 10 12 13 stem

ghɨht'ɔch        'I sucked on [O]'

(52b) ghâht'ɔch    'you [pl] sucked on [O]'

Thus the phonetic shape of the subject prefixes provides evidence about which of the classifiers is present underlyingly.

3.1.2.4.2 /sə/ conjugation prefix

While the occurrence of [s] or [ah] in perfective forms is sufficient to determine that either /d/ or /d+h/ is present underlyingly, the rule in (48) does not determine which of these classifiers is present underlyingly. It is also necessary to consider whether the stem initial consonant of the verb is a possible output of the D-Effect Rule. If it is not (i.e., if it is a fricative or [ʔ]), this suggests that the underlying classifier is /d+h/ (*1). However, if the stem-initial consonant is a possible output of the D-Effect Rule, it may still be the case that /d+h/ is present underlyingly. This can be determined from the surface form of the conjugation prefix /sə/.

The shape of this prefix is determined in part by which of the classifier prefixes is present. In forms where no prefix intervenes between the conjugation prefix and the classifier (3s, 1p, and 3p forms), the following rules apply to the intermediate representation [s] of the conjugation prefix /sə/:4

(53) Aspiration

s → h / ___ {h ?} [stem]
(54)  \(s\) Voicing
\[ s \rightarrow z / \_\_ \_ [\text{stem}] \]

Thus \([s]\) is preserved only before /d/ classifier. These rules are illustrated in the forms in (55)-(57):

(55)  \(s \rightarrow z\)

\[
\begin{array}{l}
\text{ta-}d\text{-}s \quad \_?q \\
\text{lose \ cnj handle compact 0} \\
\text{2 9 10 stem} \\
\end{array}
\]

\[\text{tad} z?q\] 'he, she lost [compact 0]'

(56)  \(s \rightarrow h\)

\[
\begin{array}{l}
\text{u -}z\text{-}s \quad -h \quad -ts'q \\
\text{thm thm cnj clf listen to 0} \\
\text{9 9 10 13 stem} \\
\end{array}
\]

\[\text{uz\_h}ts'q\] 'he, she listened to [0]'

The rule of Cluster Simplification has also applied in (56):

\[u-z\_s-h-ts'q\]

<table>
<thead>
<tr>
<th>Conjugation Tone Mapping</th>
<th>(\delta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>s-Conjugation Fronting</td>
<td>(\delta)</td>
</tr>
<tr>
<td>Aspiration</td>
<td>(h)</td>
</tr>
<tr>
<td>Cluster Simplification</td>
<td>(\emptyset)</td>
</tr>
</tbody>
</table>

\([\text{uz}\_h\_ts'q]\)

(Conjugation Tone Mapping and s-Conjugation Fronting will be discussed in 5.2.1.1 and 4.2.1.1.)

(57)  \(n\_n\_s \quad -s \quad -d \quad -h \quad -?i\_i\_

\[
\begin{array}{l}
\text{cont der cnj clf clf sneak} \\
\text{2 9 10 13 13 stem} \\
\end{array}
\]

\[\text{n\_n\_h}?i\] 'he, she sneaked around'

(58) indicates that \([s]\) is preserved before \(d\) classifier.
(58)  chu -nə -s -d -dq
  water term cnj clf drink
  3 9 10 13 stem

  chun₇sdq

Thus the phonetic shape of the conjugation prefix /sə/ provides
good evidence about which of the classifiers is underlyingly
present.

3.1.2.4.3 Summary

There are three kinds of evidence that determine which of
the classifiers is present underlyingly:

--verb stem initial consonant

--shape of 1s and 2p subject prefixes

--shape of /sə/ conjugation prefix

Often more than one kind of evidence is required to determine
with certainty that the classifier sequence /d+h/, rather than
/d/, is present underlyingly. The reader can now verify that
the forms in (41) and (43)-(47) do indeed contain /d+h/ classi-
fiers, and that those in (24)-(29) contain /d/ classifier.

3.2 Level 1 Phonology

In this section I discuss three phonological rules which
apply to stems but not to the verbal prefixes:

Voicing Assimilation
D-Effect Rule
Palatalization

These rules distinguish stems from prefixes, suggesting that
stems and prefixes are separate phonological domains.

3.2.1 Voicing Assimilation

Consider the following contrasts between voiced and voice-
less fricatives in stems:

(59a) -dəs
(59b) dəz

(60a) -ʔəl
(60b) ʔəl

(61a) ts'əx
(61b) -ts'əgh

'twist'
'driftwood'
'handle compact O' Fut/Op
'branches'
'juniper'
'yawn'

It is clearly necessary to posit an underlying contrast between voiced and voiceless fricatives in Sekani. Notice, however, that the examples in (59)-(61) are all of stem-final fricatives. Stem-initially, voiced and voiceless fricatives are in complementary distribution. This is true of noun and postposition stem-initial fricatives, as well as verb stem-initial fricatives, although, as Rice (1976) first observed, the voicing rule for nouns and postpositions cannot be collapsed with the rule for verbs. I will discuss the noun and postposition rule in Ch. 4, sec. 4.

Returning to verbs, stem-initial voiceless fricatives occur after voiceless segments, and voiced fricatives, after voiced segments. The following alternations occur:

(62) s ~ z
l ~ l
sh ~ y
x ~ gh
wh ~ w

These can be collapsed into the rule of Voicing Assimilation:
(63) Voicing Assimilation

\[ [+\text{voice}] [-\text{son}] \]

The need for this rule is apparent from consideration of forms like (64)-(68):

(64a) ?d\text{nè}-də-s -s\text{ðgh}
out der 1s\$ spit
2 9 12 stem

?d\text{nèdəssðgh} 'I spit'

(64b) ?d\text{nèdəzðgh} 'he, she spits'

Underlyingly, (64b) is identical to (64a) except that the position 12 subject prefix /s/ is not present in (64b). Thus the stem-initial fricative is voiced in (64b). Some additional examples of voicing fricative alternations are provided below:

(65a) ũ\text{yə} e -s -\text{I}_t
shy epen 1s\$ be

ũ\text{yə} as\text{I}_t 'I am shy'

(65b) ũ\text{yə} a\text{I}_t 'he, she is shy'

(66a) gha-?ə -nə -ah -shis
P unspO cnj 2p\$ scare 0
1 7 10 12 stem

-gha?ənahshis 'you [pl] scare [0]'

(66b) gha-?ə -ghə-n -yis
P unspO 3p\$ cnj scare 0
1 7 8 10 stem

-gha?əghi\text{yis} 'they scare [0]'

(67a) e -s -xq
epen 1s\$ kill pl 0

e\text{xq} 'I kill [pl 0]'
(67b) əghɔ          'he, she kills [pl 0]'

(68a) nà -s -whɔt  
    cont 1sS walk fast  
    náswhɔt          'I walk fast'

(68b) nàwɔt          'he, she walks fast'

3.2.1.1 Domain of Voicing Assimilation

We have seen that stem-initial fricatives participate in 
this voicing alternation. In prefixes, however, voiceless fri-
catives occur after a voiced segment. Examples of voiceless 
fricatives in prefixes of positions 3 and 6-10 are given in 
(69)-(74):

(69)  yə -sə -nə -ʔæs  
    thm cnj 2sS sneeze  
    7 10 12 stem  
    yəsʔæs          'you [sg] sneezed'

(70)  də -Iə -a -jîh -e  
    Fut thm Fut be sweet Fut  
    9 9 11 stem  
    dəlajîhe         'he, she will be sweet'

(71)  u -sə -nə -ʔ -be  
    thm 1dS thm 1dS pick berries  
    9 8 9 12 stem  
    usənÎbe          'we [du] pick berries'

(72)  hà -sə -gə-n -ts’i  
    adv 1sO cnj Pf pinch  
    2 7 10 11 stem  
    hàsəghîts’i      'he, she pinched me'
(73) ts'ē-whē -sa -nə -ī -n -h -set
cake incp 1sO der der Pf clf wake up
2 6 7 9 9 11 13 stem

ts'ēwhēsēnīhsēt 'he, she started to wake me up'

(74) hā -sa -na-də -l -d -ʔah
out sun C der der clf compact O habitually be in position
2 3 5 9 9 13 stem

hāsanadīt'ah 'the sun shines habitually'

The fact that voiceless fricatives occur after voiceless segments in prefixes indicates that Voicing Assimilation should apply only to stems. Moreover, the data in (59)-(61) indicate that Voicing Assimilation should be restricted to stem-initial fricatives.5

(75) Voicing Assimilation

\[
\begin{vmatrix}
\text{C} \\
\text{ [+voice]} \\
\text{[+cont]} \\
\text{ (-son)}
\end{vmatrix}
\]

stem

I return to the formulation of Voicing Assimilation in Ch. 5, 2.2.

3.2.1.2 Voicing Assimilation and the classifiers h and *₁ (d+h)

We have seen that prefixes may provide the context for Voicing Assimilation when it applies to stems. The classifiers, like other prefixes, serve as a context for Voicing Assimilation:

(76) e h -whāse
epen clf tickle O
13 stem

ahwhāse 'he, she tickles [O]'

However, the classifiers do not meet the structural description
of the rule and thus do not undergo it: d is [+cont]; h is [+cont] (see Ch. 1, 6.3) but [+son]. Thus Voicing Assimilation does not provide evidence that the classifiers should be grouped with stems, or with the other verb prefixes, for phonological purposes.

As mentioned in 3.1.2.3 above, the classifier sequence d+h gives rise to a segment which is phonologically voiced. Consider the following pairs, which differ in that the (a) forms contain h classifier but the (b) forms, d+h classifiers. (See 3.1.2.3 for underlying forms.)

(77a) tl'ul nanëhxâl
     'he, she coiled the rope'

(77b) tl'ul nanëngâl
     'the rope is coiled'

(78a) zënxî
     'he, she killed [sg 0]'

(78b) zëdzëxâhî
     'he, she killed him-, herself'

The (b) forms are superficially exceptions to the rule of Voicing Assimilation. They can easily be accounted for, however, if it is assumed that a phonologically voiced segment intervenes between the [h] (<sə>/; cf. 3.1.2.4) conjugation prefix and the stem-initial fricative. Thus the following rule applies to the classifier sequence d+h:

(79)  h Voicing:

        d + h  -->  C
       [+clf]   [+voiced]

A form like (77b) can thus be derived from the intermediate representation in (80) as follows. (I use the segment l as an abbreviation for the segment that results from h Voicing.)
(80)  na -nə -s -d -h -xãl
       rev term cnj clf clf coil O
       5  9  10 13 13 stem

       na -nə -s -d -h -xãl

h Voicing
Voicing Assimilation  gh
Aspiration  h

eventually  [nanêghãl]

3.2.1.3 Voicing Assimilation: summary

Voicing Assimilation provides evidence that stems and prefixes are separate phonological domains. Assuming that Voicing Assimilation applies only to syllable-initial fricatives, then the rule indicates that prefixes which have initial voiceless fricatives, like /sə/ conjugation in position 10, are not within the domain of Voicing Assimilation.

In the following sections I will consider additional rules which support the hypothesis that stems and verb prefixes are separate phonological domains.

3.2.2 The D-Effect Rule

Two prefixes, ð classifier and lð lð subject, cause the alternations referred to in 3.1.2.2 as the D-Effect Rule. Recall the alternations to be accounted for:

(81)  prefix + stem-initial

      d + z  -->  dz
      d + l  -->  dl
      d + y  -->  j
      d + gh -->  g
      d + ?  -->  t'

Most of these rules can be collapsed:
(82a) The D-Effect Rule

\[ \begin{array}{c}
\text{d} \\
\text{C} \\
\text{---- ----} \\
\end{array} \]

\[ \begin{array}{c}
\text{+cont} \\
\text{-son} \\
\text{-round} \\
\end{array} \]

(82b) \[ \begin{array}{c}
\text{d} \\
\text{C} \\
\text{---- ----} \\
\end{array} \]

Some examples of the D-Effect Rule are given in (85)-(89) below:

\begin{itemize}
  \item d+? \rightarrow t'
  \item ghuyə-gha-ʔə -sə -nə -ʔd -ʔə
  \begin{align*}
  &3pO \quad P \quad \text{unsp}O \quad 1dS \quad cnj \quad 1dS \quad \text{hire} \quad O \\
  \end{align*}
  \begin{align*}
  \text{ghuyəʔsəʔnəʔ} & 'we [du] hired them' \\
  \end{align*}
  \item \text{cf.}
  \item ye -gha-ʔə -nə -n -ʔə
  \begin{align*}
  &4sO \quad P \quad \text{unsp}O \quad cnj \quad Pf \quad \text{hire} \quad O \\
  \end{align*}
  \begin{align*}
  1 & 1 \quad 7 \quad 10 \quad 11 \quad \text{stem} \\
  \end{align*}
  \begin{align*}
  \text{yaʔsəʔ} & 'he, she hired him, her' \\
  \end{align*}
  \item d+z \rightarrow dz
  \item k'ə-na-d -zəʔt
  \begin{align*}
  &\text{per} \quad C \quad \text{clf} \quad \text{skate} \\
  \end{align*}
  \begin{align*}
  2 & 5 \quad 13 \quad \text{stem} \\
  \end{align*}
  \begin{align*}
  \text{k'ədəʔt} & 'he, she skates around' \\
  \end{align*}
  \item \text{cf.}
  \item nə -sə -zəʔt
  \begin{align*}
  &\text{cont} \quad cnj \quad \text{skate} \\
  \end{align*}
  \begin{align*}
  2 & 10 \quad \text{stem} \\
  \end{align*}
  \begin{align*}
  \text{nəsəʔt} & 'he, she skated around' \\
  \end{align*}
\end{itemize}

(The rule of Perambulative Reduction (6.2.2) has applied in (84a).)
\[ d+1 \rightarrow d \]

\[(85a)\]
\[
\text{che } -\text{na } -\text{ne } -\text{s } -\text{d } -\text{låt}
\]
\[
\text{water rev term cnj clf sink}
\]
\[
\begin{array}{cccccc}
2 & 5 & 9 & 10 & 13 & \text{stem}
\end{array}
\]
\[
\text{chenåsdålåt 'he, she sank again'}
\]
\[
\text{cf.}
\]
\[(85b)\]
\[
\text{che } -\text{ne } -\text{s } -\text{låt}
\]
\[
\text{water term cnj sink}
\]
\[
\text{chenåzlåt 'he, she sank'}
\]

\[ d+y \rightarrow j \]

\[(86a)\]
\[
\text{hå } -\text{na } -\text{då } -\text{så } -\text{s } -\text{ja}
\]
\[
\text{out rev forth cnj lsS sg go}
\]
\[
\begin{array}{cccccc}
2 & 5 & 9 & 10 & 12 & \text{stem}
\end{array}
\]
\[
\text{håndåesja 'I walked back out'}
\]
\[
\text{cf.}
\]
\[(86b)\]
\[
\text{hå } -\text{då } -\text{så } -\text{i } -\text{ya}
\]
\[
\text{out forth cnj lsPf sg go}
\]
\[
\text{hådåeya 'I walked out'}
\]

\[ d+gh \rightarrow g \]

\[(88a)\]
\[
\text{se } -\text{ghå-ld } -\text{ghåp}
\]
\[
\text{lsS cnj ldS kill pl O}
\]
\[
\begin{array}{cccccc}
8 & 10 & 12 & \text{stem}
\end{array}
\]
\[
\text{såghågp 'we [du] killed [pl O]'}
\]
\[
\text{cf.}
\]
\[(88b)\]
\[
\text{æ } -\text{ghåp}
\]
\[
\text{epeN kill pl O}
\]
\[
\text{æghåp 'he, she kills [pl O]'}
\]

The D-Effect Rule does not apply if the stem-initial consonant is \[w\]:

\[(89a)\]
\[
\text{se } -\text{ld } -\text{wåse}
\]
\[
\text{lsS ldS itch}
\]
\[
\text{såwåse 'we [du] itch'}
\]
\[
\text{cf.}
\]
\[(89b)\]
\[
\text{æ } -\text{wåse}
\]
\[
\text{epeN itch}
\]
\[
\text{he, she itches'}
\]

98
This seems odd. Since other rules treat [w] as a labio-velar, one would expect an alternation [w]—[gw] here. I will return to this curious fact in 3.2.2.2.

3.2.2.1 Domain of the D-Effect Rule

Verbal prefixes which end in /d/ are quite rare. In addition to d classifier and 1d 1d subject, the only d-final prefix that I know of is the incorporated stem gwæt /gɔd/ 'knee':

(89) nà -gwæd-ghæ-i -h -ki
down knee cnj 1sPf clf wound
2 3 10 11 13 stem
någwætgæihki 'I banged my knee'

(90) nà -gwæd-ghe-n -h -?a
down knee cnj Pf clf ?
någwætgæih?a 'I kneeled down'

The D-Effect Rule has not applied in these forms, even though the final /d/ of the incorporated stem 'knee' is followed by a voiced fricative. This suggests that the D-Effect Rule applies only to stem-initial fricatives and glottal stop. Thus the rule in (82) should be revised:

(91) The D-Effect Rule

\[ d \rightarrow \begin{cases} \text{stem} \\ \begin{cases} \text{+cont}, \\ \text{-son}, \\ \text{-round}, \\ \text{-} \end{cases} \\ \text{...} \end{cases} \]

\[ d \rightarrow \begin{cases} \text{stem} \\ \begin{cases} \text{?} \\ \text{-} \end{cases} \\ \text{...} \end{cases} \]

Assuming that rules which refer to morphological bracketing apply on the same level or a level which is adjacent to that of
the bracketing, the D-Effect Rule applies on levels 1 and 2, but not post-lexically.

3.2.2.2 The D-Effect Rule and the perfective prefix /n/

Additional data suggest that the formulation of this rule given in (91) and the proposed analysis of its domain should be revised. The segment that is the output of the D-Effect Rule is phonetically identical to affricate or t'-initial stems which do not contain the d classifier or ḷd ḷd subject prefixes. However, certain later rules must distinguish between stems containing d classifier and phonetically identical stem-initials that do not contain this prefix. For example, the prefixation of perfective /n/ (position 11) does not occur in d classifier forms:

(92)  k'ẽ -ts'ẽ-nẽ -n -t'ats
      in half lpe  cnj Pf cut
      k'ets'enit'ats          'we cut O in half'

(93)  yidã -na -ts'ẽ-n -d -ʔats
      inside rev lps  cnj clf du go
      yidogts'it'ats           'we [du excl] walked inside again'

The sequence d-ʔats must be distinguishable from t'ats at the point in the derivation that the perfective prefix is added.

The D-Effect Rule may be revised as follows:

(94)  The D-Effect Rule: d Delinking

\[ \begin{array}{c}
   \hat{d} \\
   \tilde{d}
\end{array} \begin{bmatrix}
   C \\
   \ldots
\end{bmatrix}_{\text{stem}} \]

On levels 1 and 2, d is simply delinked from its skeletal position. Post-lexically, this floating [d] is linked to stem-ini-
tial consonants:

(95) The D-Effect Rule: \( \_ \) Linking

(a) \[
\begin{array}{c}
\_ \_ \\
\_ \_ \\
\_ \_ \\
\_ \_ \\
\_ \_ \\
\_ \_ \\
\end{array}
\]

(b) \[
\begin{array}{c}
\_ \_ \\
\_ \_ \\
\_ \_ \\
\_ \_ \\
\_ \_ \\
\_ \_ \\
\end{array}
\]

If \( \_ \) Linking applies after Velar Loss (Ch. 1, 6.3), this will account for the failure of [w] to participate in the D-Effect Rule alternations, as do the other fricatives. Finally, any floating [d]’s will be deleted. This will account for the fact that the final \( \_ \) of the 1d subject and classifier prefixes does not show up on the surface before all stem-initial consonants.\(^9\)

Regardless of how the D-Effect Rule is formally stated, what is of most interest here is its domain. To summarize, the D-Effect Rule lexically links a \( \_ \)-final prefix to an adjacent stem-initial consonant. However, \( \_ \)-final prefixes cannot be linked to prefix-initial consonants. Thus, the D-Effect Rule provides additional evidence that stems and prefixes are distinct phonological domains.

3.2.3 Palatalization

Additional evidence that verb stems and prefixes are distinct phonological domains is provided by the rule of Palatalization. The stem-initial alveolar stops alternate with palatal affricates before the stem vowels \( \_ e u \):
<table>
<thead>
<tr>
<th>Imp</th>
<th>Pf</th>
<th>Fut</th>
<th>Op</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(96)</td>
<td>jëI</td>
<td>jet I</td>
<td>dëI</td>
<td>jëI</td>
</tr>
<tr>
<td>(97)</td>
<td>ji I</td>
<td>del</td>
<td>ji I</td>
<td>ji I</td>
</tr>
<tr>
<td>(98)</td>
<td>chh</td>
<td>tÌ</td>
<td>chh</td>
<td>tÌ</td>
</tr>
<tr>
<td>(99)</td>
<td>chës</td>
<td>chets</td>
<td>tës</td>
<td>chës</td>
</tr>
<tr>
<td>(100)</td>
<td>chës</td>
<td>ch'ægh</td>
<td>t'ës</td>
<td>chës</td>
</tr>
<tr>
<td>(101)</td>
<td>ch'ux</td>
<td>t'ogh</td>
<td>ch'ux</td>
<td>ch'ux</td>
</tr>
</tbody>
</table>

Palatalization accounts not only for these alternations, but also for the fact that stem-initial coronal stops are restricted in distribution, occurring only before the stem vowels /ë o ã/.

Thus Palatalization applies in non-derived as well as in derived environments:

<table>
<thead>
<tr>
<th>(102)</th>
<th>/deI/</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(102)</td>
<td>[jeI]</td>
<td>'crane'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(103)</td>
<td>/teh -kàI -ã/</td>
<td>into water flat psd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(103)</td>
<td>[chehkâlã]</td>
<td>'water lilies'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(104)</td>
<td>/t'ës/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(104)</td>
<td>[ch'ës]</td>
<td>'charcoal'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to the alternations above in which the verb stem contains an ablauting stem vowel, alternations between t' and ch' arise through the D-Effect Rule, providing additional support for the rule:
(105a) k'è -sə -də -i -ld -ʔəts
P:on ldS der der ldS step
k'èsdich'əts          'we [du] stepped on [O]'

(105b) k'è -də -də -ghə-ld -ʔəs
P:on der Fut Fut ldS step
k'èdədədghɨt'əs       'we [du] will step on [O]'

Thus the D-Effect Rule feeds Palatalization.

We have seen that stem-initial consonants undergo Palatalization. In fact, only stem-initial consonants may undergo Palatalization. Palatalization does not apply to stem-final alveolar stops:

(106) se -ləslet-ə
1sPsr dish psd
's my dish'

(107) jugheh  kədɨ
front side covering
'apron'

(108) se -bəd  -ə
1sPsr mittens psd
'my mittens'

(109) də -ghə-n  -tl'əd-e
Fut Fut 2sS fart Fut
dəɡhɨtl'əde          'you will fart'

Moreover, Palatalization does not apply in the verb prefixes:

(110) wə-də -i -dlət
ar thm thm be steep
7 9 9 stem
wəd̪lət             '[area] is steep'

(111) ta-də-s  -ʔə
lose cnj handle compact O
2 9 10 stem
tadəzʔə           'he, she lost [compact O]'
(112) ?dnè-de-u-s-inf.  q
out det Op 1sS spit Op
2 9 11 12 stem

?dnèduussq  q         'I spit' Op

Of course, in all of these forms, the sequences [di], [du], and
[de] are derived. The failure of Palatalization to apply here
could be a consequence of rule ordering:

?dnè-de-u-s-inf.  q

Palatalization
Prefix Vowel Deletion du

[?dnèduussq]

However, since Prefix Vowel Deletion is a levels 1-3 rule,
Palatalization must also be a lexical rule. As a lexical rule,
Palatalization applies to stem-initial coronals:

(113) \[
\begin{array}{c}
C \\
[+cor] \\
\end{array}
\begin{array}{c}
V \\
[\text{high}] \\
\end{array}
\begin{array}{c}
\ldots
\end{array}
\begin{array}{c}
\text{stem}
\end{array}
\]

In keeping with this hypothesis, notice that certain words
must be lexically marked as exceptions to Palatalization:

(114) dèbi             'Davie'
(115) dìmos dzene      'Sunday'

(114) and (115) are loan words, which might be expected to be
exceptional. One predicted characteristic of lexical rules, as
opposed to post-lexical rules, is that they may have lexically
marked exceptions.

3.3 Level 1: summary

I have summarized below the evidence presented here for
analyzing stems and prefixes as separate phonological domains:
<table>
<thead>
<tr>
<th>prefix</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voicing Assim.</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>y</td>
<td></td>
</tr>
<tr>
<td>D-Effect Rule</td>
<td>n</td>
<td>y</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palatalization</td>
<td>n</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\text{y = undergoes the rule}
\text{n = may not undergo rule}

The phonological evidence presented in this section suggests that the 1d subject prefix \_\text{1d} might be analyzed as \_\text{1}, co-occurring with the \_\text{d} classifier prefix in position 13, just as other prefixes require the \_\text{d} classifier.\textsuperscript{10} Thus only the \_\text{d} classifier triggers the D-Effect Rule. Now the prefixes of position 12 clearly do not belong in the same phonological domain as the stems:

<table>
<thead>
<tr>
<th>prefix</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voicing Assim.</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-Effect Rule</td>
<td>n</td>
<td>y</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palatalization</td>
<td>n</td>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The rule of L Deletion (4.2.2) will provide additional evidence that the prefixes of position 12 belong to the domain of the prefixes to their left, rather than that of the classifiers and stems. The rule of Conjugation \_\text{a} Deletion provides evidence that the classifier prefixes belong on level 1, as will be discussed in Ch. 5, \_\text{1.3}.\textsuperscript{11}
4. Level 2

4.1 Morphology

In this section I describe the level 2 prefixes. Although I refer to prefix positions throughout this dissertation, I believe that prefix positions have no formal status in the grammar of Sekani. Affixation is a word formation process, and restrictions on affix order can be accounted for by rule ordering. However, the position classes within the verb prefixes provide a convenient way of presenting the morphology, and of illustrating affix order restrictions. My presentation of affix order restrictions will take the form of showing that the prefixes of position $n$ occur to the left of those of position $n+1$. Evidence that the prefixes of position $n$ occur to the right of those of position $n-1$ can be found in the next section.

4.1.1 Subject (position 12)

Four prefixes occur in this position:

- [s, i] 1s
- [nə, n] 2s
- [i] 1d
- [ah, a] 2p

Examples of these prefixes can be seen in the following forms:

(116) ts'e-na-s -h -sit
      wake cnj 1sS clf wake up
      ts'enəsität
      'I wake up [0]'

(117) ts'e-na-n -h -sit
      wake cnj 2sS clf wake up
      ts'enɨhsıt
      'you [sg] wake up [0]'
(118) ts'e-sə -nə -l -d -h -zit
    wake 1sS cnj 1sS clf clf wake up
    ts'esənīzit        'we [du] wake up [O]'

(119) ts'e-nə -ah -h -sit
    wake cnj 2pS clf wake up
    ts'enahsisit       'you [pl] wake up [O]'

As can be seen in the preceding forms, the position 12
subject prefixes occur to the left of the classifier prefixes.
Some additional examples which illustrate this ordering restric-
tion are provided below:

(120) ø -s -d -shən
    epen 1sS clf sing
    øsjən        'I sing'

(121) ñ -ah -l -yōtl
    asp 2pS clf swell up
    ñhyōtl       'you [pl] swelled up'

4.1.2 Mode (position 11)

Like 'classifier', the traditional term 'mode' is something
of a misnomer. The three non-zero prefixes of the 'mode' posi-
tion mark most of the major tense/aspect distinctions in Sekani.
These prefixes are qho optative, qhe future, and n perfective.
A fourth category, imperfective, is not phonologically marked.
See Rice (1983a) for a discussion of the morphological and
semantic characteristics of tense, aspect and mode in Slave, a
closely related language.

Optative. The optative prefix /qho/ has a variety of
surface forms, which include qhu, u, wə and w as well as qho.
These are all derived by regular phonological rules.
The rule of Diphthongization in (122) has created the sequence [wə] in (123):

(122) o --> wə / velar ___

(123) gho-s -tsegħ
Op 1sS cry

[wsətsegħ] 'I cry' Op

Diphthongization is blocked before syllable-final n. Thus the underlying form of the optative prefix is preserved in 2s forms:

(124) gho-n -tsegħ
Op 2sS cry

[ghoːtsegħ] 'you [sg] cry' Op

In the 2p form below, Diphthongization creates the sequence [wə]. Then Prefix Vowel Deletion applies to [wə-ah], creating [wah]:

(125) gho-ah -tsegħ
Op 2pS cry

[wahtsegħ] 'you [pl] cry' Op

An additional rule is required to account for the 1d form in (127) below. This is the rule of o Raising in (126):

(126) o --> u / ___ i

(127) gho-ī -d-tsegħ
Op 1dS clf cry

[ghûtsəgħ] 'we [du] cry' Op

gho -ī-d-tsegħ
u
Prefix Vowel Deletion ∅
[ghûtsəgħ]

The rules which create the remaining surface form [u] of the optative prefix will be discussed in section 5.2.3.
Notice that the preceding forms all indicate that the optative prefix precedes the subject prefixes of position 12.

**Future.** The future mode is discontinuously marked by position 9 de and position 11 gha. In addition, an optional future suffix -e may also be present.

(128) ?e -de -gha-s -h -xñh
unspO Fut Fut 1sS clf snore
7 9 11 12 13 stem

?æðæghæsxñh 'I will snore'

(129) de -gha-n -dlñgh -e
Fut Fut 2sS laugh Fut

deghídłñgh 'you [sg] will laugh'

Like the optative forms, these future forms also indicate that the mode prefixes occur to the left of the position 12 subject prefixes.

**Perfective.** In surface forms, the perfective prefix /n/ can be seen as nasalization of the vowel of the conjugation prefixes gha and ne. The rule of ñ Raising has also applied in these forms:

(130) gha-n -dlñgh
cnj Pf laugh
10 11 stem

ghídłñgh 'he, she laughed'

(131) che -ne -n -ñQ
water cnj Pf handle compact 0

cheniñQ 'he, she put [compact 0] in water'

As mentioned in 3.2.2, the perfective prefix /n/ does not appear in perfective forms which contain the ñ or *l classi-
fiers. In addition, perfective /n/ is never present in surface forms if a subject prefix of position 12 occurs, or in forms which contain the conjugation prefix se. Thus there are no surface forms in which /n/ and the subject prefixes co-occur. /n/ is assigned to this prefix position because its function is similar to that of the other mode prefixes.

4.1.3 Conjugation (position 10)

Three prefixes occur in this position: ne, se, and ghe. These prefixes mark conjugation classes of modes. As seen in the perfective forms (130) and (131) above, the conjugation prefixes occur to the left of the mode prefixes. I have argued elsewhere (Hargus 1984), as has Rice (to appear), that the conjugation prefixes underlyingly co-occur with the future and optative mode prefixes in certain forms, forming conjugation classes of the optative and future modes. The interested reader is referred to the above sources for more information: the rules required to account for these paradigms are complicated and not really relevant to the discussion of level ordering.

I will briefly mention one rule which affects the conjugation prefixes here. In forms in which no prefixes intervene between the conjugation prefix and an optional classifier prefix, the /ə/-final conjugation and mode prefixes /sə/, /nə/ and /gə/ is deleted. I posit a rule of Conjugation ə Deletion:

\[ (132) \]
\[ ə \rightarrow \emptyset / V \left\{ \begin{array}{l} n \ 1 \\ s \ 2 \\ gh \ 3 \ \\
\text{([+cnj])} \ \\
\text{([+mod])} \end{array} \right. \]
I return to this rule in 5.2.5, where I present illustrative examples and discuss its domain.

4.1.4 Derivational (position 9)

The following prefixes are found in this position:

ts'ē ghe Iə u Ɂəə ze əə ne i

Some of these prefixes are "thematic": they occur in every derivation of a given verb. Such prefixes must be analyzed as part of the lexical entry of the verb. Others have aspectual meanings, and require a particular conjugation prefix and set of stem suffixes. Still others are neither thematic nor aspectual, but occur in semi-productive derivations. Historically, many of these prefixes marked noun gender class, as they still do in some of the Athabaskan languages, such as Ahtna (Kari 1979). (The gender system is a fairly limited one in Sekani.) One of the prefixes of this position, də future, is completely productive.

Unlike the prefixes of most of the other positions, more than one prefix from the derivational position may be present in a given verb form. As will be seen, the surface order of these prefixes with respect to each other and with respect to the positions 8 and 12 prefixes is predictable from the phonological shape of the derivational prefix. Some of the derivational prefixes in Sekani are unstable in position, suggesting that some of the derivational word formation rules are unordered with respect to other word formation rules. In some cases, I posit metathesis rules to account for the positional properties of
these prefixes.

4.1.4.1 Metathesizing prefixes

As just mentioned, some of the prefixes of this position metathesize with the prefixes of other positions. Some of these metathesis rules are optional, while others are obligatory. First consider the optional metathesis rules.

The vowel-initial prefix u and the first vowel of the prefix ñde optionally precede ts'ø 1p subject:

(133) ts'ø u [i
         8   9   -->   9   8

(134a) ñø -ts'ø-u -h -ch'ås
        unsp0 lps thm clf hook
         ?øts'uhch'ås
(b) ñø-u-ts'ø-h-ch'ås
         =?uts'ahch'ås    'we go fishing'

(135a) ts'ø-ïø-ø-sø-1 -?i
        lps der cnj clf hide
         8   9   10   13   stem
         ts'iïðë?ì    'we hide [O']
(b) í-ts'ø-ø-sø-1-?i
         =ïts'øðë?ì

The prefixes ñø ne ze optionally precede se 1d subject:

(136) se  ñø ne ze
         8   9   -->   9   8

112
(137) xəda se-ʔə-ɬ -d -h -ghɨ
moose 1ds thm 1ds clf clf kill sg 0
xəda se-ʔə-ɬi
'we [du] killed a moose'
xəda se-ʔə-ɬi

(138) ni -se -de-ɬ -d -ʔəh
raise 1ds der der 1ds clf handle compact 0
nisədiʔəh
'we [du] lift [compact 0]'
nisədiʔəh

(139) jɪje se -u -ne-ɬ -d -be
berry 1ds thm thm 1ds clf pick berries
usəniʔe
'we [du] pick berries'
usəniʔe

Now consider the obligatory metathesis rules. As can be seen in (139) above and (141) below, u always occurs to the left of se 1d subject. Iə also occurs to the left of se 1d subject.

(140) se  u  Iə
8 9  -->  9 8

(141) gha-se -u -ɬ -d -bəh
P 1ds asp 1ds clf swim
1 8 9 12 13 stem
-ghausəbəh
'we [du] swim past [0]'

(142) se -Iə -ɬ -d -jɨh
1ds thm 1d clf be sweet
8 9 12 13 stem
Iəsəjɨh
'we [du] are sweet'

The prefixes ts'ə gha always occur to the left of the subject prefixes of position 8:

(143) ts'
gh
8 9  -->  9 8

113
(144) dah-ts'ə-ghe-ə -d -tlah
    up 1pS thm cnj clf grab 0
  2 8  9  10  13 stem
dahghəts'atlah          'we grabbed [0]' 

(145) wə -ghe-ts'ə-də-h -dəne
    thm 3pS thm pl clf feel negative emotion
wəts'əghədahdəne         'they are lonesome'

(146) dah-na -sə -ghe-ı -d -tl'ỳ
    up rev 1DS thm 1DS clf tie'
  dahngəsətəl'ỳ          'we [du] tied up [0]' 

In 4.2.1.2 I will present an additional argument for this metathesis analysis.

Finally, a metathesis rule applies to the derivational prefix ı. However, before I can illustrate this metathesis rule, I must first introduce an additional rule:

(147) ı Lowering

ı → ø / ___ {s ?}  

This rule applies in forms like the following:

(148) ı -s -h -t'αs
    asp 1sS clf shoot 0 with bow and arrow
  9  12  13 stem
  əst'αs                  'I shoot 0 with bow and arrow'

(149a) na -ı -gho-n -gwət
    rev asp Op 2sS poke
naəghqgwət             'you [sg] poke 0 once again' Op

114
(150a) ã -gho-ah -chut  
    asp Op 2pS take O


Based on these data, one would expect the surface form [əghû...] in 1d optative forms which contain the prefixes ã derivational and ã 1d subject. However, instead of *[əghû...], the surface form [ghû...] occurs. Compare (149b) with (149a), and (150b) with (150a):

(149b) na -ã -gho-ã -d -gwæt  
    rev asp Op 1dS clf poke

   naghûgwæt  'we [du] poke [O] once again' Op

(150b) ã -gho-ã-d-chut  
    asp Op 1dS clf take O

   ghûchut  'we [du] take [O] carefully'

My analysis of the forms in (149, 150b) makes use of the independently needed rule of Prefix Vowel Deletion. Only the additional metathesis rule in (151) is required:

(151) ã gho ã  
    9 11 12 --> 11 9

This metathesis rule allows the ã prefixes to be adjacent at some point in the derivation, so that Prefix Vowel Deletion can remove one of the [ã] vowels:

ã-gho-ã-d-h-chut

Metathesis  -gho-ã-ã  
L Deletion   -gho-ã-ã  
o Raising    -ghu-ã-ã  
Prefix Vowel Deletion  -ghu-ã
   -ghû

eventually  [ghûchut]

(See 5.2.2.2 for a discussion of L Deletion.)
One might well question the need for the metathesis rule in (151). Why not simply order the derivational $\mathbf{\ddagger}$ word formation rule before the 1d subject $\mathbf{\ddagger}$ word formation rule? This would account for their surface order in optative forms:

(152)  
\[
\begin{align*}
&\text{derivational } \mathbf{\ddagger} \text{ word formation rule} \\
&\text{1d subject } \mathbf{\ddagger} \text{ word formation rule} \\
&\text{optative } \mathbf{\ddagger} \text{ word formation rule}
\end{align*}
\]

The order in (152) would not cause problems in other (non-optative) forms in which $\mathbf{\ddagger}$ derivational and $\mathbf{\ddagger}$ 1d subject co-occur.\textsuperscript{13} However, it creates an ordering paradox.

The 2s and 2p forms in (149a) and (149b) indicate that the derivational $\mathbf{\ddagger}$ word formation rule should follow the $\mathbf{\ddagger}$ optative word formation rule. Other forms indicate that this is the normal ordering of these word formation rules. Consider the 1s and 3s forms in (149c,d):

(149c) na -$\ddagger$ -gho-s -d -gwet  
rev asp Op 1sS clf poke

\[
\text{naуггвёт} \quad 'I \text{ poke [0] again'} \text{ Op}
\]

(149d) na -$\ddagger$ -gho-d -gwet  
rev asp Op clf poke

\[
\text{naуггвёт} \quad 'he, she pokes [0] again' \text{ Op}
\]

The 1d optative forms in (149, 150b) are clearly exceptional. Positing a metathesis rule eliminates the ordering paradox that (151) would entail, and limits the exceptional ordering of $\mathbf{\ddagger}$ derivational before $\mathbf{\ddagger}$ optative to 1d forms.

4.1.4.2 Relative ordering of derivational prefixes

Forms in which two or more derivational prefixes co-occur indicate that some of the prefixes occur in a fixed order with
respect to each other.

ghē precedes na and de:

(153) k'aghēnedah 'he, she staggers around'
(154) ghēdēst'sēt 'he, she ate up [O]'

u precedes zē and de:

(155) uzēnts'q 'he, she listens to [O]'
(156) jīje uđēnabēl 'he, she will pick berries'

Iē optionally precedes de:

(157) Iēdajīhe 'he, she will be sweet'
=deIajīhe

de precedes na and zē:

(158) ?ađēnēghīts'ile 'you [sg] will get sick from eating too much fat'
(159) dēzahxeīl 'he, she will kill [sg O]'

ne and de precede ī:

(160) whēnītsēgh 'he, she started to cry'
(161) dīgāy 'it turned white, light'

These ordering restrictions are summarized in (162):

(162) gh _ n
    > d > ī
    u _ z

I assume that this restriction determines the order in which the derivational word formation rules apply. In the case of de and Iē, no ordering restriction is stated; thus these prefixes may be affixed in either order.

4.1.4.3 Conclusion

In a position class analysis, the Sekani verbal prefixes would be assigned to a single position underlyingly, with op-
tional and obligatory) metathesis rules determining surface order. If the verb prefixes were assigned to discreet positions, one would need five prefix positions, as in (163):

(163) 4 5 6 7 8 9
  ts'ə  ts'ə  u  ŋə  ŋə  ᶠ
  ghe  ghe  ɬə  ᵁə  ᶟə  zə

While this analysis would account for most of the facts about surface order, it would require an additional four prefix positions. Moreover, the optional metathesis rules (133) and (132) would still be necessary, and the disappearance of ᶠ in 1d optative forms would be unaccounted for.

In a word formation rule analysis of these prefixes, it is unnecessary to worry about the number of prefix positions that may be present underlyingly. However, in such an analysis, the metathesis rules in (151) and (143) are still required. As discussed above, the metathesis rule (151) avoids an ordering paradox. The data that I will present in 4.2.1.2 provide additional evidence for the ghe and ts'ə metathesis rules in (143).

4.2 Level 2 (vs. 3) Phonology

As will be seen in 5.2, many rules of the phonology distinguish level 4 from levels 2 and 3. In contrast, the evidence for a distinction between levels 2 and 3 is provided by only two rules.

4.2.1 The s-conjugation

As will be illustrated in section 5.2.1.1, the conjugation prefix sa has a segmental as well as a tonal representation.
The rules which affect the segmental representation of this prefix indicate that the prefixes of position 9 should be distinguished from those of positions 7 and 8.

Phonologically, the most complicated paradigms in Sekani are s-conjugation paradigms. I would first like to illustrate the rules required to account for these paradigms, and then consider their domains.

In (164), I have provided a typical s-conjugation paradigm.

(164a) tse tl'ō -de -sa -s -leh
rock circle der cnj lsS handle pl 0
3 9 10 12 stem

tse tl'q̣ḍësesleh 'I put rocks in a circle'

(164b) tse tl'ō -de -sa -n -leh
rock circle der cnj 2sS handle pl 0
3 9 10 12 stem

tse tl'q̣ḍëq̣leh 'you [sg] put rocks in a circle'

(164c) tse tl'ō -de -sa -Ieh
rock circle der cnj handle pl 0
3 9 10 stem

tse tl'q̣ḍësleleh 'he, she puts rocks in a circle'

(164d) tse tl'ō -de -sa -i -d -leh
rock circle der cnj 2sS clf handle pl 0
3 9 10 12 13 stem

tse tl'q̣ḍësìyeh 'we [du] put rocks in a circle'

(164e) tse tl'ō -de -sa -ah -Ieh
rock circle der cnj 2pS handle pl 0
3 9 10 12 stem

tse tl'q̣ḍëahleh 'you [pl] put rocks in a circle'

This paradigm has several unusual characteristics which I would
like to draw attention to. First, vowel sequences, which are quite rare in Sekani, appear in some of the members of this paradigm. Second, the vowel which precedes the conjugation prefix is \( e \), rather than \( a \), in the 1s, 2s and 3s forms. Third, the \( s \) of the conjugation prefix is absent, except in the 1d and 3s forms. All of these characteristics must be accounted for.

Let us first tackle the fact that the prefix which precedes the conjugation prefix contains the vowel \( [e] \) in all but 1d and 2p forms, although it is underlyingly \( [a] \). To do this, we can make use of the fact that in all but the 1d forms, the low tone of the conjugation prefix appears on the preceding prefix. (As I will show in 5.2.2.1, it is normal for the tone of the conjugation prefixes to be absent in 1d forms.) Thus we can formulate the rule in (165):

\[
(165) \quad s - \text{Conjugation} \quad \text{e Fronting}
\]

\[
\begin{array}{c}
L \\
\text{e} \rightarrow \text{e} / \_\_ \_ \text{s}
\end{array}
\]

Now the 3s form can be derived as follows:

\[\text{tl'q-de-sa-leh}\]

Conjugation \( e \) Deletion \( \emptyset \)
\( e \) Fronting \( e \)
Voicing Assimilation \( e \) \( I \)

[tl'qdsleh]

Although the inclusion of the tone in the context of this rule does not generalize to other Athabaskan languages, it seems to account well for the exclusion of the 1d form in Sekani.

Next, we need to account for the fact that the \( s \) of the
conjugation prefix is absent in 1s, 2s and 2p forms:

(166) Conjugation s Deletion

\[ s \rightarrow \emptyset / e \_ \_ \_ V \]

Since the rule applies only to intervocalic [s], it will be blocked from applying in 3s forms. By including [e] in the context of the rule, (166) will be prevented from applying to 1d forms. Thus this rule will apply to 1s forms as follows:

\[ tl'q-d\_s-e-s-Ieh \]

\[ e \text{ Fronting} \]
\[ Conjugation s Deletion \]
\[ \emptyset \]

In order to derive the long vowel in this and other forms, Prefix Vowel Deletion must precede Conjugation e Deletion:

\[ tl'q-d\_s-e-s-Ieh \]

\[ e \text{ Fronting} \]
\[ Prefix Vowel Deletion \]
\[ Conjugation s Deletion \]
\[ \emptyset \]

\[ [tl'q\_d\_e\_es\_Ieh] \]

Finally, two vowel assimilation rules are required. One rule will assimilate e to following a, as required by the 2p forms:

(167) Assimilation to a:

\[ e \rightarrow a / \_ \_ \_ a \]

\[ tl'q-d\_e-s\_a-h-Ieh \]

\[ e \text{ Fronting} \]
\[ Prefix Vowel Deletion \]
\[ Conjugation s Deletion \]
\[ \emptyset \]
\[ Assimilation to a \]
\[ a \]

\[ [tl'q\_d\_a\_ah\_Ieh] \]

We will also need an Assimilation to e rule for 1s and 2s forms.
(168) Assimilation to e

V $\rightarrow$ e / e __

This rule will apply not only to the 1s and 2s forms in (164a,b)
above, but also to forms in which the 1s perfective prefix [i]
is present underlyingly, as in (169):

(169) tse tl'q -də -sə -i -la
rock circle der cnj 1sPf handle pl 0
2 9 10 12 stem

0 tse tl'q-də-s-i-la
I put rocks in a circle

a Fronting e
Prefix Vowel Deletion --
Conjugation s Deletion Ø
Assimilation to $e$ e

[tl'q-də-s-i-la]

To summarize, the following new rules are required to
account for these s-conjugation paradigms:

(170) s-conjugation rules

s-Conjugation a Fronting
s Deletion
Assimilation rules:
Assimilation to a
Assimilation to $e$

4.2.1.1 Domain of s-Conjugation Fronting

The data in the preceding section involved an s-conjugation
paradigm in which the conjugation prefix was preceded by a
prefix of position 9.15 Now consider a paradigm in which the se
conjugation prefix is preceded by prefixes of positions 7 and 8.
In (171), the s conjugation prefix is preceded by ye, position
7, and in (172), the position 8 prefixes ts'ə and qhe precede
the conjugation prefix.
(17la) ye -sə -i -ʔ às  
thm cnj isPf sneeze  
7  10  12  stem  
ýəsiʔàs  'I sneezed'  

(17lb) ye -sə -n -ʔ às  
thm cnj 2sS sneeze  
7  10  12  stem  
ýəsiʔàs  'you [sg] sneezed'  

(17lc) ye -sə -ʔ às  
thm cnj sneeze  
7  10  stem  
ýəzʔàs  'he, she sneezed'  

(17ld) ye -sə -î -ʔ às  
thm cnj 1dS sneeze  
7  10  12  stem  
ýəsɨʔàs  'we [du] sneezed'  

(17le) ye -sə -ə -ʔ às  
thm cnj 2pS sneeze  
7  10  12  stem  
ýəsaʔàs  'you [pl] sneezed'  

(172a) ye -ts'ə-sə -ʔ às  
thm 1pS cnj sneeze  
7  8  10  stem  
ýəts'àzʔàs  'we sneezed'  
(172b) yəghàzʔàs  'they sneezed'  

The forms in (171) and (172) should be compared with those in (164) above. Notice that none of the _s_-conjugation rules listed in (170) have applied in the forms in (171) and (172): the _s_ of the conjugation prefix has not been deleted in the 1s, 2s and 2p
forms, and the vowel which precedes the conjugation prefix is e, not e, in the non-1d forms.

These data indicate that the domain of the s-Conjugation rules should be restricted to include the prefixes of position 9 but not those of positions 7 and 8. The leftmost prefix position included in the level 2 domain is the derivational prefix position:

\[
\begin{array}{ll}
\text{subject} & \text{derivational} \\
8 & 9 \\
\text{level 3} & \text{level 2}
\end{array}
\]

Since s-Conjugation Fronting applies before the other s-Conjugation rules, such as s-Deletion, one might assume that only its domain needs to be restricted to level 2. The other rules would not apply to the prefixes of positions 7 and 8 because their structural descriptions are not met:

\[
y\text{å}-\text{så-n-?ås}
\]

\[
s \text{Conjugation Deletion}
\]

\[
\text{Assimilation to e}
\]

\[
y\text{åså?ås} \quad \text{'you [sg] sneezed'}
\]

However, there is additional evidence that the other rules shut off before level 4. In the following forms, notice that the vowel which precedes the sa conjugation prefix is å; yet s-Deletion has not applied:

(173) \[
I\text{å} \quad -så -tl'å
\]

in 2 cnj tie
2 10 stem

\[
iåsatl'å
\]

'he, she tied a knot'
(174) na -gɔts'ɛlɛ-sə -i -h -kah
rev elbow  cnj 1spf clf wound
5 3 10 11 13 stem

nagɔts'ɛlɛsihkəh 'I banged my elbow again'

And in the following forms, Assimilation to a and Assimilation
to e have not applied:

(175) ʔədələ e-ah -kwi
blood  P 2ps vomit
1 12 stem

ʔədələ eahkwì 'you [pl] vomited blood'

(176) mə -ghɔh-k'e-ìji -nə -n -ts'ets
3s0 P adv mind thm 2sS think
1 1 2 3 9 12 stem

məghk'ejjiniṭs'ets 'you [sg] think about him'

I leave it as an open question whether or not s Deletion and the
Assimilation rules shut off after level 2 or after level 3.

4.2.1.2 s Conjugation Fronting and the rules of metathesis

As mentioned in 4.1.4, the s-conjugation rules provide
additional evidence that the metathesis rule involving ts'e qhe
derivational prefixes and the position 8 subject prefixes is
required. The evidence I will present here indicates that
surface order cannot be equivalent to underlying order.

As just discussed, the rule of s Conjugation Fronting ap-
plies to position 9 prefixes but fails to apply to the position
8 prefixes. Of interest here is the following s-conjugation
paradigm, which contains qhe derivational prefix. In (177a)-(e)
I have provided the 1s, 2s, 3s, 1d, and 2p forms of this para-
digm. Comparison of these forms with those in (164) indicates
that qhe clearly patterns like the other position 9 prefixes:
(177) tlį dah-na -ghə-se -s -d -tl'ŋ
    up  rev der cnj 1sS clf tie
    2  5  9  10  12  13 stem

(a)  tlį dahnaghęestl'ŋ  'I tied up the dog'
(b)  tlį dahnaghętstl'ŋ  'you [sg] tied up the dog'
(c)  tlį dahnaghęstl'ŋ  'he, she tied up the dog'
(d)  tlį dahnaghəstl'ŋ  'we [du] tied up the dog'
(e)  tlį dahnaghəahtl'ŋ  'you [pl] tied up the dog'

The rules of s-Conjugation Fronting, s Deletion, and Assimilation to e and to a have applied in the appropriate cases. If derivational ghe were added after the position 8 subject prefixes ts'e 1p and gha 3p, as its surface order suggests, one would not expect the s-conjugation rules to have applied here.

The 1p and 3p members of this paradigm provide even better support for this analysis:

(177) tlį dah-na-ts'e-ghə-se -d -tl'ŋ
    dog up rev 1pS der cnj clf tie
    2  5  8  9  10  13 stem

(f)  tlį dahnaghets'ëstl'ŋ  'we tied up the dog'
(g)  tlį dahnaghəghəstl'ŋ  'they tied up the dog'

As predicted by the rules in 4.1.4, the surface order of ghe with respect to the position 8 subject prefixes is ghe+subject in these forms. But it is clear from the fact that the s-Conjugation rules have applied here that the prefix which precedes se at the point in the derivation that the s-conjugation rules apply cannot be ts'e. If that were the case, the s-Conjugation rules would not have applied: as seen in (171) and (172) above, they do not apply when the prefix which precedes

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the $s\ e$ conjugation prefix is $ts'e$ or $gh\ e$. Clearly, the easiest way to account for the forms in (177f,g) is to assume that $gh\ e$ is a position 9 prefix, thus making use of the independently required $s$-conjugation rules. Now only a rule of metathesis, which applies after the $s$-conjugation rules, is required:

(178)     dah-na-ts'\ e-gh\ e-s-d-tl'\ y

Conjugation Tone Mapping
(see 5.2.2.1)
$s$-Conjugation Fronting
Metathesis

\[ [dahnah\ e\ e\ ts'\ e] \]

Moreover, this derivation sheds light on the particular form of the metathesis rule that is required. Metathesis cannot move entire morphemes. If so, $*dahnah\ e\ e\ ts'\ e\ tl'\ y$ would result.

Metathesis must move consonants only:

(179)     ts'
(=143)     gh

\[ 8 \ 9 \ \rightarrow \ 9 \ 8 \]

It is still necessary to restrict this rule to certain morphemes, however, as informally indicated by the position class labels. The metathesis rule in (179) does not apply to the prefixes $gh\ e$ conjugation or $gh\ e$ mode, for example:

(180)     na -ts'\ e-gh\ e-n -h -\ x\ e
rev lpS cnj Pf clf melt

\[ nats'\ egh\ h\ x\ e \]

'we melted, thawed [0]'

Without the metathesis rule in (179), it will be difficult to account for the fact that $s$ Conjugation Fronting is allowed to apply to the lp form in (177), though not in most lp forms. This analysis has certain theoretical implications as well. In
the derivation in (178), the phonological rule of s-conjugation
Fronting must precede the morphological rule of metathesis.
This derivation provides support for the Lexical Phonology mo-
del: these data would not easily be accounted for in a model in
which all phonological rules follow all morphological rules.

4.2.2 The n-Conjugation

Additional evidence for a level ordering distinction to the
left of prefix position 9 is provided by the n-conjugation.

In this section, I will be concerned with the domain of the
following rule:

(181) \( n\)-Conjugation \( \_\) Fronting

\[
\begin{array}{c}
L \\
\varepsilon \rightarrow e / \quad n \] \\
\text{syl1}
\end{array}
\]

First consider a typical n-conjugation paradigm which con-
tains a position 9 prefix:

(182a) che -chue -ne -n -s -l -tla
into water water der cnj 1sS clf sg/du run
2 3 9 10 12 13 stem
checuchudanəstla 'I ran into the water'

(182b) che -chue -ne -n -l -tla
into water water der cnj 2S S clf sg/du run
chechudanɨnɨtla 'you [sg] ran into the water'

(182c) che -chue -ne -n -l -tla
into water water der cnj clf sg/du run
chechudetla 'he, she ran into the water'

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(182d) che -chu -sə -də -nə -l -tla
into water water 1dS der cnj 1dS clf sg/du run
chechusədənɪtla 'we [du] ran into the water'

(182e) che -chu -də -nə -ah -l -tla
into water water der cnj 2pS clf sg/du run
chechudənahtla 'you [pl] ran into the water'

In the 3s form in (182c), Conjugation ø Deletion has applied, the result of which is that the n of the conjugation prefix becomes the coda of the preceding syllable. Thus the only forms in which n-Conjugation Fronting can apply are 3s forms:

che-chu-də-nə-1-tla

Conjugation ø Deletion 0
Conjugation Tone Mapping ə
n-Conjugation Fronting e
Nasalization .handleClick

[chechudəntla]

Not all syllable-final instances of the conjugation prefix [n] undergo this Fronting rule: only those which are the coda of position 9 prefixes. Compare the following forms:

(183) ts'e-ghu-ts'ə-nə -h -sit
wake 3pO 1pS cnj clf wake up
2 7 8 10 13 stem
ts'eighamts'ɪhsit 'we wake them up'

(184) ts'e-ə-gə-na -h -sit
wake 1sO 3sS cnj clf wake up
2 7 8 10 13 stem
ts'esəghɪhsit 'they wake me up'
(185) ts'e-se-nə-h -sit
    wake 1sO cnj clf wake up
    2  7 10 13 stem
    ts'esʰhsit          'he, she wakes me up'

(186) yə-chq-ʔə-nə-leh
    4sPsr guts unspO cnj handle pl 0
    yəchqʔičleh          'he, she takes its guts out'

In the preceding forms, the conjugation prefix forms the coda of a prefix in positions 7 and 8. In these forms, however, the rule of ə Raising has applied instead of n-Conjugation ə Fronting:

(187) ʔ --> i

Because ə Raising is insensitive to word-internal structure, I assume that it is a post-lexical rule. ([ʔ] does not occur in Sekani.) Thus (186) is derived as follows:

    yə-chq-ʔə-nə-leh

Conjugation ə Deletion      Ø
Nasalization                ʔ
ə Raising                    i

[yəchqʔičleh]

Actually, my data show some variation in this area. At least two of the position 7 prefixes may undergo n-Conjugation ə Fronting:

(188) kəh sə-qha-wə-n -ʔəh
    house 1sO P ar cnj handle compact O
    1 1 7 10 stem
    kəh sawʔəh            'he, she gives me a house'
The strongest generalization about level ordering consistent with these data is the following: in the position 9 prefixes, a Fronting always applies when the conjugation prefix is the coda of the preceding syllable, whereas in the level 3 prefixes, some prefixes may be exceptionally marked as undergoing n-Conjugation Fronting. Thus the rule of n-Conjugation Fronting provides additional evidence, though of a slightly weaker sort, for a level ordering distinction to the left of th prefixes of position 9.

4.3 Level 2: summary

The Conjugation Fronting rules discussed here provide evidence for a level ordering division to the left of the position 9 prefixes. However, as will be seen in 5.2.1.1, this phonological evidence has not actually determined that the prefixes of position 8 belong with those of level 3, rather than with those of level 2. The subject prefixes of position 8 routinely fail to undergo the rule of Conjugation Tone Mapping; if they do undergo tone mapping, it is not until the cycle after the Fronting rules would apply. Thus the Conjugation Fronting rules would be expected not to apply to the position 8 prefixes even if they were within the level 2 domain, just as it does not apply in 1d forms.

Future research may, or may not, determine whether or not
the position 8 prefixes are level 2 or level 3 prefixes. For
the present, I will continue to assume that the position 8
prefixes are within the level 3 domain.

5. Level 3

5.1 Morphology

5.1.1 Subject (position 8)

Three prefixes occur in this position:

- **ghǝ** animate plural
- **ts'ǝ** 1p, 1d exclusive; unspecified subject (rare)
- **sǝ** 1d inclusive

These prefixes precede the position 9 prefixes except as noted
in 4.1.4:

(190a) **ts'ǝ- nǝ - d - dash**

1pS thm clf dance
8 9 13 stem

ts'ǝnǝdash ‘we dance’

(190b) **ghǝnǝdash** ‘they dance’

(190c) **sǝ - nǝ - I - d - dash**

1dS thm 1dS clf dance
8 9 12 13 stem

sǝnǝdash ‘we [du] dance’

The category of 1d subject is marked discontinuously by sǝ in
position 8, as well as by I-d in positions 12 and 13. Position
8 sǝ and the conjugation prefix sǝ are in complementary distri-
bution in 1d forms (also cf. 4.2.1). As Story (1980) has poin-
ted out, the 1d subject prefix sǝ is historically derived from
the conjugation prefix.
5.1.2 Object (position 7)

The object prefixes inflect the verb for person and number of object. Several prefixes occur in this position:

(191) sg du pl

1 sə nə xə whə /xə/
2 nə nə nə
3 ghu(γə)
4 γə ghi(γə)

refl ?αδε
recp Iə
area ω /gho/
unsp ?α

The 4th person is an anti-reflexive category (Ch. 4, 4.1). The prefix ω (/gho/) area is a gender prefix. Its occurrence is obligatory if the theme of the sentence denotes an area.\textsuperscript{16}

The object prefixes occur to the left of the position 8 subject prefixes:

(192) Iə -γh-a-d -gək
recp 3pS clf massage
7 8 13 stem

Iəgəhəgək 'they massage each other'

(193) ghu-ts'ə-də -ɪ -ts'əgh
3pO 1pS thm thm hear
7 8 9 9 stem

ghuts'ədɪts'əgh 'we hear them'

(194) ?α -γh-a -d -bə
unspO 3pS cnj clf children, animals eat
7 8 10 13 stem

?əghabə 'they ate something'
(195) ghuya-ghə-s -gwət
3pO 3pS cnj poke
7 8 10 stem
ghuyaghəzgwət 'they poked them'

(196) wə-sə -l -d -h -tłəgh
ar 1dS 1dS clf clf rub with medicine
7 8 12 13 13 stem
wəsîtłəgh 'we [du] rub [area] with medicine'

5.2 Levels 2 and 3 Phonology

Most of the phonological rules of (what I will argue are) levels 2 and 3 are identical. The phonological evidence presented in this section will suggest that a level ordering distinction (between levels 3 and 4) occurs to the left of prefix position 7.

5.2.1 Prefix Vowel Deletion

5.2.1.1 Formulation of Prefix Vowel Deletion

I mentioned above that Sekani has a rule of Prefix Vowel Deletion, which reduces sequences of vowels to a single vowel. Prefix Vowel Deletion actually consists of two rules, given in (197).

(197) Prefix Vowel Deletion

(a) ə --> ə % ___ V
(b) i --> ə % ___ V

(a) is ordered before (b).

(198) ə + i --> i

\text{ts'ə-İ} -yəI
1pS asp swell up
8 9 stem
\text{ts'ıyəI} 'we swell up'
(199) \( i + i \rightarrow i \)

\[
\begin{array}{cccc}
\text{se} & i & -i & -d & -l & -yöI \\
\text{idS asp idSclf clf swell up} & 8 & 9 & 12 & 13 & 13 \text{ stem} \\
\end{array}
\]

\( sîyöI \) \quad \text{'we [du] swell up'}

(200) \( u + i \rightarrow u \)

\[
\begin{array}{cccc}
\text{ghu} & -i & -d & -tsægh \\
\text{Op idSclf cry} & 11 & 12 & 13 \text{ stem} \\
\end{array}
\]

\( ghûtsægh \) \quad \text{'we [du] cry'}

(201) \( ø + a \rightarrow a \)

\[
\begin{array}{cccc}
\text{de} & -ah & -bêt \\
\text{thm 2pS be hungry} & 9 & 12 \text{ stem} \\
\end{array}
\]

\( daₗbêt \) \quad \text{'you [pl] are hungry'}

(202) \( i + a \rightarrow a \)

\[
\begin{array}{cccc}
\text{i} & -ah & -yöI \\
\text{asp 2pS swell up} & 9 & 12 \text{ stem} \\
\end{array}
\]

\( åhyöI \) \quad \text{'you [pl] swell up'}

(203) \( ø + u \rightarrow u \)

\[
\begin{array}{cccc}
\text{ts'œ-u} & -tôn \\
\text{1pS thm hold 0} & 8 & 9 \text{ stem} \\
\end{array}
\]

\( ts'utôn \) \quad \text{'we hold 0'}

135
(204)  i  +  u  -->  u

\[ \hat{i} \ -u\ -l \ -y\hat{a}\hat{l} \]
asp  Op  clf  swell  up
9   11  13  stem

\[ \hat{u}y\hat{a}\hat{l} \]  \('he, she swells up' Op

A comparison of (200) and (204) indicates that a mirror-image formulation of these rules is required.

Notice that neither of the vowels in the sequence /ua/ is deleted:

(205)  u  +  a  -->  ua

\[ u\ -a\h  -t\hat{o}\hat{n} \]
thm  2p$S$  hold  O
9   12  stem

\[ u\hat{a}ht\hat{o}\hat{n} \]  \('you  [p1]  hold  O'\n
These data are summarized in (206). Not all combinations of vowels occur:

(206)  i   a   u
\[ e \ i \ a \ u \]
\[ i \ i \ a \ u \]
\[ u \ u \ ua \]

There is no need to include [o] and [e] in Prefix Vowel Deletion. Most occurrences of [e] in prefixes are derived from /a/ by the s- and n-Conjugation a Fronting rules. I suggested in 4.2.1 that Prefix Vowel Deletion must be ordered before these Fronting rules. As for [o], since all levels 2-3 [o]'s in prefixes are preceded by velar consonants, there is no reason not to assume that the rule of Diphthongization (repeated in (207)) has first applied, creating [e]:

136
(207) o --> wə / velar ___

This is illustrated in the derivation of [wahts'ɪt] 'you [pl] tell a lie':

(208) gho-ah -ts'ɪt
    ar 2pS tell lie
    7 12 stem

Diphthongization
Prefix Vowel Deletion

[wahts'ɪt]

5.2.1.2 Domain of Prefix Vowel Deletion

As discussed in 4.2.1, Prefix Vowel Deletion must precede Conjugation / Deletion, a level 2 rule, suggesting that Prefix Vowel Deletion is itself a lexical rule. Moreover, as will be seen in 5.2.3.2, Prefix Vowel Deletion must precede the lexical rule of w Vocalization.

The following data support the analysis of Prefix Vowel Deletion as a lexical rule. In general, vowel sequences which contain prefixes of positions 1-5 are not deleted.

(209) i + i --> ii

na -tsi -iɗe-se -d -ʔə
der head der cnj clf compact O is in position
5 3 9 10 13 stem

natsl̩idəst'əq 'he, she holds his, her head in his, her hands'

(210) e + i --> ei

me -ghq̩h-k'e-ɨji -nə -n -ts'ets
3sO P adv mind der 2sS think
1 1 2 3 9 12 stem

mχgχk'ei̱jinnɨts'ets 'you [sg] think about him, her'

137
(211) e + a → ea

?ədələ e-ah -h -kwi
blood P 2sS clf vomit
1 12 13 stem

?ədələ eahkwi 'you [pl] vomit blood'

(212) e + u → eu

sə -e-u -də -n -jets
1sO P der der 2sS talk
1 1 9 9 12 stem

səudəjets 'you [sg] talk to me'

(213) a + i → ai

mə -ghəh-k'e-na -i̯j i -nə -s -ts'əts
3sO P adv rev mind der 1sS think
1 1 2 5 3 9 12 stem

məh'enaśjɛnts'əts 'I think about him, her again'

(214) na -l -gho-n -d -gwət
rev asp Op 2sS clf poke
5 9 11 12 13 stem

našghəqgwət 'you [sg] poke O again' Op
(The rule of i Lowering (4.1.4) has applied in (214).)

(215) a + u → au

na -l -u -s -gwət
rev asp Op 1sS poke
5 9 11 12 stem

nałsgwət 'I poke O again' Op

The only vowel sequences which contain a vowel of prefix positions 1-5 which undergo a deletion rule are /a-a/ sequences:
(216)  a + a --> a

nà  -ah  -h  -chēh
down 2pS clf handle animate 0
2  12  13  stem

nàchēh  'you [pl] lower [animate 0]'

These data are summarized in (217). Again, not all possible combinations occur:

(217)  i  a  u

i  ii

e  ei  ea  eu

a  ai  a  au

To account for the reduction of /a-a/ to [a], I posit the rule of a Deletion in (218):

(218)  a --> Ø /   ___  a

The fact that Prefix Vowel Deletion has not applied in (209)-(215) suggests that these vowel sequences lie outside its domain:

position 5  position 7
Prefix Vowel Deletion  no  yes
Can apply

Since the leftmost prefix that Prefix Vowel Deletion can apply to is in position 7 (see (208)), this suggests that a level distinction exists between the prefixes of position 5 and those of position 7.

5.2.2 Conjugation Tone Mapping

Like Prefix Vowel Deletion, Conjugation Tone Mapping suggests that a level ordering distinction exists to the left of prefix position 7.
As Rice (to appear) has argued, the conjugation prefixes se and ne have a tonal as well as a segmental representation. However, the tone of these prefixes does not appear on the conjugation prefix itself in surface forms, as can be seen from the following forms in which the conjugation prefix /se/ is word-initial:

(219) se -h -ch'egh
cnj clf roast O
10 13 stem
sahch'egh: 'he, she roasted [O]'

(220) se -l -tsel
cnj clf be wet
10 13 stem
sahtsel: 'he, she is wet'

No low tones are present in (219)-(220). However, in (221)-(224) below, a low tone appears on the prefix to the left of the conjugation prefix.

(221) tâ-se -'se-n -h -chêh
up lso cnj 2sS clf handle animate O
2 7 10 12 13 stem
tâsêsjêhchêh: 'you [sg] carry me uphill'

(222) kôh se -gha-we-~n-e-n -?ô
house lso P ar cnj Pf handle compact O
1 1 7 10 11 stem
kôh sarowned: 'he, she gave me a house'

(223) tsêz yidå -de -~n-e-s -lêh
firewood inside wood cnj lss handle pl O
2 9 10 12 stem
tsêz yidåsênlêh: 'I carry wood inside'
(224) ñt̃s'ə̌ u ʰs̅̅̅̅̅ ʰs̅̅̅̅̅ ʰs̅̅̅̅̅ -l -gət
2sO  P  asp  cnj  isS  clf  crawl
  9  10  12  13  stem

ñt̃s'ə̌ ʰs̅̅̅̅̅gət  "I crawled to you [sg]"

Since the tone of the conjugation prefixes never shows up on the conjugation prefix itself, this suggests that the conjugation prefixes have the underlying representations in (225):

(225) ʰsə ʰnə

The tone of the conjugation is not underlyingly linked to the conjugation prefix. The rule of Conjugation Tone Mapping in (226) will account for the placement of the tones in (221)-(224):

(226)  
\[ \v  \se  \v  \nə \]

In addition to the Conjugation Tone Mapping rule, a rule which deletes any unlinked tones is also required, since the tone does not surface in any form (e.g. as downstep) when the conjugation prefix is word-initial:

(227) Unlinked L Deletion

\[ L \rightarrow \emptyset / \]

The question now arises of the point in the grammar the mapping and deletion rules in (226) and (227) apply.

5.2.2.1 Domain of Conjugation Tone Mapping

In examples (221)-(224), the conjugation prefixes were preceded by prefixes of positions 7 and 9. Now consider forms in which \( \se \) and \( \nə \) are preceded by a non-low tone prefix of

141
positions 1-5. (The only prefixes which occur in prefix positions 4 and 6 have low tone.)

(228) mə -ghənə-i -ya
    3sO P  cnj 1sPf sg goes
    1 10 12 stem

    məhniya        'I got to him, her walking'

(229) tən gha-nə-s -get
    ice P  cnj 1sS poke
    1 10 12 stem

    tən gha-hənəsget        'I chisel through ice'

(230) dah-se -h -tsuz
    up  cnj clf handle cloth-like O
    2 10 13 stem

    dahsahtsuz         'he, she hung up [cloth-like O]'

(231) ts'e-nə -n -h -set
    wake cnj 2sS clf wake up
    2 10 12 13 stem

    ts'énɨhɨsset        'you [sg] woke up [O]'

(232) na -sə -s -d -kwı
    rev  cnj 1sS clf vomit
    5 10 12 13 stem

    nəskwı         'I vomited'

(233) ts'e-na -nə -s -d -zit
    wake rev cnj 1sS clf wake up
    2 5 10 12 13 stem

    ts'enanəsätzit         'I wake up again'

In the preceding forms, the tone of the conjugation prefix does not appear on the vowel of the preceding prefix. Since these are prefixes of positions 1-5, this suggests that prefixes to
the left of prefix position 7 are not within the domain of Conjugation Tone Mapping. The level distinction posited in 5.2.1 is supported by these data:

<table>
<thead>
<tr>
<th>position</th>
<th>5</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefix Vowel Deletion</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Cnj Tone Map</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>level ordering</td>
<td>level 4</td>
<td>level 3</td>
</tr>
</tbody>
</table>

Conjugation Tone Mapping "shuts off" after level 3. Unlinked L Deletion could be either a level 4 or a post-lexical rule.

5.2.2.2 ʔa, ts'ə, ghe and Conjugation Tone Mapping

Conjugation Tone Mapping is actually more complicated than just described. As noted by Rice (1983a) for Slave, three prefixes in Sekani fail to undergo Conjugation Tone Mapping. These are ts'ə 1p subject (position 8), ghe 3p subject (position 8), and ʔa unspecified object (position 7):

(234) ts'ə-s -ch'q
    1pS cnj shoot O dead
ts'əzch'q         'we shot [O] dead'

(235) ghe-s -d -ji
    3pS cnj clf breathe
    8  10 13 stem
ghe_sji         'they breathed'

(236) mɪI dah-ʔa -s -d -tl'ʉ
    snare up unspO cnj clf tie
    2  7  10 13 stem
mɪI dahʔəxtl'ʉ    'he, she set a snare'
(237)  k'e -ts'ə-nə-n -yɨts
       in 2 ipS cnj Pf break
       2   8   10  11 stem

       k'ets'əniyɨts  'we broke [0] in 2'

Given the evidence of affix order, one would expect the prefixes
?ə ts'ə and gə to behave phonologically like the prefixes of
positions 7 and 9. As will be seen in 5.2.4, 5.2.5, and 5.2.6,
and has been demonstrated in 5.2.1, they do in fact behave
phonologically like the positions 7-9 prefixes in other ways.
However, with respect to Conjugation Tone Mapping, they are
quite exceptional.

In fact, in Sekani the exceptionality is even more compli-
cated than just illustrated. Unlike the situation in Slave, if
?ə ts'ə gə are themselves preceded by a (position 7) prefix
other than ?ə, Conjugation Tone Mapping does apply: the tone of
the conjugation prefix does appear on ?ə ts'ə gə. (Actually
this can only be illustrated for ts'ə and gə. ?ə cannot be
preceded by a position 7 prefix.)

(238)  ghu-ts'ə-ses -ch'q
       3pO 1pS cnj shoot 0 dead
       7   8   10 stem

       ghuts'əzch'q  'we shot them dead'

(239)  yə -gə-ssə -?əs
       thm 3pS cnj sneeze
       7   8   10 stem

       yəghəzəs  'they sneezed'
(240) ghuya-gha-we-t's'a-ne-n -?o
3pO P ar 1pS cnj Pf handle compact O
1 1 7 8 10 11 stem
ghuyawats'әn?i?o 'we gave [areal O] to [O]

However, if the prefix preceding ts'a or gha is ?e, Conjugation
Tone Mapping still fails to apply:

(241) mә -gha-?e -ts'a-ne-n -yats
3sO P unspO 1pS cnj Pf scare O
1 1 7 8 10 11 stem
ma?ets'әn?i?yats 'we scared [O]

(242) mI dah-?e -ghә-e-s -tl'uy
snare up unspO 3pS cnj handle rope-like O?
2 7 8 10 11 stem
mI dah?әghәztI'uy 'they set a snare'

How is the exceptionality of the prefixes ?e ts'a gha to be
accounted for? One alternative, of course, is to mark them as
exceptions to Conjugation Tone Mapping:

(243) /ghә/, animate plural, [-Cnj Tone Mapping]

However, this would not account for the fact that they do under-
go Conjugation Tone Mapping if preceded by another level 3
prefix (other than ?e).

Lexical Phonology provides another possible analysis.

Since phonological rules may apply in the lexicon, the possibil-
ity of ordering phonological rules before word formation rules
arises. Suppose that the rules within the same domain as Conju-
gation Tone Mapping are ordered as follows:

(244) word formation rules (except ?e, ts'a, gha)
Conjugation Tone Mapping
gha, ts'a, ?e word formation rules
other phonological rules
If Conjugation Tone Mapping applies before the prefixes ?e ts'e ghe are added on any given cycle, this will account for the fact that tone shows up on these prefixes when they are prefixed on the next cycle by a position 7 prefix.

To illustrate this analysis, first consider the derivation of ts'ęzch'q 'we shot [O] dead':

(245)  
\[ \text{L} \]  
\[ z\text{-ch}'q \]  
Conjugation Tone Mapping  
\[ -- \]  
\[ \text{L} \]  
\[ \text{ts}'e\text{-z-ch}'q \]  

later: Unlinked L Deletion  
\[ \text{ts}'e\text{-z-ch}'q \]

The low tone will fail to surface in this form because at the point in the derivation that Conjugation Tone Mapping applies, its structural description is not met.

Now consider a form like ghuts'ęzch'q 'we shot them dead'. Conjugation Tone Mapping will be able to reapply on a later cycle of morphology, that defined by the 3p object prefix ghu:

(246)  
\[ \text{L} \]  
\[ \text{ts}'e\text{-z-ch}'q \]  
\[ \text{L} \]  
\[ \text{ghu}\text{-ts}'e\text{-z-ch}'q \]  
Conjugation Tone Mapping  
\[ \text{ghu-ts}'e\text{-z-ch}'q \]

If this analysis is right, it provides strong support for Kiparsky's (1982a, 1983) proposal that structure-building rules are not constrained by the Strict Cycle Condition. Conjugation Tone Mapping must be allowed to reapply on a later cycle.

The analysis of a form like (241) maʔats'animyats 'we scared
him, her' requires a slight departure from the assumption that each layer of morphology defines its own cycle. We must assume that the ?e word formation rule applies on the same cycle as the ts'e and ghe word formation rules, but is ordered after them:

(247) \[ \text{niyats} \]

Conjugation Tone Mapping \[ \quad \text{--} \quad \text{L} \]

\[ \text{ts'e word formation rule} \quad \text{ts'e-niyats} \]

\[ \text{?e word formation rule} \quad \text{?e-ts'e-niyats} \]

later: unlinked L deletion \[ \emptyset \]

Although it is theoretically unattractive to posit an analysis in which two word formation rules apply on the same cycle, there seem to be no bad consequences of this move elsewhere in the phonology of Sekani. Like all word formation rules, ?e prefixation has the option of not applying.

In a Lexical Phonology analysis, the exceptionality of the prefixes ?e ts'e ghe can be formally expressed by means of independently needed principles of rule ordering. The analysis I have proposed would only be possible in a model where some phonological rules may apply in the lexicon.

5.2.3 L Deletion

The rule of L Deletion provides evidence that stems (level 1) and level 2 prefixes are distinct phonological domains, as well as providing evidence that levels 3 and 4 are distinct.

Four low tone prefixes are found among the prefixes of positions 7-12:
(248) 1d subject (position 12)
    `sə conjugation (position 10)
    `nə conjugation (position 10)
    1 derivational (position 9)

When two of these low tone prefixes co-occur in a given verb form, only one tone is present in surface forms. The leftmost tone is deleted by the rule of L Deletion:

(249) L Deletion

    L --> Ø / ___ L

This rule can only be illustrated for forms which contain the conjugation prefixes and 1d subject:

(250a) kwən na -də -`sə-ı -d -h -k’ı
    fire  rev  thm  cnj  1dS  clf  clf  kindle  fire
    5   9  10  12  13  13  stem

    kwən  nadasıık’ı          'we [du] kindled a fire'
    *nadasıık’ı

cf.
(250b) kwən na -də -`sə-i -h -k’ı
    fire  rev  thm  cnj  1sPf  clf  kindle  fire
    5   9  10  12  13  stem

    kwən  nadasııh’ı         'I kindled a fire'

(251a) che -chu -se -də -`nə-ı -d -?ats
    into water  water  1dS  der  cnj  1dS  clf  du  go
    2   3   8   9  10  12  13  stem

    chechusadənīt’ats     'we [du] walked into the water'
    *chechusadənīt’ats

cf.
(251b) che -chu -də -`nə-n -ya
    into water  water  der  cnj  Pf  sg  go
    2   3   9  10  11  stem

    chechudənīya             'he, she walked into the water'

The starred 1d (a) forms are those that would be expected if L Deletion had not applied. The (b) forms given for comparison
indicate that there is nothing exceptional about the prefixes which precede the conjugation prefixes in these forms with respect to Conjugation Tone Mapping.

L Deletion has a restricted domain. This is obvious from the fact that there exist surface forms in which more than one low tone occurs. For example, the tone of the four low tone prefixes given in (248) is preserved before a stem which has low tone:

(252)  sə -l -d -jɨh  
1dS 1dS clf breathe  
8 12 13 stem  
sɨjɨh 'we [du] breathe'

(253)  ī -h -t'as  
asp clf shoot O with bow and arrow  
9 13 stem  
ɨht'as 'he, she shoots [O]...'

(254)  kɨh  sə -gːa-wə-nə-ʔəh  
house 1sO P ar cnj handle compact O  
1 1 7 10 stem  
kɨh sawəʔəh 'he, she gives me a house'

(255)  tə-se -sə-n -h -chēh  
up 1sO cnj 2sS clf handle animate O  
2 7 10 12 13 stem  
təsəsɨnchēh 'you [sg] carry me uphill'

The low tone preceding the low tone stem has not been deleted in these data, indicating that low tone stems are outside the domain of L Deletion. The following formulation of L Deletion will ensure that no stem tones trigger the deletion of low tones in prefixes:
(256) L Deletion

\[ L \rightarrow \emptyset / \_\_ L [\text{stem}] \]

Only low tones which occur to the left of the stem can trigger L Deletion.

Now consider sequences of low tones in prefixes. Prefixes of positions 1-6 neither trigger nor undergo L Deletion. Forms in which a low tone prefix from positions 1-6 precedes one of the four low tone level 2 prefixes are given in (257)-(259) (and in (255) above):

(257) tsəz yidā -də -nə -leh
    firewood inside wood cnj handle pl 0
    2  9  10 stem

tsəz yidādəleh          'he, she carries wood inside'

(258) lē -se -l -t'l'yh
    in 2 idS idS clf tie
    2  8  12 13 stem

lēsīt'l'yu          'we [du] tie a knot'

(259) whē -nə -l -shən
    incp der der clf sing
    6  9  9 13 stem

whēnījən           'he, she started to sing'

The leftmost tone has been preserved in these forms. Next consider forms in which two low tone prefixes from positions 1-6 are present:

(260) nā -tsī -də-ghəs
    adv head thm nod?
    2  3  9 stem

nātsīdəghəs         'he, she shakes his, her head "no"'
(261) nà -dà -nə -chih
down dstr 2sS handle stick-like 0
2 4 12 stem

nədənəchəh 'you [sg] lower [stick-like 0's], one by one'

(262) dah-dà -whə -ts'a-nə -I -n -tl'ụ
up dstr incp 1pS der der Pf tie
2 4 6 8 9 9 11 stem

dahdəwhẽtsaŋtłǜ 'we started to set snares, one by one'

L Deletion has not applied to the leftmost tone in these forms either. Thus these data provide evidence that prefixes of positions 1-6 are not within the domain of L Deletion, and thus that a level ordering distinction exists within the verb prefixes:

prefixes 1-6 9-12 stems

trigger or undergo no yes no
L Deletion

5.2.4 w Vocalization

The rule of w Vocalization, whose structural description is met only by the optative prefix, provides additional evidence that a level distinction exists between the prefixes of position 7 and those of position 5.

As briefly discussed in 4.1.2, the optative prefix /ghə/ has various surface forms. In some 1s and 3s forms the application of Diphthongization, repeated below in (263), creates the surface form wə of this prefix.

(263) Diphthongization

o → wə / velar ___ (C) , C ≠ l, n

Recall that w is phonologically a labio-velar [ghw]. The fol-
lowing examples, in which the optative prefix is word-initial, illustrate Diphthongization:

(264) gho-d -shən
Op clf sing

\[\text{wejən}\]  'he, she sings' Op

\[\text{gho-d-shən}\]

D-Effect Rule
Diphthongization

\[j\]
\[\text{we}\]
\[\text{[wejən]}\]

(265) gho-s -h -shq\[i\]
Op 1sS clf blow on O
11 12 13 stem

\[\text{wəsshq\[i\]}\]  'I blow on [O]' Op

(266) gho-s -tsəugh
Op 1sS cry

\[\text{wətsəugh}\]  'he, she cries' Op

When the optative prefix is preceded by prefixes of positions 7-9, the surface form of the prefix is not \[\text{we}\], but \[u\]. I posit a rule which vocalizes \[\text{we}\] to \[u\] in such cases:

(267) w Vocalization

\[\text{we} \rightarrow u / V \]

(268) ?e -wə-s -h -xəh
unspO Op 1sS clf shore
7 11 12 1d stem

\[\text{?usxəh}\]  'I snore' Op
Diphthongization
w Vocalization
Prefix Vowel Deletion

[?usx?qh]

(269) ?ædæ-ðæ-wæ-d -ts'?t
refl Op clf scratch
7 9 11 13 stem
?ædæduts'?t 'he, she scratches him-, herself' Op

(270) ts'æ-wæ-d -shæn
1pS Op clf sing
8 11 13 stem
ts'ujæn 'we sing' Op

(271) gha-wæ-h -shɔl
3pS Op clf blow on O
8 11 13 stem
ghuhshɔl 'they blow on [O]' Op

(272) zæ -wæ-s -h -xeI
thm Op 1sS clf kill sg O
9 11 12 13 stem
zusxeI 'I kill [sg O]' Op

(273) ī -wæ-gwæt
asp Op poke
9 11 stem
 śgwæt 'he, she pokes [O] once' Op

The only forms in which w Vocalization applies are 1s and 3s forms. These are also the only optative forms in which Diphthongization applies.

5.2.4.1 Domain of w Vocalization

Vocalization has a restricted domain. In examples (268)-
(273) above, the optative prefix is preceded by a prefix of positions 7-9. In (274)-(277), a vowel-final prefix of positions 1-5 precedes the optative prefix. In these forms, however, w Vocalization does not apply:

(274) ?oedelê e-wê-h -kwi
       blood P Op clf vomit
       1 11 13 stem

?oedelê ewahkwì 'he, she vomits blood' Op

(275) nà -wê-s -h -chêI
       down Op 1sS clf lower animate O
       2 11 12 13 stem

nawascheI 'I lower [animate O]' Op

(276) ts'ah t'â -tsî -wê-l -?atl
       hat P:inside head Op clf compact O be in position

ts'ah t'âtsîwê?atl 'he, she wears a hat on his, her head'

(277) na -wê-s -d -kwi
       rev Op 1sS clf vomit
       5 11 12 13 stem

naweskwi 'I vomit' Op

The optative prefix surfaces as wê in these forms, just as it did in forms where it is word-initial. These data suggest that the prefixes of positions 1-5 and those of positions 7-9 belong to different phonological domains.

position 5 . position 7
Vocalization no yes can apply

5.2.4.2 Formulation of w Vocalization

Although the domain of Vocalization is of most importance
here, the formulation of the rule is also of some interest for Lexical Phonology.

The derivation in (268) indicated that Prefix Vowel Deletion applies to the output of w Vocalization, deleting the vowel of the prefix to the left of the optative prefix. Prefix Vowel Deletion interacts with Vocalization in another way which provides insight into the formulation of Vocalization. As is implicit in the formulation of Vocalization in (267), the rule applies only to wə sequences: the vowel of the optative prefix must be ə. The following 2p forms, in comparison with 1s and 3s forms, indicate why this is required:

(278a) ne -wə-ah -ʔh
  term Op 2pS steal 0
  9  11 12 stem

  newahʔh
  'you [pl] steal 0' Op

cf.
(278b) ne -wə-s -ʔh
  term Op 1sS steal 0
  9  11 12 stem

  nusʔh
  'I steal [0]' Op

(279a) zə -wə-ah -h -xeI
  thm Op 2pS clf kill sg 0
  9  11 12 13 stem

  zewahxeI
  'you [pl] kill [sg 0]' Op

cf.
(279b) zə -wə-s -h -xeI
  thm Op 1sS clf kill sg 0
  9  11 12 13 stem

  zuhxeI
  'he, she kills [sg 0]' Op

The 2p forms indicate that Prefix Vowel Deletion bleeds w Vocalization, as shown in the following derivation:

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The formulation of Vocalization in (267) posits the structural change of /CV/ to [V]. This kind of formulation should be avoided wherever possible. The facts just discussed suggest that a better formulation of w Vocalization is available. Underspecification and an autosegmental analysis of [round] can explain why Vocalization only applies to inputs of the form [we] and not to [wa].

Suppose that schwa is simply a V slot, underlyingly unspecified for features. Then Diphthongization can be formulated as a rule which transfers the feature [+round] from /o/ to a preceding velar:

\[
(280) \quad \text{Diphthongization} \quad (o \rightarrow we / \text{velar} \_\_ )
\]

\[
\begin{array}{c}
\text{C} \\
\text{V} \\
\text{[+high]} \\
\text{[+back]} \\
\text{[+round]} \\
\end{array}
\]

The output of Diphthongization is thus a labio-velar followed by [e]. Vocalization can be reformulated as a rule which transfers the features of the labio-velar consonant back to the following vowel, if and only if that vowel is not attached to any features (i.e., schwa):
(281) \text{w Vocalization} \quad (\text{wæ} \rightarrow \text{u} / \text{V } \_ \_ )

\[ \text{V} \quad \text{C} \quad \text{V} \]
\[ \downarrow \quad \text{+high} \quad \text{+round} \]
\[ \quad \text{+back} \]

(The C slot must also get deleted somehow because Prefix Vowel Deletion applies to the output of Vocalization.) Thus Vocalization will not apply in Zp forms.

5.2.5 Conjugation \_ Deletion

As mentioned in 4.1.3, the vowel of the conjugation and mode prefixes /sæ na ghæ/ is deleted by the following rule:

(282) \text{æ} \rightarrow \emptyset / \text{V}\{ \text{\_ } \_ \_ [ (clf) stem]}

I will argue here that the domain of this rule supports the posited level ordering distinction between prefixes 6 and 7. However, while the domain of this rule is absolutely regular for /ghæ/, the facts concerning /sæ/ and /na/ are quite a bit messier.

5.2.5.1 Levels 2-3 alternations

Evidence for the rule in (282) is provided by the following alternations: [sæ]~[s], [na]~[n] and [ghæ]~[a]. As the following examples will show, Conjugation \_ Deletion fails to occur if a position 11 or 12 prefix is present underlingly: in order for the rule to apply, no prefix may intervene between the conjugation or mode prefix and the optional classifier prefix.

First I will illustrate the rule with the conjugation prefix /sæ/. In (283) and (284), this prefix is preceded by
prefixes of positions 7–9. In (283a,b) and (284a), Conjugation e Deletion has applied. However, in (283c) and (284b), Conjugation e Deletion is blocked because a subject prefix (1s /s/ and 2p /ah/, respectively) is present.

(283a) chu -na -ʔə -sə -d -k'âts
water rev unsp0 cnj clf wash 0
3 5 7 10 13 stem
chunaʔesk'âts 'he, she washed [0]'

(283b) chu -na -ʔə -ts'ə- sə -d -k'âts
water rev unsp0 lps cnj clf wash 0
3 5 7 8 10 13 stem
chunaʔsts'esk'âts 'we washed [0]'

cf.
(283c) chu -na -ʔə -sə -s -d -k'âts
water rev unsp0 cnj 1sS clf wash 0
3 5 7 10 12 13 stem
chunaʔesəsk'âts 'I washed [0]'

(284a) ts'eq u -sə -l -tleh
P asp cnj clf sg/du run
9 10 13 stem
yets'eq ûstleh 'he, she runs to [0]'

cf.
(284b) ts'eq u -sə -ah -l -tleh
P asp cnj 1sS clf sg/du run
9 10 12 13 stem
mets'eq ûsətleh 'you [pl] run to [0]'

An alternative explanation might come to mind for the failure of Conjugation e Deletion to apply in forms like (284b): one might hypothesize that Conjugation e Deletion, like w Vocalization, is bled by Prefix Vowel Deletion. However, while this will work for 2p (and 1d) forms, it will clearly not explain the failure
of this rule to apply in 1s forms (cf. \( \_w \) Vocalization).

Alternations between [n\( \_e \)] and [n], illustrating the application of this rule to the conjugation prefix /n\( \_e \)/, are given in (285)-(286):

(285a) se -gha-w-e-n\( \_e \) -?\( \_ \)h
1s\( \_e \) P ar cnj handle compact 0
1 7 10 stem

saw\( \_ \)n\( \_ \)h 'he, she gives me [areal 0]'

(285b) m\( \_e \) -gha-w-e-ts\'e-n\( \_e \) -?\( \_ \)h
3s\( \_e \) P ar 1pS cnj handle compact 0
1 1 7 8 10 stem

maw\( \_ \)ts\'e-n\( \_ \)h 'we give him, her [areal 0]'

cf.
(285c) s\( \_e \) -gha-w-e-n\( \_e \) -n -?\( \_ \)q
1s\( \_e \) P ar cnj Pf handle compact 0
1 7 10 11 stem

saw\( \_ \)n\( \_ \)q 'he, she gave me [areal 0]'

(286a) yid\( \_ \) -d\( \_e \) -n\( \_ \)e -le\( \_ \)
inside wood cnj handle pl 0
2 9 10 stem

yid\( \_ \)d\( \_ \)e-le\( \_ \) 'he, she carries [pl wooden 0] inside'

cf.
(286b) yid\( \_ \) -d\( \_e \) -n\( \_ \)e -n -le\( \_ \)
inside wood cnj 2sS handle pl 0
2 9 10 12 stem

yid\( \_ \)d\( \_ \)n\( \_ \)e-le\( \_ \) 'you [sg] carry [pl wooden 0] inside'

Conjugation \( \_d \) Deletion has not applied in (285c) because the perfective prefix /n/ occurs between the conjugation prefix and the stem. In (286b), the presence of the 2s subject prefix [n] prevents the rule from applying.
Alternations between [ghə] and [a] are illustrated in (288)-(289). The additional rule of Gamma Lowering in (287) applies to [gh] after Conjugation a Deletion:

(287) Gamma Lowering

\( gh \rightarrow a / ___ [ (clf) stem] \)

(288a) \( ?ə -gə-d -bə \)
unspO cnj clf children, animals eat
\( 7 \quad 10 \quad 13 \) stem

\(?əbə\)
'he, she ate something'
\(?ə-gə-d-bə\)

Conjugation a Deletion \( \emptyset \)
Gamma Lowering \( a \)
Prefix Vowel Deletion \( \emptyset \)

\( [?əbə] \)

(288b) \( ?ə -ts'ə-gə-d -bə \)
unspO lPS cnj clf children, animals eat
\( 7 \quad 8 \quad 10 \quad 13 \) stem

\(?əts'əbə\)
'we ate something'
cf.

(288c) \( ?ə -gə-s -d-bə \)
unspO cnj lsS clf children, animals eat
\( 7 \quad 10 \quad 12 \quad 13 \) stem

\(?əgəsəbə\)
'I ate something'

(289a) \( də -i -gə-l -yəl \)
Fut thm Fut clf swell up
\( 9 \quad 9 \quad 11 \quad 13 \) stem

\( dəyəl\)
'he, she will swell up'
cf.

(289b) \( də -i -gə-n -l -yəl \)
Fut thm Fut 2sS clf swell up
\( 9 \quad 9 \quad 11 \quad 12 \quad 13 \) stem

\( dəgəniyəl\)
'you [sg] will swell up'

160
I will return to the formulation of this rule in Ch. 5, 3.1. Now I would like to consider the domain of this rule.

5.2.5.2 Domain of Conjugation ə Deletion

First I will illustrate the domain of Conjugation ə Deletion for the prefix /ghə/, and then I will turn to the more complicated facts involving /sə/ and /nə/.

5.2.5.2.1 /ghə/

When /ghə/ is word-initial (as in 290-291), or preceded by a prefix of positions 1-5 (292-295), its phonetic form is [ghə]: Conjugation ə Deletion has not applied.

(290) sas ɣhə-ʔi
     bear cnj see
     10 stem

     'he, she sees a bear'

(291) ɣhə-bəl
     Prg swim
     10 stem

     'he, she is swimming'

(292) ya -t'å ɣhə-l -goł
     4sO P:inside Prg clf crawl
     1 1 10 13 stem

     yət'åɣhəgəl
     'he, she is crawling inside it'

(293) nə ɣhə-d -ts'ət
     down cnj clf sg/du fall
     2 10 13 stem

     nəɣhət'sət
     'he, she fell down'

(294) ts'ah t'å ɣhə-d -təl
     hat inside rev head cnj.clf handle compact 0
     2 5 3 10 13 stem

     ts'ah t'ətsɨghət' atl
     'he, she put a hat back on'
(295) na -ghə-d -dal
    rev Prg clf sg go
    5  10  13 stem

    naghədal  'he, she is going back'

In (292)-(295), the surface form of this prefix is [ghə], not [a], although it is preceded by a vowel-final prefix. These data support the level ordering distinction posited between prefix positions 6 and 7.

5.2.5.2.2 /sə/ and /nə/

The facts about the domain of Conjugation a Deletion, as applied to /sə/ and /nə/, are quite a bit more complicated. When /sə/ and /nə/ are preceded by a level 4 prefix, or are vowel-initial, Conjugation a Deletion does sometimes apply. The circumstances under which this may occur are not entirely clear, but the available data indicate that at least the following factors are relevant:

    perfective vs. imperfective mode
    classifier prefix
    whether level 4 prefix is vowel- or consonant-final

The significance of the latter factor is particularly unclear, due to incomplete data. Thus in what follows, I will only illustrate the surface forms of the conjugation prefixes /sə/ and /nə/ taking into consideration the first two factors.

First consider /sə/. In perfective, ə- or h-classifier forms in which the conjugation prefix is word-initial or preceded by a level 4 prefix, Conjugation a Deletion does not apply:
(296) se -ch'O
     cnj shoot O dead
     10  stem
     'he, she shot [O] dead'

(297) se -h -ch'egh
     cnj clf roast
     10  13 stem
     sahch'egh
     'he, she roasted [O]'

(298) Iè -se -tl'yu
     in 2 cnj tie
     2  10 stem
     'he, she tied a knot'

(299) daltsogh e-se -h -kwi
     bile  P cnj clf vomit
     1  10  13 stem
     daltsogh esahkw'i
     'he, she vomited bile'

These data are just as predicted by the analysis: Conjugation a
Deletion has not applied in these forms.

In s-perfective forms which contain d classifier, deletion
occurs when the conjugation prefix is word-initial or preceded
by a level 4 prefix:

(300) a -s -d -ji
     epen cnj clf breathe
     10  13 stem
     ësji
     'he, she breathed'

(301) na -s -d -kwi
     rev cnj clf vomit
     5  10  13 stem
     naskwi
     'he, she vomited'

If the classifier is l instead of d, deletion fails to occur if
the conjugation prefix is word-initial, and is optional if the
conjugation prefix is preceded by a level 4 prefix:

163
(302)  sə -1 -tsəl  
cnj clf wet  
10 13 stem  
sahtsəl  

'he, she is wet'\textsuperscript{19}

(303)  ka-nə -sə -1 -dzət  
P cont cnj clf hunt  
1 2 10 13 stem  

-kanəhzət  

'he, she hunted for [0]'  

= -kanəsədzət

The s-perfective forms in (296)-(303) are summarized in (304) below:

(304)  word-initial /sə/  | /sə/ preceded by level 4 prefix | classifier

| sə | sə | 0 | sə | sə | h | s̕ə | s̕ə | d | s̕ə | l |

The facts concerning the application of Conjugation a Deletion in s-imperfective forms are slightly different. Not as many possibilities arise as above, because no s-imperfective forms exist in which the conjugation prefix is word-initial. In s-imperfective forms which contain 0, h, or d classifier, Conjugation a Deletion applies:

(305)  tə -s -kəh  
up cnj travel by boat  
2 10 stem  

'the, she goes ashore'

(306)  tə -s -h -tsus  
up cnj clf handle cloth-like 0  
2 10 13 stem  

təhtsus  

'he, she carries [cloth-like 0] uphill'
(307) tɔ-na -s -d -dah
   up rev cnj clf sg/du go
2  5  10  13 stem

    tɔnasdah  \quad \text{'he, she goes back uphill'}

However, in forms which contain l classifier, no deletion occurs:

(308) tɔ-sə -l -tleh
   up cnj clf sg/du run
2  10  13 stem

    təsətleh  \quad \text{'he, she runs uphill'}

These data are summarized in (309):

(309) \begin{tabular}{c|c}
\text{/sə/ preceded by} & \text{classifier} \\
\hline
\text{level 4 prefix} & \text{---} \\
\hline
s & \emptyset \\
s & h \\
s & d \\
sə & l \\
\end{tabular}

The domain of Conjugation $\alpha$ Deletion as applied to /nə/ is similarly complicated. As for /sə/, the tendency is for Conjugation $\alpha$ Deletion to apply in \emptyset, h or d classifier forms, but not in l classifier verbs. I have no examples of n-conjugation forms in which the conjugation prefix is word-initial.

\emptyset- and h-classifier n-perfective forms are not possible inputs to Conjugation $\alpha$ Deletion because the perfective prefix /n/ is present. (Cf. (285c) above.) However, in d and l classifier verbs, the perfective prefix is absent and thus Conjugation $\alpha$ Deletion is potentially applicable. In d classifier verbs, Conjugation $\alpha$ Deletion is optional:

165
(310)  lãts'ë  nê  -na  -d  -ji  
    cease  adv  cnj  clf  breathe  
    2  10  13  stem  
  lãts'ë  nêji  
    'he, she stopped breathing'  
=  lãts'ë  nênêji  

In _l_ classifier verbs, Conjugation = Deletion does not apply:

(311)  yidâ  -nê  -l  -tla  
    inside  cnj  clf  sg/du  run  
  yidânêtla  
    'he, she ran inside'  

In _n_-imperfective forms, Conjugation = Deletion occurs if the verb contains _∅_ or _h_ classifier:

(312)  shêI  nê  -nê  -leh  
    trap  ground  cnj  handle  pl  0  
    2  10  stem  
  shêI  nêleh  
    'he, she sets traps'  

(313)  ts'e-na  -h  -sit  
    wake  cnj  clf  V  
    2  10  13  stem  
  ts'êhsit  
    'he, she wakes up [0]'  

If the classifier is _d_, deletion is optional:

(314)  ts'e-na  -nê  -d  -zit  
    wake  rev  cnj  clf  V  
    2  5  10'  13  stem  
  ts'enanêdzit  
=  ts'enêdzit  
    'he, she wakes up again'  

If the classifier is _l_, deletion does not occur:

(315)  yidâ  -nê  -l  -tleh  
    inside  cnj  clf  sg/du  run  
    2  10  13  stem  
  yidânêtleh  
    'he, she runs inside'  

The _n_-imperfective and -perfective data presented in (310)-(315) are summarized in (316):
(316) imperfective | perfective | classifier

| n  | --            | Ø   |
| n  | --            | h   |
| n^nə | n^nə        | d   |
| nə | nə            | l   |

5.2.5.2.3 Domain of Conjugation à Deletion: summary

The data presented in 5.2.5.2.2 indicate that Conjugation à Deletion sometimes does apply when the conjugation prefix /sə/ or /nə/ is preceded by a level 4 prefix or is word-initial. The complicated facts in 5.2.5.2.2 contrast with the completely regular levels 2-3 application of Conjugation à Deletion presented in 5.2.5.1. In any analysis, one would need to distinguish the levels 2-3 and level 4 applications of Conjugation à Deletion as applied to /sə/ and /nə/. In my analysis, I have simply collapsed the regular levels 2-3 application of Conjugation à Deletion to /sə/ and /nə/ with that for /gə/; a separate set of Conjugation à Deletion rules (which I have left unformulated) is needed to describe the complicated deletion facts for level 4 and word-initial applications of this rule to /sə/ and /nə/.

5.2.6  nə Absorption

Within the verb prefixes of positions 7-12, there are two prefixes of the shape /nə/ which alternate with n when preceded by vowel-final prefixes of certain positions. This alternation also provides evidence for the distinction between levels 3 and 4.

The 2s subject prefix and the position 9 derivational
prefix are phonetically [nə] when word-initial, as the following data indicate:

\[ nə \]

2s subject

- (317) nə -wəse
2sS itch
12 stem

'you [sg] itch'

- (318) nə -d -jıh
2sS clf breathe
12 13 stem

nəjıh

'you [sg] breathe'

\[ nə \]
derivational

- (319) nə -tsı

der bad
12 stem

'he, she is bad'

- (320) nə -tsədle-azi

der small dim
12 stem

nətsədlazi

'he, she is small'

These data suggest that these prefixes are underlyingly /nə/.

When these prefixes are preceded by vowel-final prefixes of positions 5-9, the rule of \[ nə \] Absorption in (321) applies:

- (321) \[ nə \] Absorption
\[ e \rightarrow \emptyset / V n \]

This rule creates syllable-final [n] from the prefixes /nə/. By later rules, this [n] surfaces as nasalization of the preceding vowel (and sometimes as Raising of a preceding schwa to [i]). Consider the forms in in (322)-(332):
/ê/ 2s subject

(322) ?e -ê -d -bâ
unspO 2sS clf children, animals eat
7 12 13 stem

?ibâ 'you [sg] eat something'

/?ê-ê-d-bâ/

Absorption n
Nasalization ?
ê Raising i
D-Effect Rule Ø

(323) na -ê -d -kwi
rev 2sS clf vomit
5 12 13 stem

nqkwi 'you [sg] vomit'

(324) sê -ê -h -whâse
1sO 2sS clf tickle O
7 12 13 stem

sîhwhâse 'you [sg] tickle me'

(325) ya I -ê -tsâl
sky der 2sS handle compact O carelessly
9 12 stem

ya îtsâl 'you [sg] throw [compact O] into the air'

(326) se -ê -d -dli
cnj 2sS clf animate be cold
10 12 13 stem

sîdli 'you [sg] are cold'

(327) dê -geh-ê -tsaz
thm cnj 2sS be shaky
9 10 12 stem

dêghîtsaz 'you [sg] were shaky'

169
(328)  ghó-ne -tsəgh
    Op  2sS cry
      11 12 stem

    ghōtsəgh  'you [sg] cry' Op

(329)  mə̀ -à-de -ghə-ne -tsəl -e
    3sO P Fut Fut 2sə chase O Fut
      1 1 9 11 12 stem

    mədəghitsələ 'you [sg] will chase [O]'

/nə/ derivational:

(330)  ghó-ne -châ
    ar  thm big
      7 9 stem

    ghqchâ  '[area] is big'

(331)  ts'ə-ne -tsɨ
    1pS  thm bad
      8 9 stem

    ts'itsɨ  'we are bad'

(332)  ghe-ne -tsədlazi
    3pS thm small
      8 9 stem

    ghıtsədlazi  'they are small'

In the preceding examples, /nə/ is preceded by a prefix of positions 5-11. However, when /nə/ is preceded by a prefix of positions 1-4, nə Absorption does not apply:

(333)  xəda  ka-nə -l -dzət
    moose P  2sS clf hunt
      1 12 13 stem

    xəda kanadzət  'you [sg] hunt down a moose'
(334) xêda ka-nà -ne -1 -dzêt
moose P cont 2sS clf hunt
  1  2  12  13 stem
xêda kanândzêt          'you [sg] hunt for a moose'

(335) Iê -ne -tl'uh
in 2 2sS tie
  2  12 stem
Iêndtl'uh          'you [sg] tie a knot'

(336) chu se -gha kâ -ne -ya
water 1sO P contained 0 2sS sg go
  3  12 stem
chu sa kânaya            'you [sg] fetch water for me'

(337) xa -ne -dzis
hair 2sS pluck
  3  12 stem
xanâdzis            'you [sg] pluck out [0]'

(338) nà -dà -ne -chîh
down dstr 2sS handle stick-like 0
  2  4  12 stem
nâdànnechîh        'you [sg] lower [stick-like 0's], one by one'

These data suggest that prefixes 1-4 are a separate phonological
domain for the purposes of this rule, as opposed to prefix
positions 5-12. The inclusion of prefix 5 with the prefixes of
positions 7-12 comes as a surprise: the other evidence pre-
sented in this section indicated that the level distinction
occurs to the left of position 7. Perhaps the best way of
handling the exceptionality of the position 5 na prefixes is to
formulate an extra rule of level 4 Absorption, which would be
triggered only by na in position 5.
Two additional complications to the rule of Absorption must be mentioned. The first complication is easily accommodated. If the derivational prefix u precedes ne, Absorption does not apply:

(339)  u -ne -tən
der 2sS hold 0
9  12 stem

unatən 'you [sg] hold [0]'

(340)  u -ne -h -ch'as
thm 2sS clf hook
9  12 13 stem

unach'as 'you [sg] go fishing'

Absorption is accordingly revised:

(341)  ne Absorption

ə → ∅ / V n __ V ≠ u

The second complication is more messy. The prefixes which undergo the rule of ne Absorption must be distinguished from the homophonous derivational and conjugation prefixes /ne/ which do not alternate with n. I propose to do this by means of an arbitrary feature [+A bsorption)].

I leave open the question of whether or not Conjugation ə Deletion and ne Absorption should be collapsed.

5.3 Levels 2 and 3: summary

In this section we have seen that many rules whose contexts include a preceding vowel-final prefix fail to apply when the vowel-final prefix belongs to positions 1-5. A summary of the rule domains presented in this section is provided below:
prefix position:
rule:  1 2 3 4 5 6 7 8 9 10 11 12
Conj. Tone Map.  no no no - no - y y y y
L Deletion no no no no no no - - y y y y
w Vocalization no no no no no no - y y y y - y
ne Absorption no no no no no - y y y y y y y
Cnj ø Deletion no no no - no y y y y y y

no = not within domain of rule
y = within domain of rule
- = does not meet structural description of rule
or no available example

The rules of Conjugation Tone Mapping, w Vocalization and Conjugation Tone Mapping suggested that a level distinction exists between the prefixes of positions 1-5 and those of positions 7-9. The rule of L Deletion suggested that prefix position 6 belongs with those of positions 1-5 for the purposes of this rule. Thus the phonological evidence presented here suggests that the level ordering distinction falls between the prefixes of positions 6 and 7.

Some exceptions to this generalization have been encountered. The rule of ne Absorption indicated that the prefixes of position 5 pattern like those of positions 7-11 in allowing the alternate n of the 2s subject prefix to occur. Conjugation ø Deletion sometimes applies on level 4 to /sø/ and /nø/. The prefixes ?ø ts'ø gø, on the other hand, pattern like those of positions 1-5, in that Conjugation Tone Mapping fails to apply to them. Thus in these cases, affix order and phonological rule
domains fail to match up. But given the overwhelming evidence from the other rules for the proposed level ordering distinction, it seems clear that these are to be treated as exceptions.

6. Level 4

Kari (1975) has noted that the prefix-internal boundary or level ordering distinction discussed above exists in most of the Athabaskan languages. (The main exceptions appear to be the Pacific Coast Athabaskan languages.) Just as in Sekani, this boundary is quite prominent in other languages: many rules refer to it. In fact, this boundary has long been recognized in the Athabaskan languages. Li (1933, 1946), in his study of Chipewyan, first proposed that a "disjunct" boundary exists within the verb prefixes, corresponding to the level distinction motivated in this section. He labeled the prefixes which occur to the left of the disjunct boundary "disjunct prefixes", and those which occur to the right of this boundary "conjunct prefixes."

Krauss (1969) noted that there is both internal and external evidence that in Proto-Athabaskan, the leftmost verbal prefix position was that of the direct object prefixes. In Eyak, the leftmost verbal prefix position is the direct object, cognate with Sekani prefix position 7 (Krauss 1965). Moreover, many of the disjunct prefixes in the Athabaskan languages are stems, whereas there are no stems in the conjunct prefixes. As Krauss has noted, this suggests that the disjunct prefixes were
only beginning to be incorporated in Proto-Athabaskan, and were fully incorporated into the verb prefixes by the individual languages. In support of this hypothesis, there is greater cross-linguistic diversity in the inventory and positions of the Athabaskan disjunct prefixes than there is in the conjunct prefixes.

6.1 Morphology

In Sekani the disjunct prefixes are the level 4 prefixes. As will be seen, many of the level 4 prefixes are actually stems. Six prefix positions can be distinguished on level 4.

6.1.1 Inceptive (position 6)

The inceptive prefix /xO/ (phonetically whē) in position 6 co-occurs with the position 9 prefixes nə and ı. Some examples of inceptive verbs are given below:

(342) whē -nə -ı -tsəgh
    incp der der cry
    6 9 9 stem

whênɪtsəgh

'I started to cry'

(343) lədi ?a -whē -nə -ı -n -lə
    tea adv incp der der Pf make O
    2 6 9 9 11 stem

lədi ?awhēnɨlə

'he, she started to make tea'

(344) nə -whē -nə -ı -n -h -chə
    cont incp der der Pf clf rain
    2 6 9 9 11 13 stem

nəwhēnhchə

'it started to rain'
(345) k'ë-whë -nə -l -s -d -dah
per incp der der 1sS clf sg go
2 6 9 9 12 13 stem

k'ëwhëndəsdah 'I start to walk around'
The inceptive prefix occurs to the left of the position 7

object prefixes:

(346) whë -yə -nə -l -n -ʔəs
incp thm der der Pf sneeze
6 7 9 9 11 stem

whëyaʔəs 'he, she started to sneeze'

(347) kəh whë -wə-də -nə -l -i -təl'əs
house incp ar thm der der 1spf paint
6 7 9 9 12 stem

kəh whëwədənîtləs 'I started to paint the house'

(348) ts'e-whë -sə -nə -l -n -h -sət
wake incp 1sO der der Pf clf wake up
2 6 7 9 9 11 13 stem

ts'ewhësənîhsət 'he, she started to wake me up'

Because of the obligatory co-occurrence of whë and nə l, many of
the rules discussed in 5.2 do not provide evidence as to whether
the inceptive prefix belongs on level 4 or on level 3. The best
evidence for including it on level 4 comes from the rules of L
Deletion (5.2.2.1.2) and Level 4 Schwa Fronting (6.2.1).

6.1.2 na (position 5)

Two homophonous prefixes na 'reversative' and na 'habitual,
customary' occur in this position. Both prefixes require d
classifier.

6.1.2.1 Reversative na

na 'reversative' is often translated as 'again'.
(349) chu -na -ts'e-na -s -d -dq
water rev 1pS term cnj clf drink
3 5 8 9 10 13 stem
chunats'enësdq    'we are drunk again'

(350) ts'e-na -nə -s -d -zit
wake rev cnj 1sS clf wake up
2 5 10 12 13 stem
ts'enanəsdzit     'I wake up again'

With motion verbs, reversative na is often translated as
'back (returning)'

(351) ɨdō -na -ts'e-na -n -d -ʔats
inside rev 1pS cnj Pf clf du go
2 5 8 10 11 13 stem
ɨdōnats'enit'ats   'we [du excl] went back inside'

(352) na -də -sə -d -ya
rev der cnj clf sg go
5 9 10 13 stem
nadēsja           'he, she went back'

6.1.2.2 Customary, habitual na

Unlike reversative na, the customary/habitual prefix requires aspectual suffix -h or -ts, as discussed in 3.1.1. Compare the following pairs with (351)-(352) above:

(353) chu -na-ts'e-na -s -d -jɨ -h
water C 1pS term 1sS clf drink C
3 5 8 9 12 13 stem
chunats'enəsjîh    'we are habitually drunk'

cf.
(354) chu -ts'e-na -sə -d -dq
water 1pS term cnj clf drink
3 8 9 10 13 stem
chuts'enësdq       'we are drunk'

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(355) ts'e-na-s -d -zet -ts
   wake C 1sS clf wake up C
   2    5  12  13   stem

   ts'enasdzets         'I wake up habitually'

cf.
(356) ts'e-na-s -sit
   wake cnj 1sS wake up
   2    10  12   stem

Unlike reversative na, customary na also requires θ conjugation
prefix in the imperfective, as can be seen in (355).

6.1.2.3 Affix order

   Both prefixes occur to the left of the inceptive morpheme

whê:

(357) na -whê -nə -ī -n -h -xê
   rev incp der der Pf clf thaw, melt
   5    6  9  9  11  13   stem

   nawhênhîxê                     'he, she started to thaw out [0]'

(358) chamîI hâ -na -whê -nə -ī -n -la
   fishnet out rev incp der der Pf handle rope-like O
   2    5  6  9  9  11   stem

   chamîI hênawhênhîla           'he, she started to take the
                                 fishnet back out'

(359) na -whê -nə -ī -d -kwi
   rev incp der der clf vomit
   5    6  9  9  13   stem

   nawhênhîkwi                    'he, she started to vomit again'

In other Athabaskan languages, such as Slave and Ahtna,
these prefixes are assigned to different positions:

(360) Ahtna disjunct prefixes (Kari 1979)

   Adverbial  Iterative  Incorporate  Distributive
   na        rev        na  C
(361) Slave disjunct prefixes (Rice 1983a)

Adverb Postposition Adverbial Distributive Customary Incorp. 
and object

\[ \text{na rev} \quad \text{na} \, \text{C} \]

However, in Sekani there is no evidence that they do not occur in the same position. (These prefixes apparently do not co-

occur.) Perhaps the difference between Sekani and other lan-
guages with respect to the position of the na prefixes is due to the fact that these prefixes are unstable in position, as will be seen below. I will return to the question of their under-

lying position in 6.2.2.

6.1.3 Distributive (position 4)

The distributive plural prefix marks actions that are per-
formed separately rather than collectively on plural objects, by plural subjects, in plural places, etc. There are morpholoal-
ternates of this prefix: \( \text{dâ} \) and \( \text{yâdâ} \). The choice of one alter-
nate over another is probably not determined by the phonology but by morphological factors. See Rice (1983a) for some discus-
sion of what those factors might be.

Some examples of the distributive prefixes in Sekani are given in (362)-(367):

\[ \text{dâ} \]

(362) \[ \text{m} \, \text{l} \, \text{dah-dâ} \, -?e \, -s \, -\text{tl}^\prime \text{qh} \]

\[ \text{snare up dstr unspO 1Ss tie} \]

\[ 2 \quad 4 \quad 7 \quad 12 \quad \text{stem} \]

\[ \text{m} \, \text{l} \, \text{dahdâ} \, ?e \, \text{stl}^\prime \text{qh} \quad 'I set snares, one by one' \]
(363) che -dà -nə -n -h -bets
water dstr cnj 2sS clf boil O
2 4 10 12 13 stem
chedānɨhats 'you [sg] boil [O's] separately'

(364) ya dà -l -n -tsël
sky dstr der 2sS handle compact O
4 9 12 stem
ya dâîtsël 'you [sg] throw [compact O's] into air, one by one'

yàdà

(365) yàdà-yə -ts'e-sə -ʔâs
dstr thm 1pS cnj sneeze
4 7 8 10 stem
yàdâyets'əzʔâs 'we sneezed separately'

(366) yàdà-ts'e-ne -l -d -dày
dstr 1pS thm der clf dance
4 8 9 9 13 stem
yàdâts'ənîdây 'we danced separately'

(367) chu -yàdà-ts'e-ne -l -d -jih
water dstr 1pS term der clf drink
3 4 8 9 9 13 stem
chuyâdâts'ənîjih 'we get drunk separately' C

Evidence that the distributive prefixes occur to the left of reversative and customary na will be provided in 6.2.2. For now, notice that the distributive prefix occurs to the left of the inceptive prefix:

(368) dah-dà -whē -ts'e-ne -l -n -tl'ʉ
up dstr incp 1pS der der Pf tie
2 4 6 8 9 9 11 stem
dahdâwhēts'ənîtl'ʉ 'we started to set snares separately'
6.1.4 Incorporated stem (position 3)

Most of the noun and verb stems that may be incorporated into the verb prefixes occur in prefix position 3. Some examples are given below:

incorporated noun stems

(369) hå -sa -de -l -dlat
  out sun der der shine
2 3 9 9 stem

häsadîdlat 'the sun is shining'

(370) mə -ghöh-k'e-iji -nə -s -ts'øts
  3S0 P adv mind der 1sS think
1 1 2 3 9 12 stem

môhk'eijinøsts'øts 'I think about him, her'

incorporated verb stems

(371) k'ë-tsi -de -tsiŋh 'he, she sniffs around'
  per sniff der sniff
2 3 9 stem

(372) Iə -ts'øgh-de -ʔah 'he, she yawns'
  adv yawn der handle compact 0
2 3 9 stem

The incorporated stems occur to the left of the distributive plural prefixes in position 4:

(373) je -gwət-də -ts'ə-s -h -kah
  adv knee dstr 1pS cnj clf wound
2 3 4 8 10 13 stem

jegwåtdåts'ahkah 'we banged our knees separately'

(374) chu -də -ya 'Tudyah Lake'
  water dstr sg go
3 4 stem
(375) chu -yądą-ts'é-nə -s -d -dəq
water dstr 1pS term cnj clf drink
3 4 8 9 10 13 stem

chuyądąts'ənəsədq 'we got drunk separately'

I will return to a discussion of the underlying order of
the incorporated stems, distributive plural, and na prefixes in
6.2.2.

Notice that the level 4 incorporated stems may themselves
be prefixed:

(376) mə -chə -ʔə -nə -s -ləh
3spSr guts unspO cnj 1sS handle pl O
3 3 7 10 12 stem

məchəʔənəsələh 'I take its guts out'

(377) k'è-uyuz -ə -də -d -dəh
per whistling vb der clf sg go
2 3 3 9 13 stem

k'èuyuzədədəh 'he, she walks around, whistling'

In (376) and (377), the possessive prefix mə- and the thematic
prefix u- occur. This suggests that the incorporated stems are
formed on earlier levels of the lexicon and incorporated as
units into the level 4 prefixes.

Superficially, the incorporated stems present a problem for
the Level Ordering Hypothesis. According to this hypothesis,
affix order correlates with phonological rule domains, yet the
incorporated stems are level 1 domains which occur in the midst
of level 4. However, what (one version of) the LOH actually
states is:

Level n affixation precedes level n+1 affixation.

The incorporated stems do not pose a problem for a Level Order-
ing Hypothesis stated in these terms. I have suggested that the incorporated stems, together with any prefixes, are incorporated into the verb prefixes as units. Since there is no evidence that the level 4 incorporation process must precede the inflection of postpositions for object, for example, the incorporated stems pose no threat to the Level Ordering Hypothesis.

6.1.5 Adverbial (position 2)

Most of the prefixes of this position have clear spatial, temporal, aspectual or other adverbial meanings. Some examples are given below:

(378) dēghē nē -nē -nē kēh
   ground to ground cnj 2sS handle contained 0
   2 10 12 stem

dēghē nēnikēh
   'you [sg] put [contained 0] on the ground'

(379) tā-dē-s -kē
   lost cnj rope-like 0 be in position
   2 9 10 stem

tadēzkē
   '[rope-like 0] is lost'

(380) ts'e-dē -n -h -tsus
   into fire 2sS clf handle cloth-like 0
   2 9 12 13 stem

ts'edēhtsus
   'you [sg] put [cloth-like 0] in the fire'

(381) k'ē-gē-s-l -gēs
   per 3pS clf pl run
   2 8 13 stem

k'ēghēghēs
   'they run around'

The adverbial prefixes occur to the left of the position 3 incorporated stems:
(382) tâ-tsî -sə -s -l -?atl
up head cnj 1sS clf handle compact 0
2 3 10 12 13 stem
tâ-tsîsə?atl 'I wear [O] on my head'

(383) ɨdâ -shən-e -də -nə -i -ya
inside sing vb der cnj 1sPf sg go
ɨdâshənedəniya 'I walked inside, singing'

See also (368)-(372) and (376) in 6.1.4 above.

Since many of the adverbial prefixes are stem-like (a few
are clearly stems), and since the adverbial and incorporated
stem positions are adjacent, one might consider collapsing these
prefix positions. However, the discussion in 6.2.2 will indi-
cate that this hypothesis must be rejected.

6.1.6 Incorporated postposition (position 1)

An incorporated postposition, together with its object, if
pronominal, is the leftmost verbal prefix. The incorporated
postpositions precede the adverbial prefixes of position 2:

(384) tli ə-k'ə-de -ghə-s -tsəts
dog P per Fut Fut 1sS chase O
1 2 9 11 12 stem
tli ək'ədəghəstəts 'I will chase the dog around'

(385) xəda ka-nà -sə -l -dzət
moose P cont cnj clf hunt for O
1 2 10 13 stem
xəda kanəhdzət 'he, she hunted for a moose'

(386) mə -ə-ne -s -jit
3sO P adv 1sS be afraid
1 1 2 12 stem
mënəesjit 'I'm afraid of [O]'
(387) mə -t'ā -hə -ghə-i -ya
3sO P:inside out cnj 1sPf sg go
1 1 2 10 12 stem
mə't'āhəghiyə 'I took [my clothes] off'

Incorporated postpositions differ from unincorporated postpositions in that they undergo phonological rules that unincorporated postpositions do not. For example, the vowel inserted by Epenthesis (Ch. 6, sec. 2) is deleted if it follows a vowel-final incorporated postposition, but not if it follows an unincorporated postposition. Compare (388)-(390) with (391)-(393):

**incorporated postposition**

(388) xəda ka-e -s -l -dzət
moose P epen cnj clf hunt O
ka-e-s-l-dzət

Aspiration h
ə Deletion Ø

xəda kahdzət 'he, she hunted down a moose'

(389) tən gha-e -n -get
ice P epen cnj poke, chisel
1 10 stem
tən ghogət 'he, she chisels through the ice'

(390) se -gha-e -h -ʔa
1sO P epen clf ?
1 1 13 stem
sahʔa 'he, she hires me'

**unincorporated postposition**

(391) ?ə -nka a -ch'ɪ
unspO P epen be, do
ʔi'ka ac'h'ɪ 'he, she is trapping'

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(392) Peter la ø -ch'è 'he, she helps Peter'  
P epen be, do

(393) bêt ka ø -ch'è 'he, she is cooking'  
stomach P epen be, do

Phonological evidence indicates that at least some preverbal postpositions are incorporated into the verbal prefixes.

6.2 Level 4 Phonology

Evidence that the level 4 prefixes differ phonologically from the level 2 and 3 prefixes was presented in 5.2. The level 4 prefixes are primarily distinguishable from the level 3 prefixes by virtue of the fact that they require the basic alternant of many level 2 and 3 prefixes.

In 6.2.1 I discuss one phonological rule which applies on level 4 but not on levels 2 and 3. In 6.2.2 I discuss another rule which helps distinguish level 4 from the syntax phonologically.

6.2.1 Level 4 Schwa Fronting

As discussed in Ch. 1, Sekani has six underlying vowels, including /ø/ and /e/. Contrasts between these vowels can be seen in the following pairs of stems:

(394) bes  'knife'  

(395) bēs  'river bank'

(396) -bets  'cook [O] by boiling'  

(397) -bets  'stretch [O]'

Although contrasts between /ø/ and /e/ such as these can be
found in stems (level 1 domains), in affixes, the vowels $\_e$ and $\_e$ are in complementary distribution, as summarized below:

$\_e$
level 2 and 3 prefixes, except output of various $\_e$ Fronting rules
all suffixes
level 4 verb prefixes

Since $\_e$ occurs in a more restricted and thus more easily characterized set of environments than does $\_e$, I suggest that all instances of surface $\_e$ in affixes are underlyingly $/a/$. Some of the "Schwa Fronting" rules have already been encountered in 4.2 and another will be presented in Chapter 4.

On level 4, the following rule applies:

(398) Level 4 Schwa Fronting

$\_e \rightarrow \_e$

This rule accounts for the surface forms of level 4 prefixes while simultaneously accounting for the absence of $\_e$ in the level 4 prefixes.

Much of the evidence for this rule is distributional. However, there is also limited evidence from alternations in support of level 4 Schwa Fronting. The prefix $/ch\_e/ 'water, into water'$ occurs as both a nominal and a verbal prefix. In Ch. 4, 4.3.1, I will argue that nominal derivational prefixes, such as $/ch\_e/$, are added on level 1. As a level 1 nominal prefix, the surface form of this prefix is $ch\_e$:

(399) $ch\_e -m\_i\_I$
water snare

'fish net'
(400) che -ba
    water father

However, as a level 4 verbal prefix, its surface form is che:

(401) che -nə -n -ʔq
    water cnj Pf handle compact O
    2    10 11 stem

cheniʔq
        'he, she put [compact O]
in the water'

(402) che -chu -de -nə -l -tla
    water water der cnj clf sg/du run
    2    3    9    10    13 stem

chechudqtlal
        'he, she ran into the water'

Thus alternations between level 1 [che] and level 4 [che] pro-
vide some evidence that the vowel [e] in the level 4 prefixes is
underlyingly /ə/.

The distribution of [ə] and [e] in the level 4 morphology
is actually more complicated than this. Some surface [ə]'s do
occur in the level 4 prefixes. I have summarized the distribu-
tion of [ə] and [e] in the level 4 verb prefixes below:

<table>
<thead>
<tr>
<th>position</th>
<th>prefix</th>
<th>[ə] or [e]?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>incorporated postposition</td>
<td>may contain [ə] or [e]</td>
</tr>
<tr>
<td>2</td>
<td>adverbial</td>
<td>[e] only</td>
</tr>
<tr>
<td>3</td>
<td>incorporated stem</td>
<td>may contain [ə] or [e]</td>
</tr>
<tr>
<td>4</td>
<td>distributive</td>
<td>da, ya da only</td>
</tr>
<tr>
<td>5</td>
<td>customary, reversative</td>
<td>na only</td>
</tr>
<tr>
<td>6</td>
<td>inceptive</td>
<td>wa only</td>
</tr>
</tbody>
</table>

The only prefixes which occur in prefix positions 4 and 5 lack
both [ə] and [e], and thus provide no information about the
domains of [ə] and [e]. The inceptive prefix, however, provides an example of the application of Schwa Fronting. I suggested in 6.1.1 that its underlying representation is /xə/, rather than wæ, because underlying labio-velars are scarce. Most can be derived by the rule of Diphthongization:

(403)  o --> we / velar ___

Given the independently necessary rule of Diphthongization, the underlying form of the inceptive prefix can be considered /xə/, provided that Level 4 Schwa Fronting is also in the grammar:

/xə/

Diphthongization  whæ
Schwa Fronting  whê

In the adverbial prefix position, a variety of prefixes may occur. I have provided a partial list of those which contain [e]:

(404)  le  'in half'
shê  'chew'?
ʔanə  'out'
che  'into water, water'
chè  'move'?
nê  'to the ground'
ts'e  'awake; lengthwise'
k'e  'broken, severed'
k'ê  'perambulative'

Level 4 Schwa Fronting accounts for the conspicuous absence of [ə] among the adverbial prefixes.

This leaves only the incorporated stems in positions 1 and 3 as superficial exceptions to level 4 Schwa Fronting. As can be seen below, both ə and ə occur in the prefixes of this position.
stems with [e]: incorporated nouns

(405) nā ~xeI ~na ~de ~i ~n ~d ~?āh
down pack rev der der 2sS clf handle compact 0
 2  3  5  9  9  12  13 stem

nāxeInadıt’āh  'you [sg] put your pack
down again'

(406) na ~gotts’ëlë~sə ~i ~h ~kah
rev elbow  cnj 1sPf clf wound
 5  3  10  12  13 stem

nagotts’ëlësihkah  'I banged my elbow again'

stems with [e]: incorporated postpositions

(407) mə ~nəh~də ~sə ~i ~ya
3sO P  der cnj 1sPf sg go
 1  1  9  10  12 stem

mənəhdəeya  'I met him, her'

(408) mə ~k’è ~də ~i ~l ~?èts
3sO P:on der der clf step
 1  1  9  9  13 stem

mak’èdəs?èts  'I stepped on it'

stems with [ə]: incorporated nouns

(409) beI ~də ~h ~ts’əq’h
sleep thm clf yawn
 3  9  13 stem

beIdahts’əq’h  'he, she yawns'

(410) yidə ~shən~e ~də ~nə ~i ~ya
inside song vb der cnj 1sPf sg go
 2  3  9  10  12  13 stem

yidəshənedəniya  'I walked inside, singing'

These exceptions to Level 4 Schwa Fronting do not seem so excep-
tional once it is recalled that it is precisely within stems
that contrasts between /ə/ and /e/ can be found. Under the
assumption that the incorporated stems are level 1 domains, as suggested above in 6.1.4, the morphological structure of the incorporated stems on level 4 now resembles a compound, rather than affixational, sort of structure:

```
position 1  2  3  4  5  6
       [Af[Postpos.]] Adv [Af[Stem]] Dstr na Incp
  level 1 level 1
  level 4 level 4 4 4
```

Underspecification provides an explanation for why the level 4 stems with /ə/ fail to undergo level 4 Schwa Fronting. Using underspecification, /ə/ can be analyzed as an empty V slot underlyingly. Thus Schwa Fronting may be reformulated:

(411) \( V \rightarrow θ \)

We need only assume that a default rule which supplies the feature values for /ə/ has applied to empty V slots in stems prior to level 4 incorporation, perhaps at the end of level 1:

(412) [ə] default rule:

\( V \rightarrow θ \)

Thus on level 4, the incorporated stems with /ə/ will fail to meet the structural description of level 4 Schwa Fronting because of the prior application of the [ə] default rule. Consider the derivation of (409) [bəIdahts'əgh], under this analysis:

```
  level 1 [ə] default rule h-ts'Vgh bVI
                ə ə
e
  level 2       da-h-ts'əgh
  level 4
       incorporation baI-da-h-ts'əgh
```

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However, a form like [čèʔäh] contains the prefix /chV/ 'into water', which is not a stem. Since it will not undergo the level 1 [ə] default rule, it is free to undergo level 4 Schwa Fronting:

level 1
?əh

level 2
cnj  WFR  nə-ʔəh
cnj  ə  Deletion  n-ʔəh

level 4
adverbial  WFR  chV-n-ʔəh
Schwa  Fronting  che-n-ʔəh

Thus underspecification provides insight into how level 4 Schwa Fronting rule distinguishes level 1 domains from those of level 4.

6.2.2  a Raising

a Raising applies on level 4, but not post-lexically, providing evidence that the level 4 verb prefixes are phonologically distinct from the syntax.

a Raising is informally stated in (413):

(413)  a  -->  o /  ___ n]syll

As will be seen in Ch. 8, the syllable-final restriction on this rule is crucial.

Alternations between [ə] and [ʔə] provide evidence for this rule:
(414a)  chu -na -s -d -k'âs
       water  rev 1sS clf wash 0
       3  5  12 13 stem

       chunâsk'âs  'I wash [O]'

(414b)  chu -na -n -d -k'âs
       water  rev 2sS clf wash 0

       chunâqk'âs  'you [sg] wash [O]'

(415a)  ?a -s -lâ
       adv 1sS make 0
       2  12 stem

(415b)  ?a -n -lâ
       adv Pf make 0

       ?qâlâ  'he, she made [O]'

(416a)  k'ê-na-d -lits
       per C clf float
       2  5  13 stem

       k'êqâlits  'he, she floats around'

(416b)  k'ê-na-n -d -lits
       per C 2sS clf float

       k'êqânlîts  'you [sg] float around'

In (416a), a Raising must be ordered before the rule of Perambulative Reduction given in (417):

(417)  Perambulative Reduction

       k'ê+na  -->  k'an / (C) [ (clf) stem ]

       k'ê-na-d-lîts

a Raising

Nasalization  k'ê

[k'êqâlîts]

Perambulative Reduction applies only to the position 2 k'ê and
position 5 na prefixes. I will return to the formulation of
this rule in Ch. 5, 3.2.

6.2.2.1 Domain of a Raising

a Raising applies throughout the lexicon, as can be seen in the following stems:

(418a) chu k'ā-na-d -ka -h
water per C clf handle contained 0 C

chu k'ākah
'he, she carries [container of] water around'

(418b) nā -sa -ka -n
cont cnj handle contained 0 Pf

chu nāsəkə
'he, she carried..water around'

(419a) na -n -ʔa -h
rev 2sS handle compact 0 Imp

sīdlogh nqʔəh
'you [sg] give me back [compact 0]'

(419b) na -ghe-n -ʔa -n
rev cnj 2sS handle compact 0 Pf

sīdlogh naghīʔə
'you [sg] gave me back...

I will argue in Ch. 8 that a Raising may apply in non-derived contexts, as well as in the derived contexts illustrated above.

If a Raising applies on levels 1 and 4 of the lexicon, one would also expect to find forms in which it has applied on levels 2 and 3. However, a-final prefixes (and nasal-initial stems) are rare in Sekani. In the few cases where the combination arises, the syllable-final restriction on a Raising is not met:

(420) chu da -a -nīl -e
water Fut Fut high Fut

chu danīlə
'there will be high water'
(421) chè-nè -a -na
adv cnj 2pPf move
chènana 'you [pl] moved'

Thus the failure of a Raising to apply in these forms is not a problem for the lexical analysis of a Raising.

Two stem-final morphemes in Sekani which contain [q] are listed in (422):

(422) -q optative
    -hq negative interrogative

Some forms in which these morphemes occur are provided below:

(423) chu gho-ī -d -dq -~ -azi q
    water Op 1dS clf drink dur:Op dim Op
    chu ghuđqazi q 'we [du] have a little drink' Op

(424) usè ?e -gho-n -d -bà
    neg unsp Op 2sS clf children, animals eat neg Q
    usè ?aghqbà hq 'you [sg] aren't eating?' Op

(425) k'eadåqh usè ts'ødè mqsanîtsus hq
    yet neg blanket îd give cloth-like 0 to 3s neg Q
    'didn't we [du] give him, her that blanket yet?'

As some indication that these are sentence-level morphemes, notice that -a occurs to the right of the level 4 diminutive suffix -azi in (423). I will provide additional evidence for a sentential analysis of these morphemes in 7.2.3.

The existence of these morphemes which contain [q] suggests that a Raising cannot be a post-lexical rule. Since other forms indicate that a Raising is a lexical rule and (as I will argue
in Ch. 8) this rule can apply in non-derived environments, these
morphemes can only be added in the syntax, where a Raising does
not apply.

6.2.2.2 a Raising and the na prefixes

Having illustrated the level 4 rule of a Raising, I will
now consider some of the characteristics of the level 4 na
prefixes and provide evidence that they should be assigned to
prefix position 5.

Level 4 [a]-final prefixes undergo a Raising when followed
by /na/:

(426a) nā -ghe-d  -ts'it
down 3pS clf sg/du fall
nāghēts'it  'they [du] fall down'

(426b) nā -na-ghe-d  -ts'ēts
down C 3pS clf sg/du fall
nōnāghēts'ēts  'they [du] fall down customarily'

(427a) tā-se -ya
up cnj sg go
'the, she went uphill'

(427b) tā-na -s  -d  -ya
up rev cnj clf sg go
tōnasja  'he, she went back uphill'

These data seem very strange, in light of the fact that a Rais-
ing should fail to apply if the [an] sequence is not syllable-
final. However, notice that the vowel of the prefix which
precedes /na/ has not only undergone Raising, but is also nasal-
ized. These data suggest that the following rule has applied in
these forms:
(428) \( \underline{n} \) Insertion
\[ \emptyset \rightarrow n / a \underline{a} \underline{a} na \]
Clearly \( \underline{n} \) Insertion must precede \( a \) Raising, as the following derivation indicates:

\( \underline{n} \) Insertion \quad tā-na-se-d-ja
\( a \) Raising \quad tōn-na
Nasalization \quad tō-na

[tōnasja]

\( na \) is optionally deleted after \( a \) Raising and Nasalization have applied:

(429) \( \underline{a}na \) Deletion
\[ na \rightarrow \emptyset / ñ \underline{ñ} \underline{ñ} \quad \text{optional} \]

This is indicated by the following forms:

(430a) dā -na -de -ne -n -chīh
adv rev der cnj Pf handle stick-like O

= dādētō dūnādēnīchīh  'you [sg] close the doog again'

(430b) dādētō dūdnīchīh

(431a) hā -na -ah -Ieh
out rev 2pS handle rope-like O

= chēmīl hōnōhIeh  'you [pl] take the fishnet back out'

(431b) hōnIeh

The latter form indicates that Nasalization must apply before \( na \) is deleted:

\( hā-na-ah-Ieh \)

\( \underline{n} \) Insertion \quad hān-na
\( a \) Raising \quad hōn-na
Nasalization \quad hō-na
\( \underline{a} \)na Deletion \quad [hōnIeh]
Otherwise *[hənahleh] would result; [həlahleh] would not be a possible surface form.

6.2.2.3 na Metathesis

The na prefixes optionally precede the incorporated stems, as the following (free variant) forms indicate:

(432) nà -chu -na -dé -s -ts'et
cont water rev der 1sS sg/du stand
2 3 5 9 12 stem

(a) nəncudəsts'et 'I stand in the water again'
(b) =nəchunadəsts'et

(433) nà -xeI -na -dé -l -n -d -ʔəh
down pack rev der der 2sS clf handle compact 0
2 3 5 9 9 12 13 stem

(a) nəxeInadət'əh 'you [sg] put your pack down again'
(b) =nənaxeIdət'əh

(434) tə-tsI -na -ghə-d -ʔq
up head rev cnj clf handle compact 0
2 3 5 10 13 stem

(a) tətsInaghət'q 'he, she put [O] on his, her head again'
(b) =tətsInaghət'q

(435) Iughe chq -na -ʔə -dé -gə-s -ləI
fish guts rev unspO Fut Fut 1sS handle pl 0
3 5 7 9 11 12 stem

(a) Iughe ənənəʔədəgəsIəI 'I will take the guts out of another fish'
(b) =Iughe nəchnəʔədəgəsIəI
(436)  dlògh-na -yə -ghe-nə -n -zən
    laugh rev thm 3PS face Pf have made?
    3   5  7  8  9  11 stem

(a)  dlòghnayəghənizən  'they smile again'
(b)  =nadlòghyəghənizən

To account for this positional instability, the na word
formation rules and the incorporated stem word formation rule
may be left unordered with respect to each other.

Notice that na can move no further left than the incor-
porated stems (position 3). na cannot precede the adverbial
prefixes (position 2):

(437)  ts'e-na -yə -də -ghe-n -ʔə
    fire rev 3sO fire cnj Pf handle compact O
    2   5  7  9  10  11 stem
    ts'enayədəghiʔə  'he, she put it in the fire again'
    *nats'eyədəghiʔə

(438)  yidə -na -n -d -ya
    inside rev cnj clf sg go
    2   5  10  13 stem
    yidəŋəja  'he, she went back inside'
    *nayidəja

(439)  che -na -ghe-nə -jetl
    water rev 3PS cnj pl go
    2   5  8  10 stem
    chenaghıjijetl  'they ran into the water again'
    *nacheghıjijetl

These data indicate that the incorporated stem and adverbial
prefix word formation rules really are distinct. In a position
class analysis, distinct prefix positions must be recognized.
The preceding data showed that stems and the na word formation rules are unordered with respect to each other. We are now in a position to ask what the order of na is with respect to the other level 4 word formation rules. We have seen examples in which the stems occur to the left of the distributive prefixes (369-371), others in which the distributive prefixes occur to the left of the inceptive prefix (364), and also some examples in which na occurs to the left of the inceptive prefix (353-355). Thus the following rule ordering hypothesis is well-motivated:

(440) inceptive
     \   \distributive
      \   \   stems
       \   \adverbial

However, na could precede either precede or follow the distributive word formation rule. I have postponed presenting forms in which the distributive and na prefixes co-occur until now, because their interpretation makes use of the rule of a Raising and the curious facts we now know about na: that it causes n Insertion after certain prefixes, and that it is unstable in position in some forms.

Consider the following forms, in which na and dâ co-occur:

(441) che -dâ -na-ghæ-1 -ghæs
into water dstr C 3pS clf pl run
2  4  5  8  13 stem
chenadghæghæs 'they habitually run into the water separately'
(442) ni -dà -na-ts'è-dè ì -?ah
raise dstr C 1pS thm thm handle compact O
2 4 5 8 9 9 stem

ninadòts'èdè?ah 'we habitually lift
[compact O] separately'

(443) dà -na-ah -d -kwi
dstr C 2pS clf vomit
4 5 12 13 stem

nadòahkwì 'you [pl] habitually
vomit separately'

\( \text{na} \) occurs to the left of \( \text{dà} \), and \( \text{dà} \) has become nasalized and has
undergone a Raising. Clearly, the most economical analysis of
these data is to make use of already motivated phonological
rules and posit a rule of metathesis. I assume that \( \text{na} \) inser-
tion precedes distributive \( \text{dà} \) prefixation. After \( \text{n} \) Insertion
has applied, \( \text{na} \) moves leftward by the following obligatory
metathesis rule:

(444) Distributive-na metathesis

dstr \( \text{na} \) \( \rightarrow \) 5 4
4 \( \frac{5}{5} \)

This analysis is illustrated in the derivation of (443):

dà-na-ahkwì

n Insertion dàn-na
a Raising dòn-na
Nasalization dò-za
Metathesis nà-dò

[nadòahkwì]

Unless \( \text{na} \) is to the right of \( \text{dà} \) distributive at some point in
the derivation, the fact that \( \text{dà} \) has become nasalized and under-
gone Raising cannot be accounted for by the independently needed
rules of \( \text{n} \) Insertion and a Raising.
Additional support for this analysis comes from consideration of forms which contain na and the yādā distributive prefix:

(445) yādā-na-ts'e-l -d -kwi
dstr C 1pS der clf vomit
4 5 8 9 13 stem

yānaddāts'ikwi 'we vomit again separately'

(446) yādā-na-ts'e-l -tsō
dstr C 1pS der shit
4 5 8 9 stem

yānadīts'itsō 'we shitted again separately'

In these forms na occurs to the left of dā but to the right of yā. Only dā, however, has become nasalized and undergone a raising. These forms strongly support the assignment of na to a position to the right of the distributive prefixes. Moreover, they suggest a reanalysis of the Distributive-na Metathesis rule given above:

(447) dā na --> 5 4
4 5

na can only move to the left of dā, not to the left of the entire distributive prefix when the yādā allomorph occurs.

Forms like (431b) hōahIeh and (443) nadōañhkwi provide evidence that Nasalization is a lexical rule. In addition, the derivations required to account for these forms are of considerable interest for Lexical Phonology. na Deletion and na Metathesis should probably be considered "morphological" rules, since they apply only to the position 5 prefixes na reversative and na customary, never to the position 2 adverbial prefixes such as nā continuative. In the derivations of these forms, the
phonological rules of Nasalization and a Raising must apply before the morphological rules which move or delete na. Thus these forms, in which phonological rules precede morphological ones, provide strong support for the Lexical Phonology model.

7. Post-lexical phonology

As discussed in Ch. 2, Kiparsky (1983b) has predicted that rules which apply in the lexicon and those which apply in the syntactic component have different characteristics. For example, lexical rules are regulated by principles such as the Strict Cycle Condition and structure-preservation; they apply in restricted, morphologically-defined domains; and they may have lexically marked exceptions. Post-lexical rules, on the other hand, have none of these characteristics, but are often low-level, allophonic, boundary-insensitive rules. To state the hypothesis another way, the model predicts that rules with the characteristics of lexical rules always apply before rules with the characteristics of post-lexical rules. This is an important prediction: in another model, these differences between rule types could only be regarded as incidental.

Kiparsky (1983a) proposes that post-lexical rules may either assign gradient or categorical values of features. He suggests that it may be possible to predict which rules function in which ways from the formulation of the rule:

(448a) Context-sensitive rules which override lexical marking conditions have gradient outputs.

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(b) Rules which assign default or lexically markable feature values have categorical outputs.

As predicted, both types of post-lexical rules are found in Sekani. An example of the latter type of post-lexical rule in Sekani is Nasalization. This rule applies on all levels of the lexicon as well as post-lexically. However, its post-lexical application is not gradient and variable: the sentence-level morpheme ha negative interrogative does not vary between ha and han, for example. Another post-lexical rule which I will discuss in 7.2, Glottal Stop Insertion, is also a rule of this sort. However, while Glottal Stop Insertion does not violate structure-preservation, Nasalization does.

The post-lexical rule of Devocalization, discussed in 7.1, exemplifies the type of rule predicted in (448a). The output of this rule is variable, as the application of the rule depends on rate and style of speech. The rule is not structure-preserving.

7.1 Round vowel Devocalization

The round vowels /o u/ are devocalized to [w] before another vowel. This rule applies in normal- to fast-paced speech:

(449) Devocalization

\[ u, o \rightarrow w \ / \_ _ \_ \ V \]

(450a) \(?əsk'që\) 'roe'
(b) \=?əsk'wë\n
(451a) \(dək'qəzi\) 'he, she is midget-sized'
(b) \=dək'wəzi\n
The (a) forms in each pair represent a slow or careful pronun-
ciation. In slow speech, the quality of the devocalized vowel as well as its underlying tone and nasality are recoverable. In the fast speech (b) forms, low tone simply disappears, whereas nasality appears on the vowel in the context of the rule.

Devocalization has many of the predicted characteristics of post-lexical rules. Its output is gradient and variable: the devocalized version of /u/ may be any segment on a syllabicity cline from [w] to [u], depending on rate of speech. It does not appear to have any lexically marked exceptions, as do other rules in Sekani, such as Palatalization. The formulation of Devocalization does not require morphological conditioning: the level 2 derivational prefix u- and the level 1 plural suffix -hu undergo this rule just like the stem-final round vowels in (450) and (451) above.

(452) uah'tôn 'you [pl] hold [O]'
   "wahtôn

(453) uahch'eh 'you [pl] shoot [O] repeatedly'
   "wahch'eh

(454) ts'udahuazi 'children'
   "ts'udahwazi

The fact that Devocalization is insensitive to morphological structure also suggests that it is a post-lexical rule.

Finally, Devocalization is clearly not a structure-preserving rule. Although we have just seen that there is reason for doubting the validity of this principle, it is interesting to
note that many of the outputs of Devocalization are syllable-initial consonant clusters which violate canonical syllable structure constraints in Sekani. Consider the following forms:

(455) jeyqè 'bullmoose'  
  =jeywə

(456) ñt'qazi 'small leaf, flower'  
  =ñt'wazi

(457) dæk'we 'porcupine'  
  =dæk'we

(458) dlqazi 'mouse'  
  =dlwazi

(459) jèz?qazi 'gun'  
  =jèz?wazi

Since there are no tauto-syllabic consonant clusters in underlying representations, structure-preservation predicts that the marking condition in (460) should hold throughout the lexicon:

(460) * Onset

The fact that Devocalization violates this marking condition suggests that it is not a lexical rule.

Devocalization thus has many of the predicted characteristics of post-lexical rules. While it can apply to the output of lexical rules such as a Raising, there are no lexical rules that it must precede, as predicted by a post-lexical analysis of
7.2 Glottal Stop Insertion

Krauss (1964) proposed that tone in the Athabaskan languages developed from the presence or absence of a glottal segment in the nucleus of Proto-Athabaskan syllables. The contrast between glottalized and non-glottalized nuclei yielded to a tonal contrast when nucleus glottalization was lost. The glottal segment has led to the development of high tone in some languages (these are the "high-marked" languages), but low tone in others (the "low-marked" languages). Only some of the Athabaskan languages are tone languages. The toneless Athabaskan languages are typically those which have retained syllable-final ejective consonants. See Krauss (1978) or Leer (1979) for further information about tone in the Athabaskan languages.

Sekani is a low-marked language: syllable-final glottalization has led to the development of low tone. Knowing the historical situation, it would not be surprising to find that either low tone or post-vocalic glottal stop is predictable in the synchronic phonology.

7.2.1 Tone and glottal stop

Synchronously, low tone and syllable-final glottal stop are in complementary distribution except word-finally, as the following alternations will indicate. In each of the following pairs of stems, a low tone stem is word-final in the (a) forms, but word-internal in the (b) forms. The pronunciation of the unincorporated stem in the (a) forms contains a word-final
glottal stop, whereas the pronunciation of the same stem in the (b) forms, where it is not word-final, lacks the stem-final glottal stop. (I do not normally write word-final glottal stop following low tone vowels. However, for the examples in this section I have departed from the usual orthographic convention.)

(461a) sætsi? 'my head'

(461b) nà -tsi -de -ghès cont head thm ?

nàtsîdæghès 'he, she shakes his, her head "no"

(462a) sætl'å? 'my buttocks'

(462b) tl'å -na -ghæ-de -t -ts'åts buttocks rev 3pS der der ?

tl'qnahgædîts'åts 'they slide down again'

(463a) sægots'ëlë? 'my elbow'

(463b) gøts'ëlë-se -i -h -kah elbow cnj 1sPf clf wound

gøts'ëlësihkah 'I banged my elbow'

(464a) mæt'å? 'inside it'

(464b) nat'æne t'å -ghæ-i -ya clothes P:inside cnj 1sPf sg go

nat'æne t'ëghiya 'I put some clothes on'

(465a) whëk'å? 'by us'

(465b) whæ-k'å -se -n -da lpo P:by cnj 2sS sg sit

whëk'æsîda 'you [sg] stay with us'

Clearly, low tone and syllable-final glottal stop are still
synchronously related. But it is not clear from these data alone whether low tone is predictable from glottal stop, or whether word-final glottal stop is predictable from low tone.

7.2.2 /?/ or /~?/

Consider the rules that would be required by each analysis.

If low tone were present underlyingly, all that would be required is the following post-lexical rule:

(466) Glottal Stop Insertion

\[
\begin{array}{c}
L \\
\emptyset \rightarrow \? / \backslash \_
\end{array}
\]

However, if low tone were derived from glottal stop, a more complicated analysis would be required. A rule creating low tone would be needed, along with an addition rule deleting syllable-final glottal stop everywhere but word-finally:

(467) \( \emptyset \rightarrow L / \_ \? (X) \) [syl]  \\

(468) \( ? \rightarrow \emptyset \) [syl] X

However, there is a problem with the rule in (468). Word-internal glottal stops do exist. Compare the following contrast between [VV] and [V?V]:

(469) hâ -?e -n -leh  
out unspO 2sS handle pl 0  
2 7 12 stem

hâ?ileh 'you [sg] carry out [pl 0]'

(470) ni -na -tsâ -i6e-I -i -d -?q  
raise rev head der der 1sPf clf handle compact 0  
2 5 3 9 9 12 13 stem

ninatsâ?dît'q 'I lifted my head'
Clearly, (468) could not be a post-lexical rule: it would have to apply in the lexicon before the resyllabification of [?] with a following vowel-initial morpheme added on the next cycle. Otherwise, if a stem-final glottal stop were present at the point in the derivation that 'head' is incorporated in (470), it should be resyllabified with the following vowel-initial prefix, resulting in *ninatsiʔidit'q. Assuming that /?/, rather than low tone, is underlying, a simpler analysis would be to posit a lexical rule of Glottal Absorption:

(471) Glottal Stop Absorption

    ? --> L / __ 1syll

Under this analysis, post-lexical Glottal Stop Insertion would still be required.

To summarize, if low tone is underlying, the phonology requires fewer rules, but the complementary distribution of low tone and syllable-final glottal stop in underlying representations is unaccounted for. An analysis which posits underlying /?/ accounts for the distribution of /?/, but requires more rules. Before deciding between these two analyses, let me first mention some additional facts. Given the historical development of tone in Sekani, one would predict that no sequences of high tone vowels followed by syllable-final glottal stop ([ʔʔ]) exist in the synchronic phonology of Sekani. However, there are a small number of such syllables in Sekani, an exhaustive list of which is given in (472)-(476):

(472) boʔ  'kiss'

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(473) na -də -s -d -zo?
rev thm cnj clf kiss
5 9 10 13 stem

nadəsdzo? 'he, she kissed [O]'

(474) na? 'here, take [O]' voc
(475) je? 'give [O] to me' voc

(476) bûs-azîî?
cat ădim

'baby kitten'

If low tone is present in underlying representations, then the forms in (472)-(476) are predicted, not exceptional. However, given an underlying /?/ analysis of tone, the forms above would have to be listed as exceptions to Glottal Stop Absorption. However, other lexical rules, such as Palatalization, have marked exceptions: this cannot be considered a serious objection to an underlying glottal stop analysis, especially given the small number of such forms.

The choice between /?/ over /~/ thus seems to depend mainly on the number of rules required. The underlying low tone analysis requires only one rule, whereas the underlying glottal stop analysis requires two rules. However, as it turns out, the greater simplicity of the underlying low tone analysis is only apparent. If a rule of Glottal Stop Absorption is posited synchronically, this will simplify the phonology in other ways. The rule of Conjugation Tone Mapping discussed in 5.2.2 is repeated below in (477):

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If the underlying representations of these conjugation prefixes are not /\-se/ and /\-no/, but /?se/ and /?no/, then Conjugation Tone Mapping can simply be regarded as an instance of Glottal Stop Absorption. Thus an underlying glottal stop analysis accounts for the distribution of glottal stop, and requires as few rules of the phonology as an underlying low tone analysis.

Moreover, the /?/ analysis accounts for certain facts about aspectual stem variation that would be unaccounted for in an underlying /\-/ analysis. As discussed in 3.1.1, the typical durative aspectual suffixation pattern for vowel- and nasal-final roots is that given in (478):

\[
\begin{array}{cccc}
\text{Imp} & \text{Pf} & \text{Fut} & \text{Op} \\
\varnothing & \varnothing & \varnothing & \varnothing
\end{array}
\]

This pattern is illustrated below with the roots /da/ 'pl eat' and /t'in/ 'work':

\[
\begin{array}{cccc}
\text{-da} & \text{-dà?} & \text{-dàI} & \text{-dà?} \\
\text{-ch'i} & \text{-ch'i?} & \text{-ch'iI} & \text{-ch'i?}
\end{array}
\]

Consonant-final roots usually exhibit no stem variation in the durative aspect, as can be seen with /dàI/ 'play cards' and /sogh/ 'shave':

\[
\begin{array}{cccc}
\text{-dàI} & \text{-dàI} & \text{-dàI} & \text{-dàI} \\
\text{-sogh} & \text{-sogh} & \text{-sogh} & \text{-sogh}
\end{array}
\]

Now consider the following stems sets:

\[
\begin{array}{cccc}
\text{-?i?} & \text{-?i?} & \text{-?i?} & \text{-?i?} & \text{'hide'}
\end{array}
\]

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Notice that no aspectual suffixes are present in the above pair. If these roots are underlyingly vowel- or nasal-final (/ʔI/ and /ba/), they would be expected to pattern like those in (479)-(480). However, the fact that the typical durative suffixes for vowel-final roots are not added is easily accounted for if the roots in (483)-(484) are underlyingly consonant-final: /ʔin?/ and /ba/, respectively.

An addition argument for deriving low tone from glottal stop is provided by the following stem set. The non-imperfec-
tive stems in (485) suggest that the durative aspect non-imper-
fective suffix is underlyingly /ʔ/, rather than /\:/.
(485)  -sən  -sI?  -s\I  -sI?  'smile'⁡

Notice that in the non-imperfecive stems, the stem vowel /ə/ has become nasalized and has undergone a Raising. Why has this not occurred in the imperfective stem? (As will be seen in Ch. 8, it is normal for Nasalization to fail to apply to /ən/ in stems.) I suggest that it is the fact that a consonantal suffix has been added in the non-imperfective modes, but not in the imperfective, that has caused /ə/ to become nasalized (and thus undergo Raising). If the durative suffix is /\:/, it would be necessary to list two stems for 'smile' underlyingly, rather than account for the [ən] ~ [I] alternation by independently required rules.

To summarize, an underlying /ʔ/ analysis of the alterna-
tions between syllable-final [ʔ] and 0 accounts for the follow-
ing facts, in addition to the alternations:

- distribution of [ʔ]
- distribution of low tone
- aspectual stem variants
- nasalization of [ə] in stems

Two rules, Glottal Stop Absorption (lexical) and Glottal Stop Insertion (post-lexical), are required by this analysis. I will return to Glottal Stop Absorption briefly in Ch. 4. Now I would like to consider some of the characteristics of Glottal Stop Insertion, in particular, those predicted by Kiparsky's lexical/post-lexical rule typology.

7.2.3 Glottal Stop Insertion

As discussed above, the domain of Glottal Stop Insertion (466) is the word. However, what counts as a word varies according to rate of speech. Consider the following forms:

(486) nəgha unəgʰuŋŋə ʔ  
  wolverine we [du] behave like Op

  (a) nəgha unəgʰuŋŋə ʔ  'we [du] behave
  like wolverines' Op

  (b) =nəgha unəgʰuŋŋəʔ ʔ

(487) nãts'əduyã ʔ  
  we stand around Op

  (a) nãts'əduyã ʔ  'we stand around' Op

  (b) =nãts'əduyãʔ ʔ

The variants in (a) represent fast speech forms: in fast speech, glottal stops are not inserted word-finally. The variants in the (b) forms which contain stem-final glottal stop are heard in slow or careful pronunciations. Although rate of speech thus determines whether or not word-final glottal stops
are inserted, it should be noted that the rule does not apply word-internally even in slow speech:

(488) ?e -s-k'Q-è
    unsp Psr ? roe psd
    ?es.k'Q.e

'roe'

This suggests that the formulation and domain of Glottal Stop Insertion proposed above is indeed correct. In slow speech, the domain of this rule is the word; in fast speech, it is some larger, phrasal unit. The contrast between the vowel-initial suffixes in (486-7) and (488) with respect to this rule provides additional evidence that the vowel-initial optative morpheme a is indeed a sentence-level morpheme, rather than a suffix, as proposed in 6.2.2.1.

Superficially, then, the application of the rule depends on rate of speech. On closer inspection, however, it is the domain of the rule, not the application of the rule, that varies according to rate of speech.

It is interesting to note that the post-lexical rule of Glottal Stop Insertion does not violate structure-preservation, while the clearly lexical rule of Glottal Stop Absorption does. Since syllable-final /ʔ/ is present underlyingly, structure-preservation cannot be invoked to account for the fact that Glottal Stop Insertion is a post-lexical rule.

It is easy to show that Glottal Stop Absorption violates structure-preservation. First consider the evidence that Glottal Stop Absorption applies in the lexicon. a-conjuga-
tion forms like those in (489) below indicate that Glottal Stop Absorption must precede s Deletion

(489a)  de -?sə-i -h -dəgh
thm cnj 1spf clf swallow
 9 10 12 13 stem
dəehdəgh           'I swallowed [O]'

(489b)  de -?sə-n -h -dəgh
thm cnj 2ss clf swallow
dəehdəgh           'you [sg] swallowed [O]'

(489c)  de -?sə-a -h -dəgh
thm cnj 2ps clf swallow
dəahdəgh           'you [pl] swallowed [O]'

The preceding phonetic forms contain pre-vocalic low tone vowels. As seen in (469) above, word-internal glottal stop does exist. Unless Glottal Stop Absorption precedes s Deletion in these forms, nothing would prevent the syllable-final glottal stop from resyllabifying with the following vowel-initial syllable. The following incorrect derivation illustrates this problem:

(490)    /de-?s-a-h-dəgh/

lexical:
s-Conjugation e Fronting e
Prefix Vowel Deletion --
s Deletion Ø
Assimilation to [a] a

post-lexical:
resyllabification da?ahdəgh
Glottal Stop Absorption --

eventually    *[da?ahdəgh]

Post-lexical resyllabification would presumably apply before Glottal Stop Absorption, bleeding the latter. However, if Glot-
tal Stop Absorption is a lexical rule, ordered before s Deletion, the correct form will be derived:

(491) \( /də-ʔs-a-h-dəgh/ \)

Glottal Stop Absorption \( ̃ \)
\( s-\)Conjugation \( ə \) Fronting \( e \)
Prefix Vowel Deletion \( -- \)
\( s \) Deletion \( \emptyset \)
Assimilation to [a] \( a \)

\( [dəahdəgh] \)

In an analysis in which low tone is synchronically derived from glottal stop, low tone will not be marked in underlying representations. Structure-preservation prohibits the lexical introduction of non-distinctive features. However, as just seen, Glottal Stop Absorption must be a lexical rule. This suggests that either the analysis is incorrect—low tone must be represented in underlying representations—or else structure-preservation is not a viable hypothesis.

Since a good case can be made for an underlying glottal stop analysis, it is worth wondering whether structure-preservation can really be taken seriously. A similar problem for structure-preservation arises from the rule of Nasalization. I claim that all nasal vowels can be synchronically derived. However, Nasalization is clearly a lexical rule. (Cf. 6.2.2 above.) Thus structure-preservation would prohibit Nasalization from linking a nasal autosegment to vowels, since such linkings are not found in underlying representations.
8. Conclusion

The Sekani verbal prefixes provide evidence that many of the predictions of the Lexical Phonology model are correct.

The Level Ordering Hypothesis is strongly supported. This was perhaps most dramatically illustrated in 5.2, where many rules of the phonology indicated that a level ordering distinction should be posited to the left of the position 7 prefixes.

Derivations in which phonological rules apply before morphological rules were given in 4.2.1, 5.2.2.2, and 6.2.2.3. Such derivations provide the strongest possible evidence that phonological rules must be allowed to apply in the lexicon.

Perhaps also of interest for morphological theory, we have seen three cases (4.1.4.1, 4.2.1.2, and 6.2.2.3) where rules which move affixes must be posited.

An underspecified analysis of /ə/ as a V slot provides a better formulation of the rule of w Vocalization, and also provides an explanation for why Level 4 Schwa Fronting does not apply to the incorporated stems.

Finally, Sekani supports Kiparsky's proposed lexical/post-lexical rule typology. However, the prediction that lexical rules are structure-preserving is called into question by the Sekani rules of Glottal Stop Absorption and Nasalization.

Notes.
1. The conjugation prefixes had aspectual functions historically. See Krauss (1969) for discussion.
2. Following Kari (1979), I use the term "perambulative" for the combination of morphemes kə in the adverbial position 2 and
na customary in position 5 which can be used to derive verbs which denote repeated, undirected motion. I will return to perambulatives in Ch. 5, 3.2. I use the term "repetitive" to denote a derivation which requires position 9 u (and the conjugation prefix ghe in the perfective). See Semelfactive later in this section.

3. In departing from the traditional Athabaskan analysis of four synchronic classifiers (θ, h (k*1), d and *l), I follow the analysis first proposed by Stanley (1969) for Navajo. Stanley suggested that all instances of the l classifier in Navajo could be derived from /d+w/.

4. The rule of Conjugation a Deletion creates the intermediate form [s]. See 5.2.5.

5. In support of this, stem-final fricatives do not undergo Voicing Assimilation in suffixed stems:

(492) nà -h -châl -azi
    cont clf rain dim
    2 13 stem

nâchâlazi
    'it is raining a bit'

(493) k'e -də -a -yîs -e
    break Put Put break Put
    2 9 9 stem

k'edâyîse
    'he, she will break [0] in two'

6. In languages like Navajo which have a phonetic [l] classifier, exceptions to Voicing Assimilation which are parallel to these arise from rules which delete the l classifier interconsonantally.

7. h Voicing provides weak evidence that the voiceless unaspirated stops are voiced underlyingly.

8. As Howren notes, an additional rule is required to convert:

\[
\begin{array}{c}
C \\
\text{d} \\
\text{gh}
\end{array} \quad \text{to} \quad \begin{array}{c}
C \\
\text{|}
\end{array}
\]

9. This floating [d] analysis was suggested to me by Bruce Hayes. In an earlier analysis I had proposed that the levels 1-2 rule causes [d] to be doubly linked to classifier and stem-initial consonant positions. However, such an analysis needlessly violates structure-preservation.
10. Of course this move undermines the hypothesis that derivations in which d classifier occurs are semantically 'detransitivating'. However, I am not aware of any other problems that this analysis would lead to.

11. I present the argument for assigning the classifiers to level 1 in Ch. 5 because it is somewhat theory-dependent.

12. I assume that this rule is post-lexical and is ordered before the post-lexical linking of floating d classifier in the D-Effect Rule. The latter will apply to an intermediate representation like [sæghɪ-d-gq] 'we [du] kill [pl O]', creating [sæghɪgq]. This ordering is necessary to avoid deriving *[sæghɪgq].

13. I derivational occurs in position 9. 1d occurs in position 12. The i- derivational word formation rule precedes all other derivational word formation rules (see 4.1.4.2). Thus the only consonantal prefixes that could intervene between these prefixes are those given in (494):

(494) ̱ der  cnj  mode ̱ 1dS
            9  10  11  12

̱ derivalional requires 0 conjugation prefix; /sə ne gha/ do not Co-occur with ̱ derivational. Of the mode prefixes, n perfec-
tive does not occur in 1d forms. The future mode prefix ghe always occurs with de future, and in these forms the rules of
Prefix Vowel Deletion and L Deletion obscure the underlying
order of these prefixes.

14. As in other Athabaskan languages, the stem-initial conso-
nant of 'handle pl 0' irregularly changes from l to y in the 1d.

15. All /Ce/ prefixes in position 9 undergo the s-Conjugation
rules, except for de in 'kindle fire':

(495) kwən nadəsinh'q  'I kindled a fire'
    *kwən nadəsheh'q

This prefix must be exceptionally marked as not undergoing the
sə conjugation rules.

16. Some of the nouns that require the areal prefix are listed
below:

<table>
<thead>
<tr>
<th>noun</th>
<th>meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ya</td>
<td>'sky'</td>
</tr>
<tr>
<td>míghe</td>
<td>'lake'</td>
</tr>
<tr>
<td>saṅghë</td>
<td>'river'</td>
</tr>
<tr>
<td>tse k'eh</td>
<td>'mountain'</td>
</tr>
<tr>
<td>shìs</td>
<td>'hill'</td>
</tr>
</tbody>
</table>
déchæn tah  'bush, forest'  
keyih  'town'  
köh  'house'  
-t'adzę  'back'

Some examples of this prefix in verb forms are given below:

(496a) mət'adzę wəsch'q  'he was shot in the back'
  cf.
(496b) mətsi əsch'q  'he was shot in the head'

(497a) mịhe tawadęch'e  'three lakes'
  cf.
(497b) ghədi tadęch'e  'three animals'

(498a) sahghè ghochä  'the river is big'
  cf.
(498b) ts'elî nechä  'the creek is big'

17. This particular formulation of the rule was suggested by Bruce Hayes.

18. I does not occur with either of the conjugation prefixes na or sa. Derivational I requires a null conjugation prefix. There are also no surface forms in which derivational I and the 1d subject prefix I co-occur separated by some prefix. In optative forms, where this would be expected, I derivational occurs to the right of I 1d subject (see section 4.1.4).

19. The fact that the *I classifier is phonetically non-zero ([h]) in this form is quite unusual. It is clear from other members of this paradigm that this verb has I classifier. Compare the 2s and 1p forms in (491a) and (b):

(499a) sə -n -l -tsəl
cnj 2sS clf wet
sītsəl  'you [sg] are wet'

(499b) ts'ə-sə -l -tsəl
1pS cnj clf wet
ts'ahtsəl  'we are wet'

In the 1p form, the vowel of the conjugation prefix has been deleted by Conjugation ø Deletion and Aspiration has converted [s] to [h]. Although this form is consistent with either an I or an h-classifier analysis, if 'wet' were an h classifier verb, the 2s form would be [s̪ihtsəl] instead.
20. Historically, the two sets of prefixes were distinguishable phonetically: the prefixes which undergo Absorption are historically derived from *n (a palatalized or "front" velar), whereas those that do not are historically derived from *n. I do not believe that the synchronic phonology of Sekani still sufficiently distinguishes the reflexes of these segments to justify the positing of an abstract underlying segment /n/.

21. Keren Rice suggested this rule to me.

22. One might consider trying to collapse the following rule, which I will discuss in Ch. 4, with the level 2 rule of s-Conjugation e Fronting discussed in 4.2.1:

\[(500)\] Preglottal e Fronting
\[
\text{e} \rightarrow \text{e} / \underline{\text{N}} ?
\]

However, this will fail for two reasons. The rule in (500) does not apply to prefixes before ?-initial verb stems, as indicated by (501):

\[(501)\] ne -?h

\[\text{term steal}\]

The rule of Schwa Fronting in (500) only applies in nouns. Moreover, if (500) applied in s-conjugation forms, there would be no way to prevent it from applying to n-conjugation forms. However, n-Conjugation e Fronting must be restricted to 3s forms.

23. The lexical entry for 'smile' is illustrated with the following 3s form:

\[(502)\] dlîgh-?a -na -n -zən

\[\text{laugh unspO face Pf make}\]

\[3 7 9 11 \text{stem}\]

\[\text{dlîgh?ənizən}\]

\[\text{'he, she smiles'}\]

24. '.behave like wolverines'; that is, in a destructive or sabotaging manner.
Chapter Four

Level Ordering: Nominals and Postpositions

In this chapter I present a level-ordered analysis of nouns and postpositions in Sekani. The phonology and morphology of nominals and postpositions in Sekani is not as intricate as that of the verbal prefixes. Nonetheless it is sufficiently complex to be of interest for Lexical Phonology.

The Sekani verbal prefixes indicated that word formation rules within levels may have to be ordered with respect to each other. This suggests that affix order restrictions are not always indicative of level ordering distinctions, and that evidence from phonological rule domains is a necessary criterion in the assignment of word formation rules to different levels. However, as just mentioned, the phonology of nouns and postpositions is not as rich as that of the verb prefixes. Consequently my arguments in this chapter for different level ordering assignments may not be as strong in certain cases as they were for the verb prefixes.

I have organized this chapter as follows. In section 1 I provide an overview of the nominal and postpositional morphology in Sekani. In section 2 I discuss the level 1 suffixes, and in section 3, the level 4 suffixes. Section 4 illustrates compounding and the possessive and oblique object prefixes. The structure of possessed derived nominals and possessed compounds is of some theoretical interest. In sections 3 and 4 I will argue that such structures require a loop from level 4 back to

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level 1 to account for their phonological and morphological properties, as first proposed by Rice (1983a) for Slave.

1. Level ordering: an overview

Evidence from affix order and phonological rule domains suggest the following level-ordering assignments:

```
level 1
  stem formation
  possession
  oblique objects
  Compounding i
  -hu human plural

level 4
  -ză prototypical
  -azi, azli?
  diminutives
  -i, i, ne
  nominals
  -ge human plural
  Compounding 2
```

Syntax

2. Level 1 Suffixes

2.1 Roots vs. Stems

Many stems in Sekani can be inflected with either nominal or verbal morphology. Some examples are given in (1)-(15) below, with nominal stems listed in (a) and verbal stems in (b):

(1a)  -bēt
      'stomach'

(1b)  -bēt
      'be hungry'
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(2a)</td>
<td>t'oghəs</td>
<td>'paddle'</td>
</tr>
</tbody>
</table>
| (b)  | -h -t'oghəs  
      |    |    |
|      |     |    |
|      |     |    |
|      |     |    |
|      |     |    |
|      |     |    |
| (3a) | uyuz | 'whistling' |
| (3b) | -h-shūs | 'whistle' (sh-y) |
| (4a) | shən | 'song' |
| (4b) | -d-shən | 'sing' |
| (5a) | ch'ēs | 'charcoal' |
| (5b) | -h-ch'ēs | 'roast [O]' |
| (6a) | -gha- | 'hair' |
| (6b) | -gha-n  
      |    |    |
|      |     |    |
|      |     |    |
| (7a) | xël'l'e | 'night-time' |
| (7b) | -h-xël'l | 'become dark, night' |
| (8a) | -ghə | 'grease' |
| (8b) | -h-xə | 'melt O' (x-gh) |
| (9a) | -dəl- | 'blood' |
| (9b) | -dəl | 'be red; raw' |
| (10a) | tśə | 'shit' |
| (10b) | -tśən, tśə | 'shit' |
| (11a) | təs | 'cane' |
| (11b) | -təs | 'walk around with a cane' |
(12a) t'ás  
(12b) -h-t'ás  

'arrow'
'shoot [O] with bow and arrow'

(13a) xàl  
(13b) -h-xàl  

'club'
'handle stick-like [O] (uncontrol)'

(14a) tsël  
(14b) -tsël  

'axe'
'handle [compact O] (uncontrol)'

(15a) chîh xel  
stick pack  

'box'

Sapir (1921-3:141) argued that Athabaskan verb stems are underlyingly nominal, with the 'third modal' elements (certain verb prefixes) acting as category-changing morphemes. Sapir claimed that analyzing verb stems as nouns would account for the following pan-Athabaskan facts:

1. the ease with which a great many evident nouns are transformed into 'verb stems'...

2. the frequency with which 'verb stems' with a clearly defined verbal force...take on, when isolated, an abstract or concrete nominal significance...

3. the fact that a number of verb stems refer not to specific activity but to a class of objects.

Despite these observations, there does not seem to be overwhelm-
ingly great evidence that the stem which underlies pairs such as these is nominal, rather than verbal.

I suggest instead that the underlying stem is simply not assigned to a particular lexical category. Roots which are not marked for lexical category, as well as those that are, undergo
stem formation rules which, among other things, assign roots to particular lexical categories: noun, verb, or postposition. In the case of verbs, this stem formation process is probably the suffixation of an aspectual morpheme (Ch. 3, 3.1.1). However, in the case of nouns, there is more often than not no overt stem-forming suffix. I now turn to some possible nominal stem formation processes in Sekani.

2.1.1 Instrumental stems

The suffix -\( i \) derives instrumental noun stems from roots. Consider the following forms:

\(/xe/ \ 'pack'\)

(16a) \( xeI \) 'pack' [N]

(16b) \( k'è-na-nə -d -xe -h \)

per C 2sø clf pack asp

2 5 12 13 stem

k'ènqgeh 'you [sg] pack [O] around'

\(/tl'u, tl'un/ \ 'tie'\)

(17a) \( tl'uI \) 'rope'

(17b) mə -è-tl'u-?ə -nə -tl'u-\( .\)

3sØ P tie unspØ 2sS tie Imp

møtl'u?ıtlt'u̯h 'you [sg] tie up O'

(In (17b), the root \( tl'u \) is also incorporated as a level 4 verb prefix.) As these are the only two such nouns with this suffix that I am aware of in Sekani, I assume that this word formation rule is no longer productive.

2.1.2 -e

Some instances of stem-final -e might also be regarded as
stem-forming suffixes. Although -e has no discernible function (except perhaps to mark that what it is attached to is a stem), there are phonological reasons for regarding it as a suffix, as will be discussed below.

For many noun and verb stems, this suffix is part of the lexical entry of the noun or verb. Some examples of it are given below:

nouns + -e

(18) Iughe_ 'fish'
(19) ts'גге 'woman'
(20) -чатл'е 'younger brother'

verbs + -e

(21) нєгє 'he, she is absent'
(22) дєт'ає 'he, she is thin'
(23) нєтсдєлє 'he, she is small'
(24) дєк'ає 'he, she is short'
(25) зєвє 'he, she itches'
(26) єдєхєгє 'he, she squats'

Consider the root /tl'ğn/ 'circle, circle of water'. This root occurs in the incorporated stem position in a variety of derivations:

/tl'ğn/ 'circle, circle of water'

(27) tl'ğ -дє -т'акс
circle der fly
3 9 stem

tl'ğдєт'акс 'he, she flies in a circle'
(28)  tl'ë -ghe-ři -I
    circle Prg flow asp
      3   10   stem

  tl'ëɡheřiI       'whirlpool'

(29)  tl'ë -de -se -Ieh
    circle der cnj handle pl 0
      3   9   10   stem

  tl'ëdəsIeh       'he, she puts [pl 0] in a circle'

However, as an unincorporated stem, /tl'än/ requires the suffix
-ën:

(30)  tl'ënəne       'bend in river'

    *tl'ë

If -ën is analyzed as a stem-forming suffix, and if incorporated
[tl'ë] is a root (see 2.1.4 below), then the absence of -ën on
the incorporated stem is accounted for.

As mentioned above, in the majority of cases, -ën has no
clear semantic or morphological function, and in such forms, one
might question its analysis as a suffix. As mentioned above,
there are phonological reasons for analyzing it as a suffix. As
will be seen later on in this chapter, Sekani has a rule of
Suffix Vowel Deletion:

(31)  V --> Ø / ] X ___ ] V

The final vowel of a suffix is deleted before another vowel-
initial suffix. In (18)-(26) and (30), final -ën is deleted
before another suffix:

(32)  ts'ëgh-e -azi
    woman  stm  dim

  ts'ëghəzi         'small woman'
(33)  nə -tsədl -e -azi
       thm small stm dim

       netsədlazi       'he, she is small'

But other instances of stem-final -e do not delete before a
vowel-initial suffix:

(34)  dəbe         'sheep'

       dəbeəzi       'small sheep'

I suggest that the final -e in dəbe is part of the root, whereas
in ts'èghe, final -e is a suffix.

In support of the suffixal analysis of final -e in forms
such as ts'èghe, it is perhaps worth pointing out that there are
two other formatives -e which are clearly suffixes. As Janda
(1982) and Kiparsky (1983b) have observed, it is not uncommon
for semantically distinct suffixes to be homophonous in lan-
guages.

Incorporated stems (verb prefix position 3) may be suffixed
with -e. This suffix (glossed "vb") denotes an action which is
subordinate to that of the main verb. Compare (35) and (36),
which differ only in terms of whether or not this suffix is
present:

(35)  k'è-chu -e -də -d -dah
       per water vb der clf sg goes
       2  3  3  9  13 stem

       k'èchuedədah       'he, she walks around drinking'

(36)  k'è-chu -də -d -dah
       per water der clf sg goes
       2  3  9  13 stem

       k'èchudədah       'he, she wades around'
Some other examples of this suffix are given below:

(37) k'ë-ts'ægh-e -de -d -dah
per yawn vb der clf sg goes
2 3 3 9 13 stem
k'ëts'æghedah 'he, she walks around yawning'

(38) de -k'âhî e'h k'ë-sal -e -de -d -dah
reflPsr spouse P per shout vb der clf sg goes
2 3 3 9 13 stem
dëk'âhî ëh k'ësæledah 'he, she walks around shouting at his, her spouse'

Notice the semantically verbal interpretation of incorporated stems which contain this suffix.

The second -e which is homophonous with the nominal suffix -e is a future mode suffix. Some examples of it are given below:

(39) -t'âdzi ye -de -na -gæ-s -chî -I -e
P thm Fut thm Fut 1sS depend Fut Fut
7 9 9 11 12 stem
-t'âdzi ye'denægheschîle 'I will depend on [O]'

(40) ?a -na -de -gæ-s -d -Ie -I -e
adv rev Fut Fut 1sS clf handle pl Fut Fut
2 5 9 11 12 13 stem
?anadæghæsdlele 'I will repair [O]'

The suffix -e occurs to the right of the aspectual suffix -I which also marks these as future stems. The suffix -e is optional in future forms.

2.1.3 Ø-derived stems

We have seen two non-zero suffixes, -e and -I, which may be regarded as nominal stem-forming suffixes. The vast majority of noun stems, however, have no overt suffixes. I assume in these
cases that noun stems are derived from roots by the addition of a zero suffix:¹

(41) [root Ø]N stem

Noun stems may be zero-derived from roots of unspecified lexical category as well as from underlyingly nominal roots.

2.1.4 Possessed stems

The possessive word formation rule may also be regarded as a stem formation process. There is some evidence for this from the rule of Nasalization and from the morphology of inalienably possessed nouns.

First consider Nasalization. This rule cannot apply to nasal-final stems until after the possessive suffix is added:

(42) /tsân/  'shit'

sə̀ -tšə̀n-ə̀
1sPsṛ shit psd
*sətsə̀ē

(43) /gàn/  'arm'

sə̀ -gə̀n-ə̀
1sPsṛ arm psd
*səpə̀ē

There is some evidence, to be presented in Ch. 8, that Nasalization applies to stems, but not roots. This implies that the possessive word formation rule derives (possessed) noun stems from roots.

Second, consider inalienably possessed nouns. A large class of nouns, among them body parts and kinship terms, require
an overt possessor. To account for this fact, I assume that
inalienably possessed nouns are subcategorized for a possessive
suffix (which may be ə, ə or 0), and that the possessive word
formation rule in (44) applies obligatorily to insert (unincor-
porated) roots into a branching structure, the left member of
which is a nominal or pronominal possessor.

(44) X [root Af ]N stem
     [+psd]

The root becomes a (possessed) noun stem by this word formation
rule. Body parts are normally inalienably possessed nouns. As
incorporated stems, however, many of these lack possessive mor-
phology. Consider the stem /tsī/. As an unincorporated stem
(45), this noun requires an overt possessor. If no particular
possessor is specified by the semantics, the prefix ʔə-, which
marks an unspecified possessor, is added:

/tsī/ 'head'

(45) ʔə -tsī
unspPs r head

ʔōtsī 'someone's head'

However, as an unincorporated stem in (46), no possessive prefix
is required:

(46) ts'ah t'ā -tsī -sə -s -l -ʔatl
    hat P:inside head cnj lsS clf handle compact O
    1 3 10 12 13 stem

    ts'ah t'ōtsīsəʔatl 'I wear a hat on my head'

The absence of ʔə- in (46) can be accounted for by assuming that
in this form, [tsī] is a root that has not undergone the posses-
sive word formation rule.
2.1.5 Nouns: summary

So far I have suggested that noun and verb stems are derived from roots, and that the nominal stem-forming process may be manifest in a number of ways:

<table>
<thead>
<tr>
<th>stem type</th>
<th>formative</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-possessed stems:</td>
<td></td>
</tr>
<tr>
<td>instrumental stems</td>
<td>-l (not productive)</td>
</tr>
<tr>
<td>(certain lexically marked stems)</td>
<td>-e (not productive)</td>
</tr>
<tr>
<td>other non-possessed stems</td>
<td>-Ø</td>
</tr>
<tr>
<td>possessed stems:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>possessive word formation rule:</td>
</tr>
<tr>
<td></td>
<td>possessive suffix; nominal or pronominal possessor</td>
</tr>
</tbody>
</table>

2.1.6 Postpositions

Like the majority of noun stems, postposition stems contain no overt suffix. However, like inalienably possessed nouns, postpositions require an object (here referred to as the 'oblique object'), which may be either nominal or pronominal. A postposition word formation rule similar to the possessive nominal word formation rule accounts for the fact that postpositions must have an object:

(47)  X [root Ø]ₚ stem

The output of the postposition word formation rule is a branching structure, the right branch of which is the postposition.

2.2 Possessive suffixes

As mentioned above, possessed nouns are marked by one of three suffixes, e, ñ, or Ø. The choice of suffix is lexically
determined. Some examples of each of these suffixes (glossed 'psd') are given below:

-ə possessive suffix

(48) se -dze -ə

1sPsr heart psd

seçzeə 'my heart'

(49) ñæ -ch'ox -ə

unspPsr quills psd

ñæçhoxə '(its) quills'

(50) se -ñæsba-ə

1sPsr goat psd

señæsbaə 'my goat'

In (50), the rule of Schwa Fronting given in (51) accounts for the surface form [se] of the possessive prefix /sə/:

(51) Pre-glottal Schwa Fronting:

ə --> e / ___\_N?

Schwa Fronting applies only in nominal forms. In (52), the rule of Prefix Vowel Deletion (Ch. 3, 5.2.1) has deleted the vowel of the possessive prefix /sə/:

(52) se -ãhtəs -ə

1sPsr sister psd

sãhtəsə 'my sister'

morphology

se-ãhtəs-ə

Prefix Vowel Deletion

∅

[sãhtəsə]

Now consider examples of the possessive suffixes -ə and ∅:

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- possessive suffix

(53) se -xâda -
1sPsr moose psd
sâghâdâ  'my moose'

(54) se -da -
1sPsr eye psd
sâdâ  'my eyes'

(55) se -se -
1sPsr belt psd
sâzê  'my belt'

(56) jîje chu -
berry water psd
jîje chû  'wine (berry's water)'

-Ø possesive suffix

(57) ?æ -t'oh-Ø
unspPsr nest psd
?æt'oh  'nest'

(58) se -kôh-Ø
1sPsr house psd
sâkôh  'my house'

(59) na -zês-Ø
2sPsr skin psd
nâzês  'your skin'

(60) ?æ -za -Ø
unspPsr sand psd
?æza  'sand'

2.2.1 Nasalization

Phonological evidence from the rule of Nasalization suggests that the possessive suffixes, as well as the -e stem formative suffix, are added on level 1. As previously men-
tioned, all nasal vowels in Sekani can be derived from syllable-final /Vn/ sequences. In the following pair, the nasal conso-
nant in (61b) is not syllable-final and thus Nasalization does 
not apply:

(61a)  tsq̂

' shit'

(61b)  se -tsɔn-ə
1sp sr shit psd

'my shit'

Now consider the diminutive form of this stem:

(61c)  tsq̂-azi

'small shit'

shit dim

Nasalization applies before the diminutive suffix has been added 
but waits until after the possessive suffix has been added:

(62)  Possessive suffixes
Nasalization
Diminutive suffix

This suggests that the diminutive suffix is added on a non-
initial level of the lexicon, and furthermore, that the posses-
sive suffix is added on the first level. If -ə were suffixed on 
level 2 or later, Nasalization would presumably have applied to 
the stem before the possessive suffix could be added, as it has 
in the diminutive form of this stem. This can be seen in the 
following derivation:

stem  tsɔn

level 1 
a Raising  tsɔn
Nasalization  tsq̂

level 2 
possessed noun suffix  tsq̂-ə

eventually  *-tsq̂-ə
If the possessive suffix is added on the first level of the lexicon, the fact that Nasalization does not first apply to nasal-final stems before the possessive suffix is accounted for. This is in accord with the analysis of the possessive suffixes as stem-forming suffixes suggested above. In a level-ordered analysis, one would expect the stem formation rules to be assigned to level 1, where they precede the word formation rules of specific lexical categories.

Similar data involving nasal-final stems suggest that the stem-forming suffix -e should be added on level 1. Consider the derived stem /sha-n/:

/sha -n/  
grow Pf

(63a) tlį yon -e  
dog grown stm  
'old dog'

(63b) tlį yon -azi  
dog grown dim

tlį yqazi  
'old, decrepit dog'

A nasal vowel occurs in (63b), which contains the diminutive suffix, but Nasalization is blocked in (63a) because of the prior application of the -e suffixation word formation rule.

Further evidence which suggests that -e belong on level 1 is provided by affix order, as will be seen in section 3 below.4

2.2.2 Possessive suffixation and Glottal Stop Absorption

In Ch. 3, 7.2 I discussed a rule of Glottal Stop Absorption, repeated in (64):

(64) ? → L /   _syll

This rule accounts for the nearly complementary distribution of
low tone and syllable-final glottal stop.

A potential problem for this analysis comes from consideration of low tone stems suffixed with vowel-initial suffixes. In such forms, low tone vowels appear on the stem, but no glottal stop is present:

(65) sə -tsə? -e?
    1sPsr beaver psd
    sə-tsəè 'my beaver'

(66) sə -ts'a?-e?
    1sPsr plate psd
    sə-ts'aè 'my plate'

These forms are analogous to those in which stem-final nasal vowels appear before a vowel-initial suffix, such as the diminutive suffix. In those cases, I suggested that Nasalization precedes diminutive suffixation. Here too I will suggest that Glottal Stop Absorption precedes possessive suffixation:

/tsə?/

Glottal Stop Absorption    tsə
possessive suffixation     tsə-e?
Glottal Stop Absorption    tsə-e
eventually                [sə-tsəè]

Since possessive suffixation is a level 1 rule, this derivation provides evidence that the first rule of level 1 is phonological, rather than morphological. These data support Kiparsky's hypothesis that the levels are linked through the phonology.

Notice that Glottal Stop Absorption is a structure-changing rule (? is deleted), yet it applies on the first cycle, in
apparent violation of the Strict Cycle Condition. I suggest that, since Glottal Stop Absorption is clearly a syllable-based rule, the prior application of the syllabification rules (Ch. 6, 6.2) has created a derived environment for this rule to apply in. This is a conclusion that I will return to in Ch. 8.

2.3 -hu human plural

-hu is one of two human plural suffixes in Sekani. The other suffix is -ge/ghe, discussed in 3.3. Nouns are lexically marked for which of these suffixes they require.

Some examples of -hu human plural are provided below:

(67a) ts'ūda       'child'
(67b) ts'ūdahu     'children'

(68a) ?ech'e       'girl'
(68b) ?ech'ehu     'girls'

Evidence from affix order (3.3) provides weak evidence that -hu is a level 1 suffix.

This suffix supports the analysis of stem-final -e as a suffix, rather than part of the root, in certain forms. First note that the initial consonant of -hu is deleted if the stem to which it attaches ends in a consonant. This rule is informally stated in (69):

(69)  h Loss:
      h --> Ø / C

Its application can be seen in (70) below:
(70a) dakeI 'Indian person'
(70b) dakeIu 'Indian persons'

Now consider the following forms:
(71a) ts'êghe 'woman'
(71b) ts'êghazi 'small woman'
(71c) ts'êghu 'women'

As indicated by the diminutive form (71b), final -e should be analyzed as a suffix in this form because it deletes before a vowel-initial suffix. The plural form in (71c) suggests that the suffix -e is not present in the plural form underlyingly. In 3.3 I will present evidence that -e and the possessive suffix -ê do not delete before consonant-initial suffixes. If stem-final -e were part of the root, the surface form *ts'êghehu would be expected. The underlying representations of the singular and plural forms of these nouns must differ:
(72a) /ts'êgh-e/ 'woman'
(72b) /ts'êgh-hu/ 'women'

2.4 Summary

The suffixes -ê possessive and -e stem-formative must be added before Nasalization applies to stems, suggesting that these suffixes are added on level 1, in contrast to other vowel-initial suffixes. Evidence from affix order to be presented in 3.3 will suggest that -hu human plural is also added on level 1.

3. Level 4 Suffixes

3.1 Nominalizing Suffixes

Nouns may be derived from any of the major lexical cate-
gories—noun, verb or postposition—through a nominalizing process which I hypothesize to be a level 4 process.

There are three non-zero nominalizing suffixes in Sekani: i 'human singular', ne 'human plural', and i. The non-zero suffixes also attach to verbs in relative clauses.

3.1.1 Examples

In this section I have provided some examples of each kind of derived nominal:

-Ø nominalizing suffix

(73) na -be
rev swim
5 stem
'otter'

(74) sə -h -ts'i
cnj clf be sour
10 13 stem
sahts'i
'pepper'

(75) Ie -s -d -tl'ų
in half cnj clf tie
2 10 13 stem
lėstl'ų
'knot'

(76) nə -na -sə -d -tl'ų
cont term cnj clf tie
2 9 10 13 stem
nənəstl'ų
'fence'

(77) dah-da -s-ghq
up thm ? be hairy
2 9 stem
dahdæsghq
'(tree moss species)'

(78) ?ə -də -s-xət
unspO thm ? saw 0
7 9 stem
?ədəsxtət
'saw'
(79) hà -sa -de -de -se -ʔq
up sun thm thm cnj compact 0 is in position
2 3 9 9 10 stem
həsadədəʔq "sunrise"

(80) me -k'e -de-se -h -ts'i
3sO P:on pl cnj clf pl sit
1 1 9 10 13 stem
mək'edəhts'i "couch"

(81) ?ə -ts'ə -gə
unsp0 unspS dry 0
7 8 stem
ʔəts'əgə "dried meat"

-ɨ̱ human singular

(82) tse -k'eh-ɨ̱ 'Sekani person'
mountain P:on nom:hum sg

(83) de -k'al -ɨ̱ 'white person'
thm be white nom:hum sg

(84) se -k'ah -ɨ̱ 'my spouse'
1sPsr marry nom:hum sg

(85) se -ʔh-Iəgh-ɨ̱
1sPsr ? one nom:hum sg
səhIəghɨ̱ "my friend, partner"

(86) done whə-we -de -h -ʔh -ɨ̱
people 1p0 thm thm clf teach nom:hum sg
done whəwədahʔʔɨ̱ "teacher"

-ne human plural

(87) tse -ləh-ne 'Ft. Ware people'
mountain end nom:hum pl

(88) tsə kəh -ne 'Ft. St. John people'
shit house nom:hum pl
(89) ?ïh -k'âh -ne 'married couple' 
recep marry nom:hum pl

(90) keyih nà -jëI -ne 'people who live in town'
town cont live nom:hum pl

(91) îànëde ø -h -ts'î-ne 1 place epen clf born nom:hum pl
îànëde ahts'îne 'family (of one household)'

(92) ìø -a -d -ghö -ne 
recep cnj clf kill pl 0 nom:hum pl
îagqne 'soldiers'

(93) ne -sø -d -døs -i 
term cnj clf twist nom 
9 10 13 stem
nèsdøsi 'twisted tree'

(94) tsîl -gha ø -s -d -tl'î-i 
head hair epen cnj clf tie nom 
10 13 stem
tsîgha æstl'î 'braids'

(95) dah-æ -ts'æ -sø -t -ya 
up unspO unspS cnj clf pl 0 be in position nom 
2 7 8 10 13 stem
dah?øts'ahyai 'glasses'

(96) ?ø -ïlâ gha-de -î -n -?ö 
unspPsP hand P thm asp Pf compact 0 be in position nom 
9 9 11 stem
?ïlâ ghadî?qi 'ring'

(97) mø -k'eh tsez ø -ch'el-i 
3sO P:on firewood wood split nom 
9 stem
mak'eh tsez dæch'eli 'chopping block'

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(98) u -s-ä  -lës -i  'toboggan, sled'
    thm ? clf drag nom
    9  13 stem

(99) kwän me -t'ä  ðæ -sæ -kw'ën-i
    fire 3sO P:inside fire cnj burn nom
    9  10 stem
    kwän mét'ä dëzkw'ënî  'stove'

(100) hâ-na-e -h  -sëh -i
    up der clf grow nom
    2  9  13 stem
    hänahshehi  'cultivated plants'

Most of the preceding examples illustrate nominals derived from verbs. However, the nominalizing suffixes can also be attached to nouns and postpositions, as indicated by (88) and (82).

3.1.2 Level Ordering: Nasalization

Phonological evidence from Nasalization suggests that the nominalizing suffixes are added on level 4.

Stem-final nasal vowels, rather than nasal consonants, occur before the vowel-initial nominalizing suffixes. This suggests that the nominalizing suffixes do not belong to the same level as the possessive suffixes. Consider the following nominals suffixed with -i:

(101) sa-ts'æ -ðæ -I  -?q
    ?  unspS thm asp compact O be in position nom
    sats'ædñ?qi  'pendant'

(102) me -ã-de -s-j clit-i
    3sO P thm ? ? nom
    mëdæsjïli  'binoculars'

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(103) chu mə -k'eh-se -kə -i
   water 3sO P:on cnj contained 0 be in position nom
   chu mək'ehsəkəqi 'washstand'

If the nominalizing suffixes were added on level 1, before
Nasalization applied, these stems should have final nasal consonants rather than nasal vowels, as do the level 1 suffixes -ə and -ẽ:

(104) *-ʔoni , *-jîni , *-koni etc.\(^5\)

The fact that nasal vowels occur instead of nasal consonants suggests that the nominalizing suffixes belong to a non-initial level of the lexicon. Level 4 is an arbitrary choice.

It should be noted that many derived nominals are "phrasal," in that they consist of more than one word. Informally, two kinds of 'phrasal' nominals may be distinguished. Fixed lexical expressions, such as 'teacher' (86) and 'braids' (94) above, and examples like the following, may contain more than one word:

(105) mə -ẽh k'ẽ-na-d -gûx -i
   3sO P:by means of per C clf drive nom
   2  5 13 stem
   məh k'ągûxi 'car'

(106) dəda k'ẽ-na-d -ghe -h -i
   sickness per C clf pack C nom
   2  5 13 stem
   dəda k'ągehi 'magpie' (packs sickness around)

(107) tən nə -ghe-tl'ũ -i
   ice down cnj tie nom
   2  10 stem
   tən nąghetl'ũi 'icicle'

It should be noted that the same set of non-zero suffixes (-i,
-i, and -ne) that appear on lexically derived nominals mark verbs in relative clauses:

(108) Iughe ne -chå -i kayǝnǝssǝn
    fish thm big nom I want
    Iughe nəchâi kayǝnǝssǝn 'I want a big fish'

(109) i døne ø -jən -i me -yez nətsï
dem person epen sing nom:hum sg 3sPsr throat is bad
    i døne øjənï moeze nətsï
    'the person who is singing has a bad voice'

(110) ǝkwǝne mə-k’ā -sə -s -da -ne ɣhîzû
    3p 3 P:by cnj 1sS sg sit nom:hum pl they are nice
    ǝkwǝne mǝk’asǝsdane ɣhîzû
    'the people I stay with are nice'

(111) eyə ts’ah tǝ-tsî -sə -l -ʔatl -i
    3s hat up head cnj clf compact 0 be nom:hum sg
    eyə ts’ah tətsîhʔadli 'the one who is wearing a hat'

I leave the constituent structure of relative clauses (phrasally derived nominals?) in Sekani as a question which requires future (syntactic) research. (See Rice (1983a), Saxon (1984), Schaub (1979) for descriptions of the syntax of relative clauses in other Athabaskan languages.)

3.1.3 The Loop: Possessed Derived Nominals

Derived nominals may be possessed, just like other nouns:

(112a) dah-ʔǝ -ts’ǝ -sǝ -l -ya -i
    up unspO unspS cnj clf pl 0 be in position nom
    dahʔǝts’ahyai 'glasses'
(112b) se -daht'sahyai-è
    1sPsr glasses    psd
    sedah't'sahyaè     'my glasses'

The rule of Suffix Vowel Deletion has applied in (112b), deleting the nominalizing suffix -i before the possessive suffix -è.

(113a) de -tsey-i
    der whip nom
    detsèsi          'whip'

(113b) se -detsèsi-è
    1sPsr whip    psd
    sedetsèsè     'my whip'

(114a) mè-k'eh-s -d -da -i
    3s P:on cnj clf sg sit nom
    mèk'esdai      'chair'

(114b) se- mèk'esdai-è
    1sPsr chair    psd
    semèk'esdàè    'my chair'

(115a) ?e -bil -i
    unspO swing nom
    ?ebili         'swing'

(115b) se- ?ebili-è
    1sPsr swing    psd
    se?ebilè      'my swing'

Phonological evidence from Nasalization indicates that the possessive suffix -è cannot be added to possessed derived nominals on the first pass through level 1. (Recall that, as argued above in 2.2, the possessive suffix -è is added on level 1.) Consider additional examples of possessed derived nominals which are derived from nasal-final stems:

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(116a) sa-ts'ẽ -dã -i -?q  
? unspS der asp compact O is in position nom
sats'ẽdĩ?qi 'pendant'

(116b) se -sats'ẽdĩ?qi-ẽ  
1spSr pendant psd
s resorts'ẽdĩ?qe 'my pendant'

(117a) me -ẽ-dã -s-jĩ-i  
3sO P thm ? ? nom
mẽdẽsǰĩi 'binoculars'

(117b) se -mẽdẽsǰĩi -ẽ  
1spSr binoculars psd
sẽmẽdẽsǰĩẽ 'my binoculars'

(118a) chu me -k'eh-sã -kq  
water 3sO P:on cnj contained O be in position nom
chu mẽk'ehsẽkqi 'washstand'

(118b) se- chu mẽk'ehsẽkqi-ẽ  
1spSr washstand psd
sechu mẽk'ehsẽkqẽ 'my washstand'

The stems in (116)-(118) contain nasal vowels, rather than nasal consonants. If the possessive suffix -ẽ were added on the first pass through level 1, forms with stem-final nasal consonants should result, as in:

(119) setsõnẽ 'my shit'
(120) seõðnẽ 'my arm'

The possessed derived nominals with stem-final nasal vowels suggest that the possessive suffix -ẽ is added at a point in the derivation after Nasalization has applied. Plausibly, this point is some time after the level 4 nominalizing suffixes have
been added:

(121)  level 1  Nasalization
       level 4  nominalizing suffix
       level 1  possessive suffix

Affix order also suggests that the possessive morphology
should be added after the nominalizing suffixes are added. In
section 4 I will argue that the possessive prefixes are added on
level 1. In the following examples, note that a possessive
prefix occurs to the left of a level 4 verbal prefix:

(122a) mə -e-ʔə -da -i
       3sO P unspO pl eat nom

       meʔədai

       'food'

(122b) mə - meʔədai-è
       3sPsr food  psd

       məmeʔədaè

       'his, her food'

(123a) mə -ðh k'è-na-d -gùx -i
       3sO P:by means of per C clf drive nom

       mèh k'qùxi

       'car'

(123b) sa-  mèh k'qùxi-è
       1sPsr car  psd

       səmèh k'qùxiè

       'my car'

(124a) ʔiħ -là nà -gə-n -ʔa -i
       récpO P down cnj Pf compact O be in position nom

       ʔiħ lənàgħiʔai

       'coveralls'

(124b) sa-  ʔiħ lənàgħiʔai-è
       1sPsr coveralls  psd

       səʔiħlà nàgħiʔaè

       'my coveralls'

Affix order suggests that the possessive prefixes are added
after level 4 verb prefixation in these forms. I posit a loop
from level 4 back to level 1 to account for the structure of possessed derived nominals:

\[(125)\]

\[
\begin{array}{c}
\text{level 1} & \text{possession} \\
\text{levels 1-4} & \text{verb formation}
\end{array}
\]

3.1.4 Locative nominals

Before leaving the structure of derived nominals in Sekani, I will briefly discuss the problematic status of derived locative nominals in Sekani.

First let me present some examples. The morphemes *daḥ/diḥ* mark a two-dimensional location; *-gāḥ* marks a one-dimensional location. These suffixes are frequently, but not exclusively, found on place names:

\[(126a)\] chu chi daḥ
\hspace{1cm} 'Tacheeda L., Tudick L.'
\hspace{1cm} water big nom:loc

\[(126b)\] chu chi gāḥ
\hspace{1cm} 'Tacheeda L. creek'

\[(127a)\] ?aẓaže diḥ
\hspace{1cm} 'Azouzetta L.'
\hspace{1cm} flying squirrel nom:loc

\[(127b)\] ?aẓaže gāḥ
\hspace{1cm} 'Atunatche Creek' (flows out of Azouzetta L.)

\[(128a)\] chu yaze diḥ
\hspace{1cm} 'Chuyazega L.'
\hspace{1cm} water rough nom:loc

\[(128b)\] chu yaze gāḥ
\hspace{1cm} 'Chuyazega R.'

Some additional examples of *daḥ/diḥ* are given below:

\[(129)\] bāt -ka de- ch'į diḥ
\hspace{1cm} stomach P:for for oneself do, be nom:loc
\hspace{1cm} 'kitchen'

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(130) de -sə -li diḥ
forth cnj flow nom:loc
dəzli diḥ 'lake outlet'

(131) Iə -ts'ə -a -d -ghə dəh
recp unspS cnj clf kill pl 0 nom:loc
Iəts'agə dəh 'War Lake'

(132) saba -azi diḥ
Dolly Varden trout dim nom:loc
sabazi diḥ 'Sabai Lake'

(133) kweh diḥ
grave nom:loc
kweh diḥ 'Arctic Lake'

One would expect these morphemes to be added in the lexicon on the same level as the other nominalizing suffixes. However, there is some evidence that dəh/diḥ and gəh are not lexical morphemes.

First note that dəh contains the vowel [ə]. As discussed in Ch. 3, 6.2.2, the rule of a Raising applies in the lexicon, but not post-lexically, in derived as well as non-derived environments (see Ch. 8). The only requirement of a Raising is that the nasal which triggers Raising be syllable-final. The fact that dəh contains [ə] suggests that this morpheme is sentential, rather than lexical.

Second, the possessive suffix -ə always occurs inside of dəh/diḥ, whereas -ə always occurs to the right of the nominalizing suffix -i in possessed derived nominal forms. Compare the following with the possessed derived nominals given in 3.1.3:

(134a) ?ədezla dəh 'warehouse'
(134b) se?ədezlaə dəh 'my warehouse'
(135a) hàʔənəyəh dəh 'garden'
(135b) səhàʔənəyəhə dəh 'my garden'

Third, the diminutive suffix -azi can only occur inside of
dəh/dəh, while (as I will show in 3.2) -azi can occur inside or
outside of the other nominalizing suffixes:

(136a) tl'ogh-e dəh grass stm nom:loc 'meadow'
(136b) tl'oghazi dəh 'small meadow'
(136c) *tl'oghè dəhazi

(137a) nən hə-ə-h -ʔəq dəh earth up ar clif dig nom:loc
    nən həwahʔəq dəh 'hole in the ground'
(137b) nən həwahʔəqazi dəh 'small hole in the ground'
(137c) *nən həwahʔəq dəhazi

Given the plausible hypothesis that placenames like (131) are
fixed lexical expressions, these facts suggest that perhaps a
fifth lexical level should be posited to accommodate the loca-
tive nominalizing suffixes. Again, this is highly speculative
and obviously a topic which requires future research.

3.2 Diminutives and other adjectives
3.2.1 Diminutives

There are two diminutive suffixes in Sekani, -azi 'small'
and -azilʔ 'tiny, baby'. (The latter suffixed is glossed
'ddim'.) Some examples of each suffix are given in the forms in
(140)-(141) below:
(138a) bûs  'cat'
(138b) bûs-azi cat dim  'small cat, kitten'
(138c) bûs-aziʔ cat  ʔdim  'tiny newborn kitten'

(139a) gusbay  'sucker' (fish)
(139b) gusbay-azi  'small sucker'
(139c) gusbay-aziʔ  'tiny, baby sucker'

Diminutive forms of verbs are also possible. At least -azi may be suffixed to verbs, as can be seen in (140)-(142):

(140a) ə -s -whês -e enep 1sS itch stm
  øswhêsəse  'I itch'
(140b) øswnêsazi  'I itch a little bit'

Notice that the stem-final vowel -e in (140b) has been deleted by the rule of Suffix Vowel Deletion.

(141a) nà -h -chįl ghq  adv clf rain Q
  nàhchįl ghq  'Is it raining?'
(141b) nà -h-chįl -azi ghq  'Is it raining a little bit?'
  adv clf rain dim Q
(142a) chu gho-ɬ -d -d̪  -ə water Op 1dS clf drink Op
  chu ghud̪əq  'we [du] have a drink' Op
(142b) chu ghud̪əaziq  'we [du] have a little drink' Op
  dim

As discussed in Ch. 3, 6.2.2, -azi occurs to the left of the sentential morphemes ə optative and ghq positive interrogative. This is predicted by the level ordering model: morphemes added
in the lexicon should occur inside of morphemes generated by the syntax.

Some stems, especially those which denote inherently small objects or measurements, usually or always contain a diminutive suffix:

Inherently diminutive nouns:

(143) ʔ̪ibazi 'weasel'
(144) ʔ̪hs̪ɑzi 'spider'
(145) dlqazi 'mouse'
(146) k'qjazi 'bear cub'
(147) noj -e -azi big game animal stm dim
       nōjazi 'bird'
(148) dət'ōn-e -azi duck stm dim
       dət'onazi 'bird'
(149) chusk'azi 'chickadee'
(150) dachusdəst'azi 'hummingbird'
(151) ?ūz̪əhazi 'owl species'

Inherently diminutive verbs:

(152a) nətsəd₁-e, 'he, she is small'
(152b) nətsəd₁azi "
(153a) dək'ās-e, 'he, she is short'
(153b) dək'āsazi "
(154a) dət'ād-e, 'he, she is skinny'
(154b) dət'ādazi "

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The verb forms in (152)-(154) which contain the diminutive suffix are far more common than the forms which lack the diminutive suffix. In fact, for some speakers, the forms without the diminutive suffix are unacceptable.

A variety of evidence suggests that the diminutives belong to a non-initial level of the lexicon. First, as discussed in section 2.2, the fact that Nasalization must precede diminutive suffixation suggests that the diminutive suffixes are not added on level 1, as are the possessive suffixes:

(155a) tsq 'shit'
(155b) sætsônè 'my shit'
(155c) tsqazi 'small shit'

The diminutive suffix in other Athabaskan languages is consonant-initial. Consider two examples from Navajo (Young and Morgan 1980:64)

(156) shash yázhi
    bear    dim
    'bear cub'

(157) 'ashkii yázhi
    boy     dim
    'little boy'

With facts like this in mind, an alternative interpretation of the data in (155) might come to mind. Following Marlett and Stemberber (1984), one might consider positing an empty consonant as the initial segment of the diminutive suffix in Sekani: /Cazi/. The empty consonant would block Nasalization; thus there would be no reason not to assign diminutivization to level 1. However, having posited /Cazi/, one would then predict that the initial consonant would block vowel deletion rules, as well
as resyllabification. However, rules like Suffix Vowel Deletion and a Deletion do apply in diminutive forms, thus indicating that a /Cazi/ representation of this suffix is not only ad hoc, but untenable. (Similar arguments from vowel deletion also indicate that the nominalizing suffixes /i/ and /ı/ are not consonant-initial.)

Additional support for a non-initial level ordering assignment of the diminutive suffix is provided by consideration of affix order. The nominalization and diminutivization word formation rules are apparently unordered with respect to each other. In surface forms, affix order reflects the semantically most plausible constituent structure:

\[ i-azi \]

(158a) se - k'âh - \(î \)
1sPsr marry nom 'my spouse'

(158b) se - k'âh - \(î \) - azi
1sPsr marry nom dim
sek'âh\(q\)azi 'my dear spouse'

\[ azi-i \]

(159a) nêts̀dla\(z\)i 'he, she is small'

(159b) nə - ts̀d\(l\)-e - azi-\(i \)
thm small stm dim nom:hum sg
nêts̀dla\(z\)i 'small person'

\[ ne-azi \]

(160a) tse k'eh-ne 'Sekani people'
mountain P:on nom:hum pl
(160b) tse   k'eh-ne   -azi
        mountain P:on nom:hum pl dim

tse k'ehnazi     'dear Sekani people'

These data suggest that the nominalizing suffixes and the diminutive suffixes belong to the same level.

Finally, note that the diminutive suffix always occurs to the right of the non-zero possessive suffixes ə and ã:

(161a) ts'ʊda     'child'

(161b) me   -ts'ʊda-ə
        3sPsr child psd
mets'ʊdā     'his, her child'

(161c) me   -ts'ʊda-ə   -azi
        3sPsr child psd dim
mets'ʊdāzi    'his, her small child'

(162a) bes     'knife'

(162b) me   -bes   -ə
        3sPsr knife psd
mēbesəzi     'his, her knife'

(162c) mē-bes-ə   -azi
        psd dim
mēbesəzi    'his, her small knife'

These data are consistent with an analysis in which the possessive suffix is added before the diminutive suffix.

3.2.2 -zā prototypical

The suffix zā (-zāazi) should be mentioned in connection with the diminutives. The noun to which this suffix attaches is translated as 'normal, plain, medium-sized'; in other words, the noun suffixed with -zā refers to a prototypical representative of its class. Some examples of this suffix, sometimes in com-
parison with the diminutive, are given below:

(163a) dane  'man, person'
(163b) dønezāazi 'Indian person'

(164a) jëz?q  'gun'
(164b) jëz?qazi 'small gun (e.g. .22 caliber)'
(164c) jëz?qzāazi 'average gun (e.g. .30-.30)'

(165a) Iës  'flour, bannock'
(165b) Iësazi 'small bannock'
(165c) Iëszā 'plain, basic bannock'

(166a) bes  'knife'
(166b) besazi 'small knife'
(166c) beszāazi 'plain knife, e.g. table knife'

zā occurs to the right of the nominalizing suffixes:

(167a) usdlusi  'toboggan'
(167b) usdlusizāazi 'sled'

(168a) mëhk'qûxi 'car'
(168b) mëhk'qûxizāazi 'truck, car'

Since there is no evidence that zā can attach to any lexical items but nouns, I suggest that zā is added on level 4, after the nominalizing word formation rules have applied.

3.2.3 Glottal Stop Absorption

The suffixes -azii? 'baby (double diminutive)' and -zâazi 'prototypical' are a problem for the rule of Glottal Stop Absorption. Notice that these suffixes contain pre-vocalic low
tone vowels. In an analysis in which low tone is derived from underlying syllable-final glottal stop, these suffixes cannot be monomorphemic. Otherwise, phonetic forms like [zaʔazi], in which the glottal stop is resyllabified with [azi], should result. Thus the underlying representations in (169) are required, if all low tones are derived:

(169a) /azi-ʔ-inʔ/
(b) /zaʔ-azi/

There is some justification for the bimorphemic analysis in (169b): [zà] is a variant of the prototypical suffix. Moreover, in (169a), the double diminutive is plausibly derived from the basic diminutive /azi/. However, there is no morphological or semantic reason for regarding -ʔ- as a morpheme (and hence creating its own cycle of phonological rules). This morphological analysis is required solely to maintain Glottal Stop Absorption as a rule in the grammar.

This analysis raises another problem. One would predict that if these forms actually contain two suffixes, they could undergo the rules of Suffix Vowel Deletion and a Deletion, thus creating the surface forms in (170):

(170a) [aziʔ]
(170b) [zâzi]

These forms must be listed as exceptions to Suffix Vowel Deletion and a Deletion. However, recall that the final glottal stop in the double diminutive suffix must also be marked as an exception to Glottal Stop Absorption. Moreover, given the rar-
ity of surface vowel sequences in Sekani, it is not implausible that these forms are listed as exceptions to the vowel deletion rules. But even this requires some additional complexity. As exemplified above, the initial vowel of the diminutive suffix -azi undergoes a Deletion. This is also true of the double diminutive suffix, as the following examples indicate:

(171) $m\bar{e} -\dot{i}l\bar{a} -az\bar{I}\bar{I}$?  
3sPr hand ddim  
mil\bar{a}zI\bar{I}$?$  'his, her (baby) hand'

(172) $?\bar{e}g\bar{a} -az\bar{I}\bar{I}$?  
spoon ddim  
$?\bar{e}gaz\bar{I}\bar{I}$?  'baby spoon'

These data indicate that only the second vowel sequence [ii] should be lexically marked as an exception to Suffix Vowel Deletion.

To summarize, two of the suffixes discussed in this section pose a problem for the rule of Glottal Stop Absorption. Although a morphological and phonological analysis of the exceptionality of these suffixes can be constructed, the ad hoc nature of the analysis casts some doubt on the validity of Glottal Stop Absorption as a synchronic rule in Sekani.

3.3 Human plural -ge/ghe

There are two human plural suffixes in Sekani. The suffix -hu was discussed above in 2.3. The other human plural suffix is -ge/ghe. Nouns are lexically marked for which of these suffixes they require.

Some examples of forms containing -ge/ghe are given below:
(173a) tsaItsəl
   'baby'
(173b) tsaItsəl-ge
        hum pl
   'babies'

(174a) sə -əhtəs -ə
        lsPsr sister psd
        səhtəsə
   'my sister'
(174b) səhtəsə-ge
        hum pl
   'my sisters'

(175a) sə -chatl' -e
        lsPsr younger brother stm
        səchatl'e
   'my younger brother'
(175b) səchatl'ge
   'my younger brothers'

The fact that -ge/ghe and -hu form a substitution class suggests that, in the absence of other evidence, these suffixes belong to the same level. However, the suffixes behave differently with respect to their order of affixation with the diminutive suffix -azi. -hu always occurs to the left of -azi diminutive:

(176) ts'ègh -hu -azi
        woman    hum pl dim
        ts'èghuazi
   'small women'
*tts'èghazihu

(177) ts'ùda-hu -azi
        child    hum pl dim
        ts'ùdahuazi
   'small children'
*tts'ùdazihu

However, -ge always occurs to the right of -azi:
(178) sa- chu -ê -azi-ge
1sPsr daughter psd dim hum pl

sechuâzige 'my small daughters'
*sechuêgazi

(179) sa- chu-ê -azi-ge
1sPsr son psd dim hum pl

sachuâzige 'my small sons'
*sachuêgazi

These data suggest that -ge/ghe human plural belongs to a later level of word formation than does -hu human plural. In the absence of phonological evidence that -ge/ghe is a level 5 suffix, I analyze it as a level 4 suffix, ordered after the diminutive word formation rule.8

3.4 Level 4 suffixes: summary

Nasalization and affix order suggest that the diminutive and nominalizing suffixes are added on a non-initial level of the lexicon, which is arbitrarily picked as level 4. The human plural suffixes -ge/ghe cannot occur inside of the diminutive suffixes. This suggests that they are level 4 suffixes, ordered after the diminutive word formation rule.

Possessed derived nominals require a loop from level 4 back to level 1.

4. Compounding and prefixes

In this section I discuss the level ordering properties of compounds and the possessive and oblique object prefixes. Evidence for level ordering assignments is provided by the rules of Continuant Voicing and Nasalization.
In 4.1 I provide a brief description of the inventory of possessive and oblique object prefixes and in 4.2, of compounding types. In 4.3 I illustrate the rule of Continuant Voicing. In 4.4 I discuss the evidence for level ordering assignments from Nasalization and Continuant Voicing and present phonological evidence for two distinct types of compounding.

4.1 Possessive prefixes and oblique objects

As discussed in 2.1, possessed nouns receive two kinds of morphological marking. A possessive suffix (which may be phonologically 0) is required. In addition, a non-null possessive prefix or nominal possessor is also required.

In (180) I provide a list of the possessive prefixes in Sekani. With the important exception of the reflexive prefix, these are identical to the oblique object prefixes and to the verbal prefixes which occur in prefix position 7:

(180) singular dual plural reflexive
1 se naxe whə
2 ne naxe
3 me ghuye də
4 ye ghiye
unsp ?ə
area we
recp Iə/?iŋ

The 4th person prefixes are anti-reflexive: they are used when the subject and object of the sentence are both third person and are obligatorily disjoint in reference. An example is provided
in (181):

(181)  yə-se -ch'q
        4sO cnj shoot dead

       yəzch'q                   'he, she¹ shot him, her² dead'


The oblique object prefixes (objects of postpositions) are identical to the possessive prefixes in (180) above with the noted exception of the reflexive prefixes. The reflexive possessive prefix de requires a third person antecedent. However, the reflexive oblique object and direct object prefix ?ade does not require a third person antecedent: its antecedent may be first, second or third person. This is summarized in (182):

(182)  reflexive prefixes

possessive prefix       de       requires 3rd person antecedent

oblique object prefix, ?ade  antecedent may be non-3rd person

verbal prefix

This difference in inflection between postpositions and nominals is important. As Rice (1983a) first pointed out, this provides evidence that postpositions and nouns are distinct lexical categories. Some examples which illustrate the difference between the prefixes de- and ?ade- are given in (183)-(187) below:

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?ædæ- reflexive oblique object

third person antecedent:

(183) k'ækwænæ ?ædæ-dæghæ k'ædæghæ-qæ-dæ -tægh
2p refl P:for adv 3p der thm sew
2 8 9 9 stem

k'ækwænæ ?ædædæghæ k'ædæghædædæhtægh
'They sew for themselves.'

non-third person antecedent:

(184) naxænæ ?ædæ-dæghæ k'ædæghæ-dæ -dæ -ah -tægh
2p refl P:for adv der thm 2ps sew
2 9 9 12 stem

naxænæ ?ædædæghæ k'ædæghædahtægh
'You [pl] sew for yourselves.'

(183) and (184) indicate that ?ædæ- oblique object may be used regardless of whether the antecedent of ?ædæ- is third person or not. Now compare dæ, the reflexive possessive prefix:

dæ reflexive possessive prefix

third person antecedent:

(185) k'mædæ- ts'ahghæ dædæp k'æ -wæ-?alà
refl hat psd table P:on Op handle compact 0 Op
Sam dæts'ahghæ lèdap k'èwæ?a?à q
'Sam puts his own hat on the table.' Op

(186) dæ -gæt'sæl kæ-na -gæ-dæ -u -t'æs q
refl 3p head P rev 3p der Op cut Op
dæghutsæl kanaghædut'æs q
'They cut their own hair.' Op
non-third person antecedent:

(187) se -šila -' se -i -t'âs
1sPtsr hand psn 1sPf cut

šilâ sit'âs 'I cut my hand.'
*dîlâ

The reflexive possessive prefix de- cannot be used with a non-third person antecedent, as seen in (187).

For more detailed information about the pronominal prefixes in Dogrib (a closely related language), see Saxon (to appear).

4.2 Compounds

Sekani compounds may be built on postposition stems (postposition +noun) and verb stems (noun+verb), as well as simply noun stems. Some examples of each type of compound are provided below:

noun + noun compounds

(188) xêda ts'ê
moose female 'cow moose'

(189) ts'â k'êde
plate place 'cellar'

(190) Iughe mëyikahi
fish dipper 'fish dipper'

(191) tl'ogh ts'â
grass plate 'basket'

postposition phrase + noun compounds

(192) [tl'ogh tah] we-dene -'
grass P:among ar-people-psd
tl'ogh tah we-dânè 'Ft. Ware people'

(193) [chen tah] tlî
stick P:among dog 'coyote'

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(194) [tsa  ghq] shê' 'beaver trap'
     beaver P:for trap

(195) [gat  tah] kôh 'Pt. St. John'
     spruce P:among house

(196) [ə'lə  t'ah] kôh
     spruce bark P:under house

     'smoke house'

(197) [tsəz  gha] kôh 'woodshed'
     firewood P:for house

     verb + noun compound

(198) dəchen yû 'bush medicine'
     wooden medicine

     noun + verb compounds

(199) tsîl  ?atl 'pillow'
     head compact 0 be in position

(200) ?ə-  ḷa  ?q
     unspFsr hand psd compact 0 be in position

     ?îlə  ?q 'ring'

(201) dəl  tsogh 'bile'
     red, blood yellow

(202) kw'ês  tsâdle 'bead'
     cloud small

(203) chu  zel 'soup'
     water warm

(204) ?iḥ -ts'i das
     recip wind twist
     'tornado, twister'

(205) dəne  ts'êt 'dead person'
     person die

(206) tse  gây 'Clear Mt.'
     mountain white, light

(207) chu  yon -e 'waves'
     water grown stm

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In the compounds in (199)-(207), the verb stem in the second member of the compound lacks the usual verbal morphology. Compare (203) and (208), for example:

\[(208)\] chu se-zel-i 'warm water' 
water cnj warm nom

I would now like to turn to phonological evidence for the level ordering assignments of possessive prefixation, oblique object prefixation, and compounding.

4.3 Continuant Voicing

The phonological rule of Continuant Voicing is of central importance in a level-ordered analysis of these structures.

4.3.1 Basic data

In general, there is no contrast between voiced and voiceless stem-initial fricatives in underlying representations. Surface voicing is predictable. Following Rice (1983a,b), I assume that stem-initial fricatives are underlyingly voiceless in this position, with a voicing rule providing surface voicing in appropriate environments. This is a controversial position in Athabaskan linguistics (cf. Cook 1984, Kari 1976), but I believe that Rice has provided good arguments for the underlyingly voiceless nature of the continuants. Moreover, these arguments are based on consideration of a wider range of stem-initial data than I have seen in any discussion which claims that stem-initial fricatives are underlyingly voiced.

The initial fricatives of noun and postposition stems are voiceless when unprefixed, but voiced when the stems are prefixed or preceded by a nominal possessor or object. These
alternations are summarized in (209):

(209)  s  ~  z  \\
I  ~  l  \\
sh  ~  y  \\
x  ~  gh  \\
wh  ~  w

A first approximation to Continuant Voicing is given in (210):

(210)  [+cont]  →  [+voice] / X [___ ... ]N,P

As will be recalled from 2.1, various stem formation rules create precisely this structure. This analysis predicts that fricative-initial noun or postposition stems will be voiceless in isolation, and this is generally true.⁹

The effects of Continuant Voicing can be seen in a wide variety of morphological structures. First consider alternations involving possessed noun stems:

(211a)  xås  \\
(b)  sèghåsè  \\

(212a)  wñes  \\
(b)  sëwñesè  \\

(213a)  sas  \\
(b)  sèzåsè  \\

(214a)  ñe  \\
(b)  Peter  ñè  \\

(215a)  ñës  \\
(b)  bøsøn  ñësè  \\
white person  \\

'flour, bannock'  \\
'white person's bannock'

The effects of Continuant Voicing can be seen in a wide variety of morphological structures. First consider alternations involving possessed noun stems:
Continuant Voicing applies regardless of whether the possessor is nominal or pronominal.

Various (unproductive) derivational prefixes also trigger Continuant Voicing:\(^{10}\)

(216a) sa
'\(s\)un'
(b) īza(nah)
'month'

(217a) Iugh-e
fish stm
'fish'
(b) ta -lugh
water fish
'salmon'

(218a) shən
'song'
(b) sayənə
'my song'

(219a) xel
'pack'
(b) ?a- gheI-e
work pack stm
'Carrier Indian'

This suggests that the derivational prefixes belong to the same domain, phonologically, as the possessive prefixes and other morphemes which provide a context for Continuant Voicing.

The initial continuant of the second member of a compound is voiced:

(220a) sh̓i s
'hill'
(b) chu chi y̓i s
water big hill
'Tudick Lake hill'

(221a) shəl
'trap'
(b) tsə yəl
beaver trap
(222a) x̂àz        'windfall roots'

(b) tse  ghəz-e          'Old Friend Mt.'
    mountain roots stm

Since postpositions and inalienably possessed nouns are always preceded by an object or possessor, these stems are always voiced, if continuant-initial:

  inalienably possessed nouns

(223) məz̃ì        'his, her body'
(224) ?əlā           'boat'
(225) səq̃hə        'my hair'
(226) səwəz          'my leg'

  -ghə postposition

(227) ?əde -ghə ?a -s -ch’i
   refl0 F work lsS be, do

   'I work for myself'

(228) də -k’əhị  gha-də -z  -ya
   reflPsFspouse P der cnj sg go

   'he, she left his, her own spouse'

  -ghə̀ postposition

(229) ?əde -ghə̀ ah -d -lị
   refl0 F 2Ps clf be

   'you [pl] take care of yourselves'

(230) mama  ghə̀h na -s -i -ch’i
   mother P cont cnj lsPf dream

   'I dreamed about mother'
-la postposition

(231) sə -la-nə -ch’ā
1sO P 2sS help

'you [sg] helped me'

(232) sə  -kè  lu  -s  -tən
1sPsr foot P thm 1sS hold

'I hold it with my foot'

To summarize, Continuant Voicing applies to fricative-
initial stems in a variety of morphological structures: pos-
sessed nouns, nouns in compounds, postpositions, nouns which
contain derivational prefixes, etc. These structures all have
one thing in common: the noun or postposition stem contained in
them is not word-initial.

4.3.2 Incorporated stems

Since postposition stems and inalienably possessed nouns do
not occur in isolation, it is generally impossible to provide
alternations between voiced and voiceless continuant-initial
stems for this latter set. There is one environment, however,
where inalienably possessed nouns sometimes occur without pos-
sessive morphology. This is in the incorporated stem position,
verb prefix position 3. Continuant-initial incorporated stems
have uniformly voiceless initials:

(233a) wëzəghə

'our language'

(233b) k’e  -səgh  -e  -də  -d  -dah
around language vb der clf sg goes

k’e_səghedədah  

'he, she walks around talking to
him-, herself'

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(234a) xeল 'pack'

(234b) nā̃ -xeł -de -ne -ʔâh
down pack der 2sS handle compact O

nāxełdʔâh 'you [sg] put your pack down'

(235a) sa 'sun'

(235b) hā̃-sa -de -ʔ -n -dlat
up sun der asp Pf sun shine

hāsadʔdlat 'the sun is shining'

(236a) shën 'song'

(236b) k'ë-shën-e -de -d -dah
per sing vb der clf sg go

k'ësʰenədə dah 'he, she walks around singing'

(237a) əzəł 'he, she shouts'

(237b) k'ë-səł -e -de -d -dah
per shout vb der clf sg go

k'əsəledədah 'he, she walks around shouting'

Notice that the incorporated stems in the preceding examples occur in verbs with additional level 4 prefixes. Thus the incorporated stems meet the structural description of Continuant Voicing given in (210), yet they have not undergone the rule.

Two possible explanations for the failure of Continuant Voicing to apply to continuant-initial incorporated stems come to mind. One possibility is that Continuant Voicing has shut off by level 4, the point at which the stems are incorporated into the verb prefixes. In fact, this conclusion is independently required to account for the phonological properties of certain compounds, as will be seen in 4.4.2.
Another possible explanation for the failure of Continuant Voicing to apply here, advanced by Rice (1983a), is that the incorporated stems are roots, not stems, and the rule of Continuant Voicing does not apply to stems. In fact, this conclusion is also independently required (2.1.4, 4.3.4).

Although only one of these explanations is actually required to account for the failure of Continuant Voicing to apply to incorporated stems, it is not possible for me to determine which is correct.

4.3.3 Continuant Voicing vs. Voicing Assimilation

As discussed in Ch. 3, 3.2.1, continuant-initial verb stems are voiceless when preceded by a voiceless prefix, and otherwise voiced. The rule of Voicing Assimilation accounted for alternations between verb-initial voiced and voiceless fricatives. Since the initial fricatives of nouns and postpositions also exhibit voicing alternations which are superficially similar to those described by the rule of Voicing Assimilation, we might consider collapsing the rules of Continuant Voicing and Voicing Assimilation, as has been the standard analysis of these voicing alternations prior to the work of Rice (1983a, etc.).

Close inspection of the data reveals one important difference between the voicing alternations in verbs and those in nouns and postpositions: whereas a verb stem assimilates in voicing to the voicing of a preceding segment, the voicing of a noun or postposition stem does not depend on whether the noun or prefix which precedes it ends in a voiced or voiceless conso-

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nant. Consider the following examples of voiced stem-initial continuants which are preceded by voiceless segments:

(238) bûs sês
    cat skin

    bûs zês
    'cat skin'

(239) mæ- dôh -xâ
    3sPsr lips hair

    medôh qhâ
    'his whiskers'

(240) ʔih -gha -ʔə -ghə-na -d -shâts
    recp P unspO 3pS cnj clf scare O

    ʔihghaʔeqhîdzâts
    'they scared each other'

(241) lâglos gha kôh
    bell P house

    'belfry'

(242) dzêh ghôh shè-de -ne -s -ʔâl
    gum P adv thm thm 1sS chew

    dzêh ghôh shèdônesʔâl
    'I chew on gum'

The rules of Continuant Voicing and Voicing Assimilation cannot be collapsed.

4.3.4 Possessed continuant-initial compounds

Additional data involving compounds indicate that the facts of Continuant Voicing are more complicated than just discussed. Consider the following possessed compounds:

(243a) sa -dze -è
    sun heart psd

    'watch'

(243b) sesadzeè

    'my watch'

(244a) sa -ba
    sun father

    'Dolly Varden trout'

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(244b) səəabaə 'my Dolly Varden trout'

cf.
(245) iza 'month'

(246a) Iughe-ʔəs -ə
  fish  weir  psd
  'fish weir'

(246b) sələughe ʔəsə 'my fish weir'

cf.
(247) səlughə 'my fish'

(248a) xəda -jə
  moose  horn
  'moose horn'

(248b) səxəda jə 'my moose horn'

cf.
(249) səgəhədə 'my moose'

Continuant Voicing has failed to apply to the stem-initial fricative of these compounds. These stems are clearly within the domain of Continuant Voicing: the examples in 4.3.1 indicated that the possessive prefixes supply the phonological environment for Continuant Voicing just as compounds do. Moreover, the continuant-initial noun stem occurs in the right branch of a word structure tree:

(250)
  sə

How might Continuant Voicing be revised to account for these data? Intuitively, the reason why Continuant Voicing fails to apply in (250) is that the continuant-initial stem occurs in the left, rather than right, branch of the compound [xəda jə]. We might think of putting two conditions on the
original rule of Continuant Voicing: Continuant Voicing applies
(1) only to stems which occur in the right branch of a word
structure tree, and (2) only if the right branch does not branch:
(251) [+cont] --> [+voice] / X [ ___ ... ]_{N,P}
condition: [___...] contains no internal brackets
Unfortunately this analysis runs into trouble when the original
(unproblematic) data presented in 4.3.1 are reconsidered. Con-
tinuant Voicing applies to possessed stems like the following:
(252) Peter zè 'Peter's belt'
(253) bosden lèsè 'white man's bannock'
The constituent structure of possessed stems like Peter zè
'Peter's belt' is plausibly something like the structure in
(254), in which the possessed stem and the possessive suffix
form a constituent:
(254)
```
     N
    /|
   N  N
   / |  Af
  Peter se
```
Given this analysis of possessed nouns, se 'belt' occurs in the
branching right constituent of a word structure tree, which
under the current hypothesis ought to block Continuant Voicing,
yet Continuant Voicing of course applies here, yielding Peter
zè. Perhaps what is needed is a formal way of distinguishing
branching structures which contain affixes from branching struc-
tures which contain stems.

An alternative analysis of similar facts in Slave has been
proposed by Rice (1983a). Rice's account of the failure of Continuant Voicing to apply in the above possessed compounds is as follows: the first member of the compound is a root rather than a stem, and Continuant Voicing is a rule that applies to stems and not roots. (We will return to the root/stem distinction below in 4.4.2.) Following Rice, then, the rule of Continuant Voicing can be revised as follows:

(255) [+cont] --> [+voice] / X [___ ... ]_N,P stem

In Sekani there seems to be no evidence that the left branch of such compounds contain roots, rather than stems. However, in the absence of a formalization of the alternative analysis, I adopt the root/stem analysis here.

4.4 Level ordering

We have seen that Continuant Voicing can apply to the right branch of a variety of morphological structures which contain continuant-initial noun and postposition stems. In the absence of counter-evidence, we might assume that all of the morphology that triggers Continuant Voicing belongs to the same level. The level ordering question thus reduces to the following: on which level does Continuant Voicing apply?

4.4.1 Nasalization

The rule of Nasalization provides evidence that possession must be a level 1 word formation process. Consider forms like the following:

(256a) ?ə- t'ɑ̄ unspPsr leaves 'leaves'

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(256b) seʔ- ?eʔ- t'që -ë
1sPsr unspPsr leaves psd
seʔeʔt'qëë 'my (its) leaves'

In 2.2 I argued that the possessive suffix should be analyzed as a level 1 suffix because it is suffixed before Nasalization can apply. Yet in (256b), Nasalization has applied before possessive suffixation. (256b) is thus an apparent counter-example both to the level-ordering analysis presented in 2.1 and to the claim that all nasal vowels can be derived from syllable-final /Vn/ sequences.

In Ch. 7 I will suggest that these and other examples of "repossessed" nouns contain two layers of possessive morphology:

(257)

In this analysis, the possessive suffix can still be assigned to level 1: in forms like (256b) it is added on the second cycle of level 1. The first cycle of morphology in (256b) is affixation of the unspecified possessive prefix ?e-. Since the prefixation of ?e- must precede the suffixation of -ë, which is a level 1 suffix, ?e- itself must be a level 1 prefix. Moreover, since the possessive prefix ?e- triggers Continuant Voicing, this suggests that all of the word formation rules which trigger Continuant Voicing can be assigned to level 1. Thus I conclude that the oblique objects, nominal derivational prefixes, and possessive prefixes, are added on level 1. In addition, Compounding occurs on level 1.
4.4.2 Domain of Continuant Voicing

Rice (1983a) proposed that Continuant Voicing distinguishes two kinds of compounds in Slave: there exist compounds whose second member is voiceless, even if continuant-initial.

Such compounds occur in Sekani also, although they are relatively scarce. Consider the following examples:

(258) se -tl'â -sës -ë
1sPsr buttocks skin psd
se tl'â sësë 'my trousers'

(259) Iës -sës
flour skin
Iës sës 'sack of flour'

(260) me- xës sës
3sPsr egg skin
meghes sës 'his scrotum'

(261) me- xës -lë
3sPsr egg ?
meghes lë 'his testicles'

(262) chih xeI
stick-like O pack
chih xeI 'box'

Clearly there is nothing exceptional about the second member of these compounds. Compare the following:

(263) ?æzës
'hide, skin'

(264) seqhelë
'my pack'

The compounds in (258)-(262) must be formed outside the domain of Continuant Voicing. I distinguish between the two types by the following names: type 1 compounds (or Compounding 1) are
formed on level 1 along with the other morphology that causes Continuant Voicing. Type 2 compounds or (Compounding 2) are formed on a later level of the lexicon.

Since the only other level of the lexicon on which nominal word formation rules are found is (somewhat arbitrarily) level 4, it seems reasonable to assign Compounding 2 to level 4. This preserves the generalization that nominal word formation occurs on two levels of the lexicon.

4.4.3 The loop

Notice that the initial continuants of type 2 compounds are voiced when these compounds are possessed:

(265) me- xēs sēs
     3sPsr egg skin

    magnēs sēs       'his scrotum'

(266) me- xēs -Iē
     3sPsr egg ?

    magnēs Iē        'his testicles'

These compounds thus contrast with type 1 compounds in two ways: the initial continuant of the second member of the compound is voiceless; and the initial continuant of the first member of the compound is voiced, if the compound is possessed.

As Rice (1983a) first observed from the analogous Slave data, such forms provide strong evidence for the loop. Notice that we need to assume that type 2 compounds are formed on level 4, at a point in the derivation where Continuant Voicing has shut off, yet we must somehow return to the domain of Continuant Voicing to account for the fact that the possessed type 2 com-
pounds begin with voiced initial continuants. That is, we must posit a loop from level 4 back to level 1:

stems \([xəs] \ [səs]\)

level 4 compounding 2 \([xəs] \ [səs]\)
Bracketing Erasure \([xəs \ səs]\)

level 1 possession \([mə \ [xəs \ səs]]\)
Continuant Voicing \([mə \ [ghəs \ səs]]\)

There are actually two possible explanations for why Continuant Voicing can apply to the initial continuants of the type 2 compounds on level 1. We may assume, following Rice, that the first member of type 2 compounds are stems, whereas those of type 1 compounds are roots:

(267) type 1 type 2
root + stem stem + stem

Since Continuant Voicing applies to stems and not roots, it is free to apply to the possessed type 2 compounds on level 1. While there is good evidence in Slave for the root vs. stem distinction in type 1 vs. type 2 compounds (see Rice 1983a), I am not aware of any corresponding evidence in Sekani. Clearly this is an area of Sekani morphology which requires further research.

4.5 Summary

In this section I have suggested, on the basis of the rules of Continuant Voicing and Nasalization, that the compounding and prefixation word formation rules be assigned to levels 1 and 4 of the Sekani lexicon:
level 1  oblique objects
      possessive prefixes  Continuant Voicing
      Compounding 1  Nasalization

level 4  Compounding 2

A loop from level 1 back to level 4 is required to account for
the phonological properties of possessed type 2 compounds.

5. Conclusion

Various questions (requiring future research) remain from
this study of the phonology and morphology of nominals in Sek-
ani:

---What might the constituent structure of relative
clauses imply about the structure of derived nominals,
and vice versa?

---Is a fifth lexical level required to accommodate the
locative nominalizing suffixes?

---What is the phonetic voicing of stem-initial fricatives
in type 2 compounds embedded in type 1 compounds, and
vice versa?

---Can evidence for a root/stem distinction between type 1
and type 2 compounds in Sekani be found, as in Slave
(Rice 1983a)?

Despite these questions, it is still possible to draw certain
analytical and theoretical conclusions from this level ordered
analysis.

The interaction of possessive suffixation and Glottal Stop
Absorption suggests that roots enter level 1 through the phono-
logy, rather than the morphology, as suggested by Kiparsky
(1982b).

Two levels of phonology and morphology can be distinguished
within nouns. As in Ch. 3, restrictions on affix order gener-
ally correlate with phonological rule domains. However, a loop between levels is required, which suggests that facts about affix order cannot always be taken at face value.

It is perhaps possible to salvage something about affix order by appealing to markedness theory. Just as affixes are assumed not to be infixes until proven otherwise, restrictions on affix order within a word might be assumed to reflect level ordering assignments in the unmarked case unless there are other indications. The Level Ordering Hypothesis must be accordingly revised:

(268) In the absence of counter-evidence, assume that the word formation rules of level n are ordered after those of level n-1.

In adopting this evaluation metric, facts about affix order can be allowed to retain some significance.

Notes.

1. I posit a -Ø suffix, rather than Ø- prefix, for example, because the nominal morphology is mainly suffixing. Cf. -I, -e.

2. Anyone who is familiar with Keren Rice's work will recognize how heavily indebted this chapter is to her research.

For example, the postposition and inalienably possessed noun word formation rules posited in 2.1 make use of Rice's insight that these nouns require a possessive prefix or nominal possessor. However, the rules I posit create a branching structure rather than an empty syllable node which is later filled in by the morphology. This difference reflects my views of syllable structure: I assume that syllable structure is a derived, rather than underlying, property of phonological representations. As this is a controversial position in current phonological theory (cf. Lowenstamm and Kaye (1983), the reader may choose whichever word formation rules suit his or her theoretical preference.

3. In other Athabaskan languages, -è and -è mark different categories of possessed nouns. For example, in Tutchone (Ritter
1983), the cognate of the tonal suffix marks inalienably possessed nouns, while the cognate of -ê marks alienably possessed nouns.

4. One might be curious about the level ordering assignments of the other stem-final -e suffixes in Sekani.

   I know of no nasal-final roots that can be incorporated into the verb prefixes. (Incorporation is not productive.) Thus no evidence from Nasalization is available to shed light on the level ordering assignment of stem-final -e in the incorporated stem position.

   Nasal-final verb stems that lack the future suffix -I are rare. However, consider (269):

   (269) ?o:k'a dê -nê -ghe-n -ts'i -e
       fat Fut thm Fut 2sS [stem] Fut

   ?o:k'a ðêmêghîts'ê 'you [sg] will get sick from eating too much fat'

This form suggests that the future mode suffix -ê is not a level 1 suffix.

5. The existence of stem-final -oni sequences suggests that this conclusion might be wrong:

   (270) dêztoni 'log'

   But I will argue in Ch. 8, 3.1 that level 1 Nasalization does not apply if the stem vowel is underlyingly /a/ or /o/. The stem /toni/ in 'log' may thus be analyzed as containing underlying /o/, as opposed to /a/ (cf. a Raising).

6. In Slave, -gâh is a postposition: 'along'. A more detailed study of the locative nominalizing suffixes might clarify the function of -gâh in Sekani.

7. The human plural nominalizing suffix -ne is also used as a human plural suffix.

8. The lexically governed choice of -ge/ghe or -hu is somewhat messier than my discussion in the text might suggest. There is a great deal of idiolectal variation in the choice of these suffixes. Some speakers use -ge/ghe with some nouns while other speakers use -hu. Moreover, for some speakers, -ge/ghe and -hu are free variants for some nouns. The phonological shape of the suffix is also quite variable. The suffixes -gu/ghu/huge are variants of -ge/ghe. The former variants appear to be historically derived from -ge-hu, etc.
9. Some exceptions to the basic generalizations about where voiced and voiceless noun stems occur should be noted.

Some noun stems must be marked as exceptions to Continuant Voicing:

(271) sæse       'my mother's brother'
(272) æsat'l'e   'younger brother' voc
(273) æse        'father-in-law' voc
(274) æsy        'mother-in-law' voc

The vocative forms in (272)-(274) might be formed on level 4, after Continuant Voicing shuts off. However, /æse/ 'mother's brother' in (271) must simply be marked as an exception to the rule.

A more serious problem is created by the following stems. Some noun stems begin with voiced fricatives even in isolation:

(275) ya          'sky'
(276) yà          'louse'
(277) yù          'medicine'
(278) yas         'snow'
(279) ghâjε       'goose'
(280) yâtöne      'deer'

The initial fricatives of the stems in (275)-(278) are underlyingly voiced. In (279)-(280) the voiced fricative may be part of a prefix.

10. ?a- and i- are clearly prefixes. ta 'water' might be a noun. I have no other examples of this morpheme.
Chapter Five
The Bracketing Erasure Convention

Certain Sekani rules require a weakening of the Bracketing Erasure Convention (BEC). In this chapter, I will argue that stems and classifiers in Sekani are exceptions to the Bracketing Erasure Convention, thus supporting the proposal of Kiparsky (1983b) (and Hammond 1984) that marked exceptions to Bracketing Erasure must be allowed.

I begin this chapter with a brief discussion of the need for a Bracketing Erasure Convention. Next I discuss the motivation for the current version of the BEC, in which brackets are not erased cyclically, but only at the end of a level. I next turn to the Sekani data which are a problem for this version of Bracketing Erasure. The rules of Conjugation → Deletion, Perambulative Reduction, Continuant Voicing, and Suffix Vowel Deletion—all discussed in Chapters 3 or 4—all apply on level 3 or later, yet must differentiate between stems and affixes. I will propose that stems and classifier prefixes are marked with \ldots labelled brackets, and that a revised version of level-final Bracketing Erasure, Exceptionable Bracketing Erasure, does not apply to labelled brackets.

1. The need for Bracketing Erasure

In Lexical Phonology, rules which apply in word-initial or word-final contexts must contain a bracket ([ or ]) in the context of the rule. Without word-internal Bracketing Erasure,
it will be difficult to keep such rules from over-applying. Thus rules which apply at the edges of words, such as Russian Final Devoicing, discussed in Ch. 2, presuppose the erasure of word-internal brackets.

Such rules are not the only evidence that can be adduced in favor of some version of Bracketing Erasure. Rules which apply at the edges of levels provide evidence that Bracketing Erasure must apply within the lexicon.

1.1 English sonorant syllabification

Mohanan (1982) noticed that the SPE rule of Sonorant Syllabification presupposes some sort of Bracketing Erasure. A slightly reformulated version of the SPE rule of Sonorant Syllabification is given in (1):

(1)  [+son] \rightarrow [+syl] / C ___ #

The need for this rule can be seen in alternations between syllabic and non-syllabic sonorants, as given in (2)-(3):

(2a) rhythmic
(2b) rhythm

(3a) theatrical
(3b) theater

This rule also applies to stem-final sonorants which are suffixed with the participle ending -ing, as well as to the word-final sonorants above:

(4a) hindrance
(4b) hinder
(4c) hindering
(5a) twinkling (in 'in the twinkling of an eye')
(5b) twinklē
(5c) twinkling

In a Lexical Phonology analysis, Sonorant Syllabification must include a bracket in its context. Thus Mohanan formulates this rule as follows:

\[
(6) \text{ [+son]} \rightarrow \text{V} \mid \text{C} \mid \text{ } \]

Sonorant Syllabification must be prevented from applying to forms like theatrical or hindrance, even though these will meet the structural description of the rule at some point in their derivation. For this purpose, the SPE analysis included a boundary (#) in the rule. Words like theatrical were assumed not to contain an internal #, and thus Sonorant Syllabification could be blocked from applying.

Boundaries are not available in Lexical Phonology. Thus Mohanan proposed instead that Sonorant Syllabification is restricted to level 4,\(^1\) and crucially, that the internal brackets in forms like [[hindrance]] (which are derived on an earlier level) have been erased by the point in the derivation at which Sonorant Syllabification applies. Since the rule requires a bracket in its context, it will be blocked from applying in forms like hindrance. The following derivations of hindrance and hindering illustrate this analysis. (I assume that ance is added on level 1.)
(7) hindrance hindering
    stem [hindr] [hindr]
level 1
  WFR's [hindr]ance ---
  BEC [hindrance] ---
level 4
  WFR's --- [hindr]ing
  Son. Syll. --- [hindr]ing

Bracketing Erasure must apply between the -ance WFR and Sonorant Syllabification in order to prevent the overapplication of Sonorant Syllabification.

1.2 Malayalam stress

A second set of data which illustrates the need for Bracketing Erasure also comes from Mohanan (1982). In Ch. 2, 3.4 I discussed the Malayalam stress rules and the two types of compounds, cocompounds and subcompounds. To summarize, stress provides one of the ways in which cocompounds and subcompounds differ from each other. Each stem of a cocompound contains one primary stress, but an entire subcompound contains only one primary stress. (Primary stress is realized as low tone and each secondary stress is marked by a high tone; a high tone is placed on the last syllable of the word.) Compare the following compounds:

(8) [[mata] [widweesam]]
    L H H
    religion hatred 'hatred of religion'

(9) [[acchan] [amma]] maare
    L H L H
    father mother pl 'parents'
The subcompound in (8) contains only one low tone (=primary stress), whereas the cocompound in (9) contains primary stress on both of its stems. Mohanan accounts for this difference between the two types of compounds by assuming that the compounding WFR's and the stress rules of Malayalam are ordered as follows:

(10) Subcompounding  
    Stress  
    Cocompounding

Thus the following derivations are required:

(11) | Subcompound | Cocompound |
-----|-------------|------------|
level 2 | [[mata][widweśam]] | --- |
        | [mata widweśam] | --- |
level 3 | [mata widweśam] | [acchan] [amma] |
        | L H H | L H L H |
        | --- | [[acchan][amma]] |
        | L H L H |
level 4 | --- | [[[acchan][amma]] maaṛṣe] |
        | L H L H |

Bracketing Erasure must precede the stress rules in order to ensure that stress is blind to the internal structure of subcompounds.

1.3 Sekani Conjugation ð Deletion

So far we have seen three rules—Russian Final Devoicing, English Sonorant Syllabification, and Malayalam Stress Assignment—which apply in contexts of the form:

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/ __ ]
or  / [ __

In these cases it was essential to assume that Bracketing Erasure had applied prior to the application of these rules in order to prevent their overapplication.

The Sekani rule of Conjugation ø Deletion also provides evidence for word-internal Bracketing Erasure. This rule is sensitive to local morphological complexity but disregards more distant complexity. As we will see, the application of the Bracketing Erasure Convention in this case prevents the under-application of Conjugation ø Deletion in forms which contain classifier prefixes.

As discussed in Ch. 3, 5.2.5 the rule of Conjugation ø Deletion deletes the vowel of ø-final conjugation and mode prefixes when no prefixes of the subject (position 12) or mode (position 11) prefix positions intervene between the conjugation or mode prefix and the optional classifier prefix or verb stem:

\[(12) \quad ø \rightarrow \emptyset / V \{n\} \quad [\{clf\} \text{stem}]\]
\{\{[+cnj]\}\}
\{\{[+mod]\}\}

(In 3.1 below, I will present arguments for the formulation of this rule, including arguments against a phonological restate-ment of the context [(clf) stem].) Consider the following examples, which involve the conjugation prefixes /sə na/. The vowel of the conjugation prefix has been deleted in the (b) forms:

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(13a) na -sə -s -d -kwí
    rev cnj lsS clf V:vomit
    5 10 12 13 stem

našæskwi  'I vomited'

(13b) na -sə -d -kwí
    rev cnj clf V:vomit
    5 10 13 stem

naškwí  'he, she vomited'

(14a) ts'ě-ghu-ne-s -h -sit
    adv 3pO cnj lsS clf V:wake up
    2 7 10 12 13 stem

ts'eghũñassít  'I wake them up'

(14b) ts'ē-se- ne -h -sit
    adv lsO cnj clf V:wake up
    2 7 10 13 stem

ts'ēšhsít  'he, she wakes me up'

In (14b), the conjugation prefix [n] can be seen as nasalization and raising (to [i]) of the preceding vowel.

(15a) kqh  sə -gḥa-wə-ә-nə-n -ʔq
    house lsO P ar cnj Pf V:handle compact O

kqh sawəñiʔq  'he, she gave me a house'

(15b) kqh  sə -gḥa-wə-ә-nə-ʔał
    house lsO P ar cnj V:handle compact O
    1 1 7 10 stem

kqh sawəʔał  'he, she gives me a house'

In (15b), the conjugation prefix [n] has nasalized and fronted (to [e]) the vowel of the preceding prefix.

The fact that Conjugation ə Deletion is blocked by the presence of a position 11 or 12 prefix but applies regardless of whether a position 13 prefix is present (cf. (13b), (14b)) suggests the following analysis:...
(16) Classifier WFR  
Bracketing Erasure  
Conjugation WFR  
Conjugation ø Deletion

Bracketing Erasure must apply after the classifier word formation rule and before the rule of Conjugation ø Deletion. Thus the classifier prefixes can be assigned to level 1 along with stems.

The following derivations of nasøskwi 'I vomited' and naskwi 'he, she vomited' illustrate this analysis:

(17)

<table>
<thead>
<tr>
<th></th>
<th>nasøskwi</th>
<th>naskwi</th>
</tr>
</thead>
<tbody>
<tr>
<td>stem</td>
<td>[kwí]</td>
<td>[kwí]</td>
</tr>
<tr>
<td>level 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>classifier WFR</td>
<td>[ð[kwí]]</td>
<td>[ð[kwí]]</td>
</tr>
<tr>
<td>BEC</td>
<td>[ð kwí]</td>
<td>[ð kwí]</td>
</tr>
<tr>
<td>level 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1s subject WFR</td>
<td>[s[ð kwí]]</td>
<td>---</td>
</tr>
<tr>
<td>conjugation WFR</td>
<td>[sø[s[ð kwí]]]</td>
<td>[sø[ð kwí]]</td>
</tr>
<tr>
<td>Conjugation ø Del</td>
<td>---</td>
<td>[s [ð kwí]]</td>
</tr>
<tr>
<td>BEC</td>
<td>[sø s ð kwí]</td>
<td>[s ð kwí]</td>
</tr>
<tr>
<td>level 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reversative WFR</td>
<td>[na[sø s ð kwí]]</td>
<td>[na [s ð kwí]]</td>
</tr>
<tr>
<td>eventually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nasøskwi</td>
<td>[naøskwi]</td>
<td>naskwi</td>
</tr>
</tbody>
</table>

Bracketing Erasure must precede Conjugation ø Deletion in order to allow this rule to apply in morphologically complex forms which contain a classifier prefix.

1.4 English deverbal nouns

The process by which English nouns and verbs are zero-
derived from other lexical categories has been recently discussed by Kiparsky (1982a, 1983b). These data provide additional evidence for the BEC. Like the cases discussed in 1.1 and 1.2, Bracketing Erasure in this case prevents the overapplication of a constraint on the kinds of forms that can undergo zero derivation processes.

Kiparsky, following Hayes (1981), recognizes two kinds of zero-derived deverbal nouns in English. Some nouns retain the final stress characteristic of verbal stress patterns whereas other have the "retracted" stress pattern characteristic of nouns. The contrast between these two sets can be seen by comparing (18) and (19):

(18)  
verb  | noun
---|---
to record | récord

to permit | pérmit

to advocate | âdvocate

to associate | assâciâte

(19)  
verb  | noun
---|---
to exhaust | exhâust

to consent | consént

to reform | reôform

to result | resûlt

Kiparsky assumes that the nouns and verbs in (18) share a common root, and that neither is derived from the other. The nouns in (18) with initial stress are derived on level 1 (prior to the application of the stress rules). The nouns in (19), on the other hand, which have the stress pattern characteristic of
verbs, are derived from verbs on level 2 after verbal stress has been assigned.

As Kiparsky notes, it is also necessary to recognize a class of verbs which are zero-derived from nouns:

<table>
<thead>
<tr>
<th>Verb</th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>to pattern</td>
<td>pattern</td>
</tr>
<tr>
<td>to pressure</td>
<td>pressure</td>
</tr>
<tr>
<td>to picture</td>
<td>picture</td>
</tr>
</tbody>
</table>

Since the verbs in (20) have the stress pattern characteristic of nouns (cf. (18)), these verbs are zero-derived from nouns on level 2 after the level 1 stress rules have applied.

The level 1 zero-derived nouns and verbs in (18) differ from those derived on level 2 in (19) and (20) with respect to further derivational potential. Kiparsky notes that nouns formed with level 1 suffixes can form zero-derived verbs on level 2, as can be seen above in (20) and also in forms like engineer, proposition. However, nouns formed with level 2 suffixes cannot undergo further zero-derivation processes:

<table>
<thead>
<tr>
<th>Verb</th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>*to singer</td>
<td>singer</td>
</tr>
<tr>
<td>*to freedom</td>
<td>freedom</td>
</tr>
<tr>
<td>*to promptness</td>
<td>promptness</td>
</tr>
<tr>
<td>*to alcoholism</td>
<td>alcoholism</td>
</tr>
<tr>
<td>*to sisterhood</td>
<td>sisterhood</td>
</tr>
</tbody>
</table>

To account for this fact, Kiparsky proposes that zero suffixes cannot be added to suffixed forms, formally expressed by the well-formedness condition on the output of WFR's given in (22):

$(22) \quad * [X] \emptyset$

The application of Bracketing Erasure after level 1 word forma-
tion will ensure that the filter in (22) applies only to verbs which are zero-derived from nouns containing a level 2 affix. Thus Bracketing Erasure in this case prevents the well-formedness condition in (22) from overapplying, ruling out acceptable forms like to proposition.

1.5 Summary

A variety of evidence indicates that Bracketing Erasure must apply in the lexicon between the operations of certain lexical rules. Another case not discussed here which presupposes Bracketing Erasure is Malayalam Causative formation (see Mohanan 1982).

In this section I have discussed three cases in which the application of Bracketing Erasure prevents the overapplication of phonological or word formation rules (1.1, 1.2, 1.4), and one case where Bracketing Erasure prevents the under-application of a phonological rule (1.3). In the next section I consider evidence for the particular place in the lexicon where Bracketing Erasure is assumed to apply.

2. The need for non-cyclic, level-final Bracketing Erasure

2.1 The Opacity Principle

The original Bracketing Erasure Convention proposed in Pesetsky (1979) applied cyclically: at the end of every cycle, internal brackets were erased. Mohanan (1982), on the basis of Malayalam causative data, proposed a weakening of Pesetsky's proposal. Mohanan's Opacity Principle is given in (23):
(23) The internal structure at one stratum is invisible to the processes at another.

As Kiparsky (1982a) notes, non-cyclic, level-final Bracketing Erasure is equivalent to Mohanan's Opacity Condition.

The English zero-derived nouns and verbs discussed in 1.4 and the Sekani rule of Conjugation a Deletion 1.3 both indicate that Bracketing Erasure cannot apply cyclically. The rules in question are sensitive to local morphological complexity. The fact that English verbs cannot be zero-derived from nouns which contain level 2 affixes indicates that the brackets which distinguish the stem from the level 2 affix in [free[dom]] cannot be erased before the level 2 zero-derivation filter in (22) has a chance to apply. Similarly, in the Sekani example, the level 2 brackets which indicate that prefixes intervene between the conjugation prefix and the level 1 domain must not be cyclically erased.

2.2 Slave Voicing Assimilation

An additional example of the need for a last-cyclic, level-final version of the Bracketing Erasure Convention has been pointed out by Rice (1982), who observed that the phonological rule of Voicing Assimilation in Slave requires this weaker version of the BEC. Stem-initial fricatives are voiced when preceded by a voiced segment; otherwise, the fricative remains voiceless.

(24) [+cont] --> [+voiced] / [+voiced] [___ ...],

where [...] contains no inner brackets

Consider the following voicing alternations:
(25a) ná -h -wē cont 1sS live
   nāwē 'I live, stay'
(25b) nāwē 'he lives, stays'
(26a) he -h -sē epen 1sS shout
   hehsē 'I shout'
(26b) hehsē 'he shouts'
(27a) he -h -xa epen 1sS lace
   hehxā 'I lace'
(27b) hehxā 'he laces'
(28a) ná -ʔe -ne -h -ʔu cont? unspO thm? 1sS sew
   nāʔenehʔu 'I sew'
(28b) nāʔenehʔu 'he sews'

Only stem-initial fricatives undergo Voicing Assimilation. Compare (25)-(28) with forms which contain prefix-initial voiceless fricatives, such as whe conjugation:

(29) ne -wē-i -h -k'e
    2sO cnj 1spF clif shoot
    nēwihk'e 'I shot you [sg]'
(30) de -wē-ʔd -die
    incp cnj 1pS p1 go
    dewhídīe 'we [pl] started out'

The conjugation prefix remains voiceless, even though it is preceded by a voiced segment.
In order for this rule to be able to distinguish stems (level 1 domains) from level 2 prefixes on level 2, Bracketing Erasure must be prevented from applying cyclically. The following derivations of (30) 'we [pl] started out' provided by Rice illustrate this analysis. First consider the incorrect form that will be generated if Bracketing Erasure applies cyclically:

stem 

level 2
  subject WFR 
  BEC
  cnj WFR
  BEC
  inceptive WFR
  Voicing Assimilation
eventually

[\[die\]]
[\[die\]]
[\[wh\[d\]ie\]]
[\[wh\[d\]ie\]]
[\[de\[wh\[d\]ie\]]
[\[de\[w\[d\]ie\]]
*\[d\]ew\[d\]ie"

If Bracketing Erasure applies cyclically, stems will be indistinguishable from affixes on level 2. However, if Bracketing Erasure is last-cyclic, stems will be identifiable as the innermost set of brackets on level 2:

level 1
  stem

level 2
  subject WFR
  cnj WFR
  inceptive WFR
  Voicing Assimilation
eventually

[die]
[\[die\]]
[\[wh\[d\]ie\]]
[\[de\[wh\[d\]ie\]]
[\[de\[w\[d\]ie\]]
*\[d\]ew\[d\]ie"

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Voicing Assimilation will be blocked from applying to the prefix \textit{who} because it is clearly not the stem, which is surrounded by the innermost set of brackets.

3. Violations of the Bracket Erasure Convention in Sekani

A variety of evidence suggests that Bracketing Erasure must apply in the lexicon, but not cyclically, to erase the internal structure of levels. The strongest form of the Bracketing Erasure Convention which can account for these cases is the level-final version which is equivalent to Mohanan's Opacity Principle.

In Sekani, a number of rules which apply on level 3 or later are sensitive to the distinction between stems and affixes, thus presenting a problem for this version of the Bracketing Erasure Convention. The contexts of the Sekani rules crucially refer to an earlier, non-adjacent level.

The existence of forms whose derivations violate the Bracketing have appeared elsewhere in the literature. Famous bracketing paradoxes like \textit{ungrammaticality} pose a problem for the Bracketing Erasure Convention, as noted by Kiparsky (1983b) and Sproat (1984). Although violations of the Bracketing Erasure Convention may not be new, the treatment of such forms is still quite controversial. Kiparsky (1983b) has suggested that certain affixes must be marked as exceptions to the Bracketing Erasure Convention, and Hammond (1984) has argued that English compounds are exceptions to Bracketing Erasure. However, Kipar-
sky's analysis has been criticized by Sproat (1984), who proposes an analysis of forms like ungrammaticality in which morphological bracketing is independent of phonological bracketing.

In this section, I will argue that the Sekani rules which violate the Bracketing Erasure Convention can only be accounted for by allowing stems and classifier prefixes to be marked as exceptions to the Bracketing Erasure Convention. Since the rules in question do not lead to paradoxical bracketings which violate subcategorization restrictions, the solution offered by Sproat (1984) has no bearing on these data. I suggest that the Sekani stem and classifier word formation rules which violate the Bracketing Erasure Convention are marked with labelled brackets:

(31) \[1 \quad 1\]

Moreover, I suggest that Bracketing Erasure does not apply to labelled brackets:

(32) Exceptionable Bracketing Erasure Convention

The last rule of level n is: erase unlabelled internal brackets.

I will refer to the stronger form of the BEC as the Exceptionless Bracketing Erasure Convention.

I have organized this section as follows: first I will discuss the rules of Conjugation _e Deletion, Perambulative Reduction, and Continuant Voicing, which apply on level 3 or later and distinguish stems from prefixes. Next I will consider the rule of Suffix Vowel Deletion, which must distinguish stems from suffixes.
3.1 Conjugation a Deletion

The rule of Conjugation a Deletion, discussed above in 1.3, poses a problem for level-final Bracketing Erasure. This rule must refer to the external bracketing of level 1 when it applies on level 3. If Bracketing Erasure applies at the end of level 2 as predicted, this information about the extent of level 1 will be unobtainable.

Recall that Conjugation a Deletion does not apply if the conjugation or mode prefix is followed by a prefix in positions 11 or 12.

\[
\begin{array}{c}
\varepsilon \longrightarrow \emptyset / \left\{ \begin{array}{l}
\text{s} \\
\text{\textit{gh}}
\end{array} \right\} \quad \text{[...]} \\
\varepsilon \longrightarrow \emptyset / \left\{ \begin{array}{l}
\text{[+cnj]} \\
\text{[+mod]}
\end{array} \right\}
\end{array}
\]

where [+] contains no inner brackets

In 1.3 I provided alternations involving the conjugation prefixes se and s. Examples which involve the conjugation prefix ghe are given in (34) and (36) below.

(34a) ?e -ghes -s -d -ts'et
unspO cnj 1sS clf eat
7 10 12 13 stem

?eghes'ts'et
'I ate something'

(34b) ?e -ghe-d -ts'et
unspO cnj clf eat
7 10 13 stem

?ats'et
'he, she ate something'

The segment [gh] that results from the application of Conjugation a Deletion to the /gh/ conjugation and mode prefixes must undergo the additional rule of Gamma Lowering:
(35) Gamma Lowering

\[ gh \rightarrow a / ____ [...], \]

where [...\] contains no inner brackets

\[/?e-ghe-d-ts'ët/\]

Conjugation \( e \) Deletion

\( \emptyset \)

Gamma Lowering

\( a \)

Prefix Vowel Deletion

\( \emptyset \)

\( [?ats'ët] \)

(36a) se -gha-n -ts'ët

IsO cnj Pf V:scratch

7 10 11 stem

seghits'ët 'he, she scratched me'

(36b) ?ædææ-ghe-d-ts'ët

refl cnj clf V:scratch

7 10 13 stem

?ædæats'ët 'he, she scratched him-, herself'

3.1.1 The problem for the Exceptionless Bracketing Erasure Convention

In Ch. 3, 4.2 I argued that a level ordering distinction, motivated by the rules of \( s- \) and \( n- \) Conjugation Fronting, exists between verb prefixes 8 and 9.\(^3\) The existence of this level ordering distinction, as well as the need for Conjugation \( e \) Deletion to apply on level 3 and level 2, creates a problem for Exceptionless Bracketing Erasure.

If level-final Bracketing Erasure removes all internal brackets at the end of level 2, the application of Conjugation \( e \) Deletion will be blocked on level 3 because the innermost set of brackets given in the context of the rule will be in the wrong place: the brackets will not occur to the right of the conjugation and mode prefixes, but will include these prefixes. The

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derivation of ?ats'èt 'he, she ate something' in (37) illus-
trates this problem:

(37)  ?ə -gə-d -ts'èt
      unsP0 cnj clf V:eat 0

level 1
  classifier WFR       [d [ts'èt]]
  BEC                 [d ts'èt]

level 2
  conjugation WFR      [gəh d ts'èt]]
  Conjugation ø Deletion ---
  BEC                 [gəh d ts'èt]

level 3
  object WFR          [?ə[gəh d ts'èt]]
  Conjugation ø Deletion ---
  eventually          *?əghəets'èt
  should be           ?ats'èt

The structural description of Conjugation ø Deletion fails to be met in two places in (37). First, on level 2, no vowel precedes the prefix gəh and the rule does not apply. Second, on level 3, no brackets are present to delineate the level 1 domain, due to the application of the BEC at the end of level 2.

However, if stems and classifier prefixes are marked as exceptions to the Bracketing Erasure Convention, the correct output will be obtained. Level 2 Bracketing Erasure will not erase the stem and classifier brackets because the brackets which contain the stems and classifier prefixes are labelled [1.

The derivation in (38) illustrates this analysis:

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(38) level 1
  classifier WFR \{_{1d \ [_{1ts'\\&t1}]}\}
  BEC \{_{1d \ [_{1ts'\\&t1}]}\}

level 2
  conjugation WFR \{ghe \{_{1d \ [_{1ts'\\&t1}]}\}\}
  Conjugation \& Deletion ---
  BEC \{ghe \{_{1d \ [_{1ts'\\&t1}]}\}\}

level 3
  object WFR \{?\& \{ghe \{_{1d \ [_{1ts'\\&t1}]}\}\}\}
  Conjugation \& Deletion \{?\& \{gh \{_{1d \ [_{1ts'\\&t1}]}\}\}\}
  Gamma Lowering \ a
  Prefix Vowel Deletion \ \emptyset
  eventually \ ?ats'\&t

Conjugation \& Deletion and Gamma Lowering can be revised:

(39) Conjugation \& Deletion

  \(\& \rightarrow \emptyset / \ V \ \{n\} ___ \{_{1}\}
  \{gh\}
  \{[+cunj]\}
  \{[+mod]\}

(40) Gamma Lowering

  \(gh \rightarrow \ a / ___ \{_{1}\)

Labelled brackets replace the context "[...], where [...] contains no inner brackets" with the simpler context \{_{1}\.

3.1.2 Possible reanalyses of Conjugation \& Deletion

Introducing labelled brackets is clearly a step in the wrong direction, as far as the theory of Lexical Phonology is concerned. Labelled brackets are reminiscent of boundaries, which Lexical Phonology claims to have eliminated through level
ordering and the application of "boundary-sensitive" rules in
the lexicon. By reintroducing some way of distinguishing cer-
tain brackets from others, some of the motivation for the cen-
tral claim of the model--allowing phonology to apply in the
lexicon--is removed.

As an example of the less constrained theory that labelled
brackets would allow, notice that the rules discussed in Ch. 3,
3.2 (the D-Effect Rule, Palatalization, and Voicing Assimila-
tion) which apply to stem-initial segments could now be analyzed
as word level or post-lexical rules. With labelled brackets,
there is no reason now not to assume that these rules must apply
in the lexicon on level 1--only theory-internal considerations,
such as whether a rule has lexically marked exceptions.

Thus before concluding that only a new version of the
Bracketing Erasure Convention will allow us to analyze Conjugation
a Deletion satisfactorily, it is worth considering whether
some aspect of this analysis can be changed so that the rule
does not crucially refer to labelled brackets.

3.1.2.1 Merging levels 2 and 3

The most obvious way in which the analysis could be changed
would be to remove the distinction between levels 2 and 3. The
evidence presented in Ch. 3, 4.2 and 5.2 indicated that levels 2
and 3 are a single phonological domain for many rules, yet only
the rules of s- and n-Conjugation Fronting provide evidence that
they are separate domains:
The preceding rules apply on level 2, providing evidence that the level 2 domain includes verb prefixes 9-12 and level 3 includes prefixes 7-8. If levels 2 and 3 were merged into a single level, labelled brackets would not be required by the rule of Conjugation $e$ Deletion. However, not recognizing the level ordering distinction leads to unnecessary complication in accounting for the rules given above. One would be forced to adopt a diacritic analysis of the prefixes which trigger these rules, in much the same way as Kari (1976:209) accounted for similar facts in Navajo:

\[(43) \quad si \rightarrow \emptyset / ASP + \_ + i + X + [\]

Notice that Kari's rule makes use of the prefix position label $ASP(ECT)$ as a diacritic for the rule to refer to.

The diacritic analysis misses the generalization that all prefixes which trigger the rules in (41) and (42) occur in the same position.\(^4\) It might be objected that the prefixes which trigger these rules do not actually all occur in the same surface position, as exemplified in Ch. 3, 4.1.4. However, I argued in Ch. 3, 4.2 that an analysis of the position of these prefixes which is equivalent to their surface order will make it
difficult to account for the contrast between (44) and (45):

(44) ts'æsdli 'we are cold'

(45) tlï dahnaghts'æstl'q 'we tied up the dog'

If ghe occurred to the left of ts'æ underlyingly, and were
diacritically marked as a trigger for the s- and n- Conjugation
rules, the rules would become considerably more complicated:
they would have to look beyond the immediately preceding prefix
to find a trigger for the rule.

Merging levels 2 and 3 seems to be a worse alternative (for
Sekani) than labelled brackets.

3.1.2.2 A morphological formulation

We might try to change the formulation of Conjugation a
Deletion so that the rule does not crucially refer to the left-
most edge of level 1. It is clear that some morphological
features must be added to the rule to distinguish the conjuga-
tion and mode prefixes ghe from the homophonous animate plural
subject prefix ghe (position 8). The latter does not alternate
with a when preceded by position 7 prefixes:

(46) tlïge ?a -ghe-tsægh
dogs unspO 3pS cry
    7    8 stem

   tlïge ?æghtsægh 'the dogs are howling'

(47) we -ghe-ts'it
thm 3pS tell lie
    7    8 stem

   wæghets'it 'they tell a lie'

If the rule must be complicated by morphological features any-
way, then the possibility of restricting it to forms which do
not contain a position 11 or 12 prefix by means of morphological features ought to be considered.

A morphological analysis of the rule soon runs into difficulties. Person/number features must prevent the rule from applying in 1s, 2s, 1d and 2p forms while allowing it to apply in 1p, 3p and 3s forms. Moreover, of the latter forms, only those which do not contain n perfective in position 12 will be allowed to undergo the rule. But [-perfective] is overly restrictive: forms which contain d and l classifier are morphologically perfective even though they lack the perfective prefix, and in such forms, Conjugation Deletion can apply (see (38), (44), (45)).

3.1.2.3 A syllable-based rule

Observe that in forms which contain a subject prefix in position 12 or the perfective prefix in position 11, the conjugation and mode prefixes are not syllable-final. This suggests that the relevant context for the rule is not the adjacency of the prefix to the level 1 domain, but perhaps simply a syllable-final restriction:

\[(48) \ v \rightarrow \emptyset / v \left\{ \begin{array}{c} s \\ n \\ gh \end{array} \right\} \}_{syll} \]

This formulation would correctly prevent the rule from applying to forms like (34a) and (36a) above. However, it would also incorrectly prevent its application to forms like (49b) which contain the classifier prefix h:
(49a) ʔə -də -ghə-s -h -xəh
unspO Fut Fut 1sS clf V:snore
7  9  11 12 13 ste
ʔədəghəsxəh  'I will snore'

(49b) ʔə -də -ghə-h -xəh
unspO Fut Fut clf V:snore
7  9  11 13 stem
ʔədəhxəh    'he, she will snore'

In (49b), the prefix ghə is not syllable-final, but Conjugation + Deletion has applied. Thus Conjugation + Deletion cannot be reformulated as a syllable-based rule.

3.1.3 Conjugation + Deletion: Summary

The rule of Conjugation + Deletion refers to the leftmost edge of level 1 when it applies on level 3, in violation of the Exceptionless Bracketing Erasure Convention. I have shown how the rule can be accounted for under the Exceptionable version of the BEC: stems and classifier prefixes are marked with labelled brackets, which remain untouched by level-final Bracketing Erasure. I have considered a number of possible reformulations of this rule, including a reanalysis of the Sekani lexicon, before concluding that Bracketing Erasure must be weakened in this way.

In the following sections, I will consider other rules which apply on level 3 or later, referring to portions of level 1. Such cases provide additional support for the Exceptionable version of the Bracketing Erasure Convention.

3.2 Perambulatives

As mentioned in Ch. 3, motion verbs in Sekani may undergo an aspectual derivation which I have labelled "perambulative,"
following Kari (1979). This construction is characterized by the prefixes k'è (position 2), na customary/habitual (position 5), and the classifier d (position 13). One of the aspectual suffixes -ts or -h, which characterize the customary aspect, may also be present in surface forms.

The following 2s forms illustrate the underlying form of this construction:

(50) k'è-na-n -d -lit -ts
    per C 2sS clf V:float C
    2 5 12 13 stem
    k'èndlits 'you [sg] float around'

(51) k'è-na-n -d -zût
    per C 2sS clf V:skate
    k'ènzût 'you [sg] skate around'

(52) k'è-na-n -d -be -h
    per C 2sS clf V:swim C
    k'ènbeh 'you [sg] swim around'

As will be seen below, these 2s forms provide the best evidence for the underlying form of the morphemes which occur in this construction. Only the regular rule of a Raising has applied in these forms.

In 1s, 3s and 2p forms in which no prefix occurs between na customary and the subject prefix, the rule of Perambulative Reduction applies:

(53) k'è-na --> k'an / ...
optional consonant. Thus a (largely) phonological context for
Perambulative Reduction can be given, as in (54):

(54)  k'ë-na --> k'an / ___ (C) [(cl) stem]

The application of Perambulative Reduction can be seen in forms
like (55)-(57) (cf. (52) above):

(55)  k'ë-na-d   -beh
      per C  clf V:swim
      k'åbeh                      'he, she swims around'

(56)  k'ë-na-s   -d   -beh
      per C  1sS clf V:swim
      k'åsbebeh                     'I swim around'

(57)  k'ë-na-ah -d   -beh
      per C  2pS clf V:swim
      k'åhbebeh                    'you [pl] swim around'

For (57), I assume that a Deletion (see 3.4 below) precedes
Perambulative Reduction (though the context of Perambulative
Reduction could probably be restated as ((V)C) with no bad
consequences)

    k'ë-na-ah-d-beh

    a Raising
    a Deletion
    Perambulative Reduction    k'an
    Perambulative na Deletion  --

eventually
      k'åhbebeh

    a Raising must precede Perambulative Reduction, which it bleeds:
the latter does not apply to 2s forms.

In forms in which a prefix occurs between na customary and
the optional position 12 subject prefix, na is deleted:
(58) Perambulative na Deletion

na --> ∅ / k'è _

The application of this rule can be seen in the following forms:

(59) k'è-na-whè -na -l -s -d -dah
    per C incp der der IsS clf V:sg go
    2 5 6 9 9 12 13 stem

k'èwhènèsdah 'I start to walk around'

(60) k'è-na-ts'ə-d -beh
    per C 1pS clf V:swim
    2 5 8 13 stem

k'èts'əbeh 'we swim around'

(61) k'è-na-ne -l -ʔih
    per C thm clf V:sneak
    2 5 9 13 stem

k'ènəʔih 'he, she sneaks around'

(62) k'è-na-wə-d -beh
    per C Op clf V:swim
    2 5 11 13 stem

k'èwəbeh 'he, she swims around' [Op]

In the preceding forms, the perambulative prefix is followed by a prefix of positions 6-11, and the prefix na is absent in the surface forms. Perambulative Reduction thus precedes Perambulative na Deletion, which it bleeds.

Clearly, Perambulative Reduction is a problem for Exceptionless Bracketing Erasure. The structural description of Perambulative Reduction cannot be met until level 4, but the rule refers to the leftmost edge of the level 1 domain. If Bracketing Erasure applies at the end of level 1, this information about the extent of level 1 will be lost.
It is worth considering whether Perambulative Reduction could be reformulated so that its context did not refer to level 1. One attempt might be the following:

(63) \( k'\dot{e}na \rightarrow k'an / \_ (C) d\ C \)

Since all verb stems are consonant-initial, the consonant cluster /dC/ would uniquely identify the classifier-stem sequence. However, it is not true that \( d \) classifier is always present in perambulative forms. Rice (1983a) has noted that in Slave, the prefixes na 'back, again' and na customary require \( d \) classifier, but that \( d \) only shows up in intransitive verbs. This is true in Sekani as well: in perambulatives (which contain na customary underlyingly) \( d \) classifier only occurs in intransitive perambulative forms. Compare the following transitive forms with the examples given above:

(64) \( k'\dot{e-na-n -\text{?ah}} \)
per C 2sS V:handle compact O
\n\n\n\n\nk'\dot{e}n\text{q?ah} \quad \text{'you [sg] carry [compact O] around'}

(65) \( k'\dot{e-na-n -\text{leh}} \)
per C 2sS V:handle pl O
\n\n\n\n\nk'\dot{e}n\text{qle}h \quad \text{'you [sg] carry [pl O] around'}

(66) \( k'\dot{e-na-n -h -tsus} \)
per C 2sS clf V:handle cloth-like O
\n\n\n\n\nk'\dot{e}n\text{qhtsus} \quad \text{'you [sg] carry [cloth-like O] around'}

If \( d \) classifier were present in these verbs, the verb stems in (64) and (65) would surface as [t'ah] and [dleh], respectively. In (66), the \( h \) classifier would not be present on the surface if

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/d/ classifier were also present underlyingly.

A phonological reanalysis of the context in which Perambulative Reduction applies appears to be impossible. Given Exceptionable Bracketing Erasure, however, the rule can be easily reformulated as follows:

(67)  k'è-na --> k'an / ___ (C) [1

Thus Perambulative Reduction provides evidence that stems and classifiers are exceptions to the Bracketing Erasure Convention.

3.3 Continuant Voicing in derived nominals

In Ch. 4, sec. 5 I discussed the structure of possessed derived nominals in Sekani and argued for an analysis in which the possessive morphology is added on a loop back to level 1 from level 4:

(68)  \[ level 1 \quad \text{possession,} \\
\quad \text{compounding 1} \\
\quad \text{level 4} \quad \text{verb formation} \\
\quad \text{level 4} \quad \text{nominalizing suffixes} \]

In possessed derived nominals and derived nominals within type 1 compounds, the phonological rule of Continuant Voicing must distinguish stems from prefixes on the loop back to level 1, thus presenting another problem for Exceptionless Bracketing Erasure.

Recall the rule of Continuant Voicing, also discussed in Ch. 4, which accounts for alternations between voiced and voiceless stem-initial fricatives in noun and postposition stems:
(69)  [+cont] --> [+voice] / X [N,P ___…]  

Stem-initial fricatives are voiced when they are preceded by any level 1 morpheme, which may be a prefix or a stem.

Continuant Voicing is motivated by forms like the following:

(70a)  se                    'belt'
(70b)  sazè                 'my belt'

(71a)  shɛI                  'trap'
(71b)  tsɛ yɛI              'beaver trap'

Following Rice (1983a,b,d), I suggested that Continuant Voicing is a level 1 rule that shuts off at level 1, thus accounting for the phonological differences between type 1 and 2 compounds.

As predicted by this analysis, the stem-initial fricative of a possessed derived nominal or nominal embedded in a compound is voiced, not voiceless, as seen in (72) and (73):

(72)  ma -sut -i
     3sPsR V:skeate nom
     məzudi                 'his, her tongue'

(73)  chɛn -Ia -i
     wood pl 0 are in position nom
     chɛn lai                'lizard'

However, Continuant Voicing does not apply indiscriminately to any noun or postposition stem-initial fricative. In Ch. 4, I pointed out that Continuant Voicing fails to apply to stem-initial fricatives in possessed type 1 compounds, even when these are word-initial:

(74a)  sa -ba
        sun father
        'Dolly Varden trout'
(74b) sesabaē 'my Dolly Varden trout'

Following Rice (1983a,b,d), I suggested that Continuant Voicing fails to apply to sesabaē because the initial fricative of the compound occurs in a root, not a stem.

Moreover, the stem-initial fricative of a derived nominal remains voiceless if it is not word-initial in the derived nominal:

(75a) ts'e -h -xēl -i
      unspS clf V:play a musical instrument nom
ts'ahxēl 'guitar'

(75b) sēts'ahxēlē 'my guitar'

(76a) ?e -dē -s-xēt
      unspO der ? V:isaw O
      ?ēdēsxēt 'saw'

(76b) sēʔēdēsxēlē 'my saw'

In order for Continuant Voicing to apply, the fricative must be word-initial, and contained in a stem, not a root.

In keeping with this generalization, word-initial, prefix-initial fricatives in derived nominals do not undergo Continuant Voicing:

(77a) se -h -kāt -i
      cnj clf V:flat nom
      ʔahkādi 'cloth covering'

(77b) sesahkādi 'my cloth covering'

(78a) sa -ts'e -dē -ī -ya -i
      ? unspS thm asp V:pl O nom
      sats'ēdīyai 'necktie'
(78b) sə̃ats'ə̃diyaə 'my necktie'

The word-initial fricative in these possessed derived nominals remains voiceless because it belongs to a prefix, not a stem.

These last forms present a problem for level-final Bracketing Erasure. Possessed derived nominals which contain word-initial stem-initial fricatives undergo Continuant Voicing on the loop back through level 1:

(79)
level 4
Nominalization WFR $[[sūd]_{N}]$
Bracketing Erasure $[sūd]_{N}$
level 1
Possessive WFR $[sə[sūd]_{N}]$
Continuant Voicing $[sə[zūd]_{N}]$
eventually $səzūdi$

However, if Bracketing Erasure erases all internal bracketing at the end of level 4, then prefix-initial fricatives will be indistinguishable from stem-initial fricatives when the possessive prefixes are added on level 1:

(80)
level 4
Nominalization WFR $[[sahkād]_{N}]$
Bracketing Erasure $[sahkād]_{N}$
level 1
Possessive WFR $[sə[sahkād]_{N}]$
Continuant Voicing $[sə[zahkād]_{N}]$
eventually $*səzahkādī$

In order to prevent Continuant Voicing from applying to all word-initial prefixes, stems must be distinguishable from pre-
fixes on the loop back through level 1.

With the Exceptionable Bracketing Erasure Convention, Continuant Voicing is easily revised to account for these data:

\[(81) \quad [+cont] \rightarrow [+voice] / X [1 \quad 1 = P, N]\]

Given the persistence of stem bracketing, prefix-initial fricatives will not undergo Continuant Voicing in possessed derived nominals like \( \text{sesahk} \ddi \) 'my cloth covering'.

\[(82)\]
level 1
stem \( [1k\ddi] \)
classifier WFR \( [1h[1k\ddi]] \)
Bracketing Erasure --

level 2
conjugation WFR \( [s\ddi [1h [1k\ddi]_1]] \)
Bracketing Erasure --

level 4
Nominalization WFR \( [[s\ddi [1h [1k\ddi]_1]]_i] \)
Bracketing Erasure \( [s\ddi [1h [1k\ddi]_1]]_i] \)

level 1
Possessive WFR \( [s\ddi [s\ddi [1h [1k\ddi]_1]]_i]] \)
Continuant Voicing --
eventually \( \text{sesahk} \ddi \)

Continuant Voicing has failed to apply because the fricative is not adjacent to a labelled bracket.

In order to account for the distribution of stem-initial voiced fricatives in possessed derived nominals, the rule of Continuant Voicing must be able to distinguish between stems and prefixes on later levels of word formation. Thus derived nomi-
nals provide additional evidence that stems are exceptions to Bracketing Erasure in Sekani.

3.4 Suffix Vowel Deletion

So far I have discussed three rules—Conjugation e Deletion, Perambulatory Reduction, and Continuant Voicing—which apply on level 3 or later and mention the leftmost edge of level 1 in the context of the rule. In this section, I will consider a rule that refers to the right edge of stems on level 4 or later.

3.4.1 Basic data

In Ch. 4 I referred to the following rule of Suffix Vowel Deletion, which deletes the final vowel of a suffix before a vowel-initial suffix:

(83) \[ V \rightarrow \emptyset / ] \times \_ \_ \_ ] V \]

I will now consider this rule in more detail. Suffix Vowel Deletion is motivated by alternations like the following:

(84a) \[ m\varepsilon \_ -bes \_ -\varepsilon \]

3sPsr knife psd

møbesè \hspace{1cm} 'his, her knife'

(84b) \[ m\varepsilon \_ -bes \_ -\varepsilon -azi \]

3sPsr knife psd dim

møbesèazi \hspace{1cm} 'his, her small knife'

(85a) \[ ?\varepsilon \_ -bil \_ -i \]

unspO V:swing nom

?øbili \hspace{1cm} 'swing'
\[(85b)\] m\(\overline{\text{e}}\) -?\(\overline{\text{e}}\) -bil -i -\(\overline{\text{e}}\).
3sPsr unsp\(\overline{\text{O}}\) V:swing nom psd
m\(\overline{\text{e}}\)bil\(\overline{\text{e}}\)  ‘his, her swing’

\[(86a)\] Iugh-e
fish stm
Iugh\(\overline{\text{e}}\)  ‘fish’

\[(86b)\] Iugh-e -azi
fish stm dim
Iugh\(\overline{\text{e}}\)azi  ‘small fish’

\[(87a)\] d\(\overline{\text{e}}\) -k'\(\overline{\text{a}}\)l -i
thm V:white nom:hum sg
dek'\(\overline{\text{a}}\)l\(\overline{\text{i}}\)  ‘white person’

\[(87b)\] d\(\overline{\text{e}}\) -k'\(\overline{\text{a}}\)l -i -azi
thm V:white nom:hum sg dim
dek'\(\overline{\text{a}}\)l\(\overline{\text{a}}\)zi  ‘dear white person’

\[(88a)\] ne -ts\(\overline{\text{d}}\)l\(\overline{\text{l}}\)-e -azi
thm small stm dim
nets\(\overline{\text{d}}\)lazi  ‘he, she is small’

\[(88b)\] ne -ts\(\overline{\text{d}}\)l\(\overline{\text{l}}\)-e -azi-\(\overline{\text{i}}\)
thm small stm dim nom:hum sg
nets\(\overline{\text{d}}\)lazi\(\overline{\text{i}}\)  ‘small person’

\[(89a)\] ?a -ghe\(\overline{\text{l}}\) -e -ne
adv N:pack stm nom:hum pl
?aghe\(\overline{\text{l}}\)ene  ‘Carrier people’

\[(89b)\] ?a -ghe\(\overline{\text{l}}\) -e -ne -azi
adv N:pack stm nom:hum pl dim
?aghe\(\overline{\text{l}}\)ene\(\overline{\text{a}}\)zi  ‘dear Carrier people’

The preceding data are summarized in (90):
(90) e+ë → ė
i+ë → ė
i+azi → azi
ē+azi → āzi
e+azi → azi
i+azi → qzi
azi+i → azi
ne+azi → nazi

These rules can be generalized to the formulation of Suffix Vowel Deletion given above:

(91) V → Ø / ] x ____ ]

A vowel-final suffix is deleted before a vowel-initial suffix.

As will be seen below, the inclusion of the first bracket, which indicates that the vowel belongs to a suffix and not a stem, poses a problem for level-final Bracketing Erasure.

3.4.2 Stem vs. suffix vowels

Suffix Vowel Deletion distinguishes between suffix vowels and stem vowels. The latter are generally not deleted before suffix vowels, as the following examples indicate:

(92a) degi 'swan'
(92b) se -degi-ë
1sPsr swan psd
degidiè 'my swan'
(92c) degi-azi
swan dim
degiazi 'small swan'

(93a) tsà 'beaver'
(93b) se -tsà -è
1sPsr beaver psd
setsaè 'my beaver'
(94a) ʔe -ch'i  'job'
unspSr job

(94b) sə -ʔe -ch'i-è
lsPsr unspSr job psd

səʔech'iè  'my job'

(94c) ʔə -ch'i-azi
unspSr job dim

ʔech'iazi  'small job'

(95) də -k'ø -azi
thm V:midget dim
dək'øazi  'he, she is midget-sized'

(96a) dəje  'groundhog'

(96b) sə -dəje -è
lsPsr groundhog psd

sədəjeè  'my groundhog'

(96c) dəje -azi
groundhog dim
dəjeazi  'small groundhog'

(97) mə -ʔə -da -i
3sPsr unspO V:pl eat nom

7 stem

məʔədai  'food'

(98) keyih nà -jè -i
town cont V:live nom:hum sg

2 stem

keyih nàjèi  'town dweller'

(99) whə-ghəh-ə -lì -ì
1pO P epen V:be nom:hum sg

1 1 stem

whəhəhəlii  'nurse' (takes care of us)
(100) i tlį dene sę -g há-ye-ne -n -h -chį -i
dem dog person 1sO P 3sO cnj Pf clf handle animate 0 nom

i tlį dene sayāniχčįi 'the dog someone gave me'

a-final stems provide the only exceptions to the generalization that stem vowels do not delete before suffix vowels.

Stem-final a is deleted before an a-initial suffix:
(101a) tsą
     'beaver'

(101b) tsą -azi
     beaver dim

     tsązi
     'small beaver'

(101b) is accounted for by the rule of a Deletion (see Ch. 3, 5.2.1):

(102) a --> Ø % a [ ___

Now consider (101c):

(101c) se -tsą -e -azi
     1sPsr beaver psd dim

     sętsąazi
     'my small beaver'

In (101c), stem-final a does not delete because it is not immediately followed by the diminutive suffix -azi in its underlying representation:

(103) sę-tsą-e-azi
a Deletion -->
Suffix V Deletion Ø

[sętsąazi]7

a Deletion must precede Suffix Vowel Deletion.

To summarize, Suffix Vowel Deletion deletes the first vowel of a sequence of two suffix vowels. This rule generally applies
only to suffix vowels, not to sequences which contain a vowel-final stem.

3.4.3 Problems for Exceptionless Bracketing Erasure

3.4.3.1 Suffix Vowel Deletion in possessed derived nominals

In Ch. 4 I argued that the possessive suffix, like the possessive prefixes, is added to derived nominals on the loop from level 4 back to level 1. This raises a problem for the Exceptionless Bracketing Erasure Convention.

As just exemplified, the nominalizing suffix i is deleted in forms which also contain the possessive suffix ə. An example of this was given above in (85b); additional examples are provided below:

(104a) ts'ë -h -xël
    unspS clf V:play musical instrument nom
    ts'ahlxël
    'guitar'
(104b) sëts'ahlxëlë
    'my guitar'

(105a) də -tsës -i
    der V:whip nom
    dëtsësi
    'whip'
(105b) sədëtsësè
    'my whip'

cf. u -də -gə-s -h -tsës -e
    rep Fut Fut 1sS clf V:whip Fut
    udæghæstseè
    'I will whip it'

As exemplified in (92a) above and in (106) and (107) below, stem-final i is not deleted when the possessive suffix is added:

(106a) k'i
    'birch'
(106b) sək'ië
    'my birch'
(107a) mə -k'e-də-se -h -ts'i
     3sO P  pl cnj clf pl sit
     1  1  9  10  13 stem

mək'edëhts'i       'couch'

(107b) səmək'edëhts'iè  'my couch'

Stem-final i thus contrasts with the nominalizing suffix i with respect to Suffix Vowel Deletion. If Bracketing Erasure removes all internal brackets at the end of level 4, it will not be possible to distinguish stem vowels from suffix vowels on the loop back through level 1. Consider the contrast between dəgi 'swan' and dətsəsi 'whip'. The diminutive forms of these nouns provide additional evidence that the final i is part of the stem in 'swan' but is a suffix in 'whip':

(108) dətsəsəzi       'small whip'
(109) dəgiəzi       'small swan'

If all internal brackets were erased at the end of level 4 in 'whip', Suffix Vowel Deletion would fail to apply to this form because no internal structure would be available to indicate that it was a derived nominal:

(110) dəgi           dətsəsi
     -dəgiè             *-dətsəsiè

However, if stem-final bracketing is still available at the end of level 4 to indicate that the final -i in 'whip' is not part of a stem, then Suffix Vowel Deletion can apply in this form as required:
output of level 4  
[de ['1tses1] i]

level 1
possessive suffix  
[[de ['1tses1] i] ø]

Suffix Vowel Deletion  
Ø

Given the Exceptionable Bracketing Erasure Convention,
Suffix Vowel Deletion can be revised:
(111)  V -->Ø/₁] X ___ ] V

Only vowels which are not adjacent to ₁] will be deleted by this rule. Suffix Vowel Deletion will be blocked by a labelled bracket.

3.4.3.2 Distinguishing stem-final [e ø] from suffixal [e ø]

Another set of data involving Suffix Vowel Deletion which were a problem for the stronger version of the Bracketing Erasure Convention are easily accounted for if stems are identifiable with labelled brackets.

Consider level 1 suffixes of the shape [e ø]. These suffixes delete before another suffix vowel:

(112a) ts'èghe  
'woman'

(112b) ts'èghazi  
'small woman'

(113a) se -chu -è
1spsr daughter psd

sechuè  
'my daughter'

(113b) se -chu -è - azi
1spsr daughter psd dim

sechuàzi  
'my dear daughter'

As exemplified above, stem-final [e] does not delete before a suffix vowel:
(114a) ghâje  'goose'
(114b) ghâje-azi  'small goose'
          goose dim
(115a) se  dâne-~
          1sPsr man  psd
       sâdenë  'my man'
(115b) se  -dâne-~  -azi
          1sPsr man  psd dim
       sâdenêazi  'my dear man'

In Ch. 4 I argued that [e ə] are level 1 suffixes, based on phonological evidence from nasal-final roots. If Bracketing Erasure takes place at the end of level 1 it will merge the distinction between structures containing stem-final [e ə] and suffixal [e ə]:

<table>
<thead>
<tr>
<th></th>
<th>stem-final [e]</th>
<th>suffixal [e]</th>
</tr>
</thead>
<tbody>
<tr>
<td>level 1 stem</td>
<td>[tsʾe̞gəh]</td>
<td>[ghâje]</td>
</tr>
<tr>
<td>suffixation</td>
<td>[[tsʾe̞gəh]e]</td>
<td>--</td>
</tr>
<tr>
<td>BEC</td>
<td>[tsʾe̞ghə]</td>
<td>--</td>
</tr>
<tr>
<td>level 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>diminutivization</td>
<td>[[tsʾe̞ghe]azi]</td>
<td>[[ghâje]azi]</td>
</tr>
<tr>
<td>Suffix Vowel Deletion</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>eventually</td>
<td>*tsʾe̞gheazi</td>
<td>ghâjeazi</td>
</tr>
</tbody>
</table>

Thus on level 4, Suffix Vowel Deletion will be unable to distinguish stem-final [e ə] from suffixal [e ə] because the internal structure of level 1 has been deleted.

Of course, if labelled brackets are allowed, then suffixal -e and stem-final -e are easily distinguished:

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level 1  stem-final [e]  suffixal [e]  
    stem  [₁⁴ts'əgh₁]  [₁⁴ghāje₁]  
    suffixation  [[₁⁴ts'əgh₁]e]  --  
    BEC  --  --  
level 4  diminutivization  [[₁⁴ts'əgh₁]e]azi]  [[₁⁴ghāje₁]azi]  
    Suffix Vowel  Ø  --  
    Deletion  
  eventually  ts'əghazi  ghājeazi  

The alternative to allowing stems to be marked as exceptions to Bracketing Erasure would be a diacritic analysis of the stem-final [e]'s in words like ts'əghe. Although some of the deleting stem-final e's have an apparent stem-forming function, most of the deleting, stem-final -e's have no clear function, as discussed in Ch. 4, 2.1.2. Under any analysis, they must be considered part of the basic lexical entry of the roots to which they will be suffixed. However, despite the fact that many instances of suffixal -e must be considered lexically specified, this does not mean that they are not suffixes. In the Athabaskan languages, it is not uncommon for lexical entries to consist of several (nonadjacent) morphemes. For example, verbs like 'tell lie' and 'handle cloth-like O' contain prefixes in their lexical entries:

(116)  /gho-ts'ɪt/  'tell lie'  
   7 stem  

(117)  /h -tsus,tsuʒ/  'handle cloth-like O'  
   [-Pf]  [+Pf]  
  13 stem  

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Prefix strings like (118) and (119) can also be regarded as separate morphemes which are associated with a single semantic representation:

(118) /ts'ẽ da/  
     2 9  
     'into fire'

(119) /ta da/  
     2 9  
     'misplaced, lost'

Given the need for these kinds of lexical representations, there is no reason why 'woman' could not have the representation in (120), in which -e is lexical, but still a suffix:

(120) /ts'ẽgh e/  
     stem sfx  
     'woman'

(120) would still differ minimally from (121) and (122), which do not undergo Suffix Vowel Deletion:

(121) /dẽe/  
     stem  
     'man'

(122) /ghäje/  
     stem  
     'goose'

In sum, there appear to be no compelling reasons to adopt a diacritic analysis over a suffixal analysis of the stem-final e's.

4. Conclusion

In this chapter I have presented evidence that exceptions to the Bracketing Erasure Convention must be allowed. I have discussed four Sekani rules which crucially refer to stems or classifier prefixes (level 1 morphology) on level 3 or later. As a means of encoding this exceptionality into the grammar of Sekani, I have proposed that exceptions to the Bracketing
Erasure Convention are marked with labelled brackets. I have also proposed a slight reformulation of the BEC as the Exceptionable Bracketing Erasure Convention, which erases only unlabelled brackets.

The analysis adopted here supports the proposal of Kiparsky (1983b) that violations of the Bracketing Erasure Convention are linked to certain kinds of morphology within a language. It is significant that the violations of the BEC in Sekani all involve a certain morphological domain. I know of no level 4 rules which crucially refer to the prefixes of position 9, for example.

In the next chapter I will return to the Exceptionable Bracketing Erasure in my analysis of the phonological rule of Epenthesis in Sekani.

Notes.

1. Sonorant Syllabification is thus apparently another counterexample to the Strong Domain Hypothesis, though it may turn out to be ruled out from applying earlier by structure-preservation.

2. The Sekani rule of Voicing Assimilation discussed in Ch. 3, 3.2.1 is identical to the Slave rule in all relevant respects.

3. As mentioned in Ch. 3, 4.3, this level ordering distinction may turn out to fall between prefixes 7 and 8 instead.

4. As noted in Ch. 3, the level 2 prefix de in 'kindle fire' exceptionally fails to undergo Conjugation @ Fronting:

(123) kwən naðəseqh'q" I kindled a fire"
    *kwən naðəehk'q

Thus the prefix de must be marked as an exception to $s$-Conjugation $a$ Fronting. I also noted in Ch. 3 that the level 3 prefixes we and ye unpredictably undergo n-Conjugation $a$ Fronting.

The existence of prefixes which must be marked for whether
or not they undergo these a Fronting rules of course weakens the argument against a diacritic analysis, but does not in itself seem to be a strong reason for abandoning the level ordering distinction between levels 2 and 3. As discussed in Ch. 3, 5.2.6, the na prefixes of position 5 must be exceptionally marked as triggers for the rule of na Absorption, but this is not a compelling reason for abandoning the level ordering distinction which falls between prefixes 6 and 7.

5. This is clear from stem variation, for example:

(124) yidā -n -d -xe -n  
inside cnj clf pack Pf

yidōgi  'he, she packed [O] inside'

6. Reversative na may be present in surface forms of perambulative aspect verbs:

(125a) k'ē-na-tsi -da-tsīh  
per C sniff der V:sniff

k'ētsǐdētsǐh  'he, she sniffs around'

(125b) k'ēnatsǐdētsǐh  'he, she sniffs around again'

As far as I know, these are the only forms in which both na's occur underlyingly. Since na customary is deleted, it is impossible to determine what the underlying order of the na prefixes is.

7. Notice that this form does not surface as *[sētsāzi], with two adjacent low tone [a]'s. The tone of the possessive suffix is exceptionally mapped to the stem vowel a when it is set afloat by Suffix Vowel Deletion:

(126)  
\[L \quad \text{a} \quad \text{a}\]  

Compare the following a-final stem:

(127) chēba  'poplar'

se -chēba -ē  'my poplar'

1sPsr poplar psd

se -chēba -ē -azi  'my small poplar'

1sPsr poplar psd dim

saschēbaäzi

*saschēbaäzi
Chapter Six
Epenthesis

Sokani, like many other Athabaskan languages, contains a phonological rule of Epenthesis.\footnote{1} Epenthesis poses an analytical problem: an early (level 2) rule of Epenthesis requires that Epenthesis be ordered after many other level 2 rules. However, while a later level ordering assignment eliminates these ad hoc ordering statements, the rule must refer to stem bracketing.

In this chapter I consider a number of possible analyses of the level ordering assignment of Epenthesis before concluding that it is a level 4 rule. Thus Epenthesis provides additional evidence for the weaker version of the Bracketing Erasure Convention discussed in Ch. 5.

I have organized this chapter as follows. In section 1 I summarize the arguments that have appeared in the Athabaskan literature in favor of a phonological rule of Epenthesis. In sections 2 and 3 I provide additional data and a preliminary analysis of the domain and formulation of the rule. In section 4, I consider necessary rule ordering statements in more detail. In section 5, I summarize the likely historical origin of Epenthesis, and propose, following Rice (1983c) that Epenthesis is a level 4 rule. The interaction of Epenthesis with an additional rule, Stray n Deletion, discussed in section 6, provides further evidence that Epenthesis is a level 4 rule.
1. Introduction

The forms in (1) and (2) indicate that the underlying shape of the 1s subject prefix is \( /s/ \), and that the category of the 3s subject is not morphologically marked:

(1a) \( n\bar{a} -s -\bar{h} -\text{xq}\bar{\bar{\bar{\bar{e}}}}h \)
    \[ \text{rev 1sS clif thaw 0} \]
    \[ 5 \ 12 \ 13 \ \text{stem} \]
    \[ \text{naxq\bar{\bar{\bar{\bar{e}}}}h \quad 'I thaw out [O]' \]}

(1b) \( n\bar{a} -\bar{h} -\text{xq}\bar{\bar{\bar{\bar{e}}}}h \)
    \[ \text{rev clif thaw 0} \]
    \[ \text{nahxq\bar{\bar{\bar{\bar{e}}}}h \quad 'he, she thaws out [O]' \]

(2a) \( n\bar{a} -\text{n}\bar{\bar{\bar{\bar{e}}}} -s -l -?\bar{\bar{\bar{\bar{i}}}} \)
    \[ \text{adv der 1sS clif hide} \]
    \[ 2 \ 9 \ 12 \ 13 \ \text{stem} \]
    \[ \text{n\bar{\bar{\bar{\bar{e}}}}n\bar{\bar{\bar{\bar{e}}}}?\bar{\bar{\bar{\bar{i}}}} \quad 'I hide' \]

(2b) \( n\bar{a} -\text{n}\bar{\bar{\bar{\bar{e}}}} -l -?\bar{\bar{\bar{\bar{i}}}} \)
    \[ \text{adv der clif hide} \]
    \[ \text{n\bar{\bar{\bar{\bar{e}}}}n\bar{\bar{\bar{\bar{e}}}}?\bar{\bar{\bar{\bar{i}}}} \quad 'he, she hides' \]

This is the analysis of the subject prefixes that has been assumed in previous chapters.

Notice that the verb forms in (1) and (2) contain syllabic prefixes that have been added by the morphology. Now consider the following forms, in which no syllabic prefix is morphologically specified:

(3a) \( s -d -\text{shan} \)
    \[ \text{1sS clif sing} \]
    \[ 12 \ 13 \ \text{stem} \]
    \[ \text{\underline{\underline{s}}}s\bar{\bar{\bar{\bar{e}}}j\bar{\bar{\bar{e}}}n \quad 'I sing' \]

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(3b)  d -shən
    clf sing
    ʃən  'he, she sings'

(4a)  tl'og  s -dət
    grass 1sS smoke O
    12  stem
    tl'og  əsdət  'I smoke grass'

(4b)  tl'og  dət
    grass smoke O
    tl'og  ədət  'he, she smoked grass'

(5a)  s -h -ch'əs
    1sS clf roast O
    12 13  stem
    əsch'əs  'I roast [0]'

(5b)  h -ch'əs
    clf roast O
    əhch'əs  'he, she roasts [0]'

Note that the rule of Schwa Lowering has applied in (5b):

    æ -h-ch'əs
  æ Lowering    a
    [əhch'əs]

In each of these forms, a syllabic element [ə] (or [a]) appears,
This vowel is the output of the rule of Epenthesis.

Before I proceed with the details of Epenthesis, however, I
would first like to point out another possible interpretation of
the data in (1)(5). The forms in (3)-(5) are all imperfective.
In early studies of the phonology of Athabaskan languages (e.g.,
Sapir and Hoijer 1967), the cognate of the epenthetic syllabic
element was sometimes analyzed as a marker of one of the conju-
gation classes of the imperfective mode, the γ-imperfective

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However, this was criticized by Krauss (1970:226), who observed that the y-imperfective is in complementary distribution with the ŋ-imperfective (another conjugation class of the imperfective) in this analysis. Moreover, as noted by Kari (1975, 1976), in a morphological analysis of the syllabic segment in (3)-(5), it is necessary to assume that this syllabic element is deleted in all but the 1s and 3s forms—those forms that lack a syllabic subject prefix.

As a final criticism of a morphological (imperfective) analysis of Epenthesis, notice that the epenthetic vowel is not limited to the imperfective mode. Consider the following perfective forms:

(6) sē -d -shi
cnj clf breathe

əsji 'he, she breathed'

(7) sē -d -shq
cnj clf grow

əsñq 'he, she is old'

Although such data were observed and puzzled over in the early analyses, the presence of the epenthetic vowel in these perfective forms was not related to the presence of the epenthetic vowel in the imperfective forms.

Under what conditions does the epenthetic vowel occur? As Rice (1983c) has insightfully described these conditions, every verb in the Athabaskan languages consists of a stem preceded by at least one syllabic prefix. If no syllabic prefix is added by the morphology, then a vowel is added by the phonological rule
of Epenthesis to ensure that the verb contains a syllabic element to the left of the verb stem in its surface form.

In a phonological analysis, then, the presence of the epenthetic vowel in non-imperfective forms like (7) is easy to explain. Epenthesis will simply apply to the output of Conjugation \( \alpha \) Deletion in a form like (7). Conjugation \( \alpha \) Deletion is stated informally in (8):

\[
(8) \quad \alpha \rightarrow \emptyset /\text{\( ^{\text{n}}S \)} /\{\text{\( ^{\text{gh}} \))}/ \{\{\text{\(+cnj\)}\}\} /\{\text{\(+mode\)}\}/\{\text{\( \text{clf} \))\} \verb stem \}
\]

The output of Conjugation \( \alpha \) Deletion, as applied to the prefixes /sə/ and /nə/, will be a form which lacks a syllabic prefix in 3s forms. Epenthesis can then apply to create the appropriate surface form:

\[
\text{Cnj} \quad \alpha \quad \text{Del} \quad \emptyset
\]

\[
\text{Epenthesis} \quad \alpha \quad \text{[esjə]}
\]

Thus a phonological rule of Epenthesis accounts for the presence of the epenthetic vowel in imperfective as well as non-imperfective forms.

2. The domain of Epenthesis—a first approximation

In the preceding section we saw that an epenthetic vowel appears in the following places:

--to the left of prefixes in positions 12, 13
--to the left of the conjugation prefix (position 10)
In the forms provided in the preceding section, the epenthetic vowel was word-initial, which might suggest that Epenthesis is a postlexical rule.

Before I assign Epenthesis to a particular level, I would first like to present some additional data. In the following forms, the epenthetic vowel is not word-initial, but occurs within a word. Notice that the epenthetic vowel occurs to the right of the level 4 prefixes in all cases where it is word-internal:

(9) ghɔqɔ se -ghqɔh lɪ
    well 1 1 1 stem
    ghɔqɔ sqhɛlɪ    'he, she takes good care of me'

(10) dah-se h -tsus
    up 2 10 13 stem
    dah ahtsus    'he, she hangs up [cloth-like 0]'

(11) ye -ghqɔh-nɛ -yah
    4sO P 1 1 10 stem
    yqhɪyah    'he, she gets to [0], walking'

These data suggest that the epenthetic vowel is inserted after the level 2 prefixes have been added, but before the level 4 prefixes.

An additional complication must be mentioned. In the preceding examples ((9)-(11)), the level 4 prefix is consonant-final. However, 1s and 3s forms (which lack a syllabic subject prefix) which contain vowel-final level 4 prefixes lack an
epenthetic vowel in their surface forms:

(12)  Iè  -s  -tl'uh  
in half 1sS tie'  
2  12 stem  
Ièstl'uh  'I tie a knot'

(13)  nà  -wàt  
cont walk fast  
2 stem  
nàwàt  'he, she walks fast'

(14)  ?ødælè e -h  -kwi  
blood P clf vomit O  
1 13 stem  
?ødælè ehkwi  'he, she vomits blood'

In keeping with the hypothesis that Epenthesis applies before the level 4 prefixes are added, information about whether or not a prefix will be added on level 4, and thus whether it is vowel- or consonant-final, is presumably unavailable at the point in the derivation that Epenthesis applies. Suppose that a formulation of Epenthesis is posited which looks only rightward to see if no syllabic prefixes have been added:

(15)  Epenthesis:

\[ \emptyset \rightarrow \varepsilon / \_ \_ C_0 [v] \]

Then all that is required is an additional rule which deletes the epenthetic vowel if a vowel-final level 4 prefix is added. Recall from Ch. 3, 5.2.1, that Sekani has a rule of Prefix Vowel Deletion, given in (16):

(16a)  \varepsilon \rightarrow \emptyset \& \_ \_ V  
(16b)  i \rightarrow \emptyset \& \_ \_ V  

Prefix Vowel Deletion is thus two rules, with (16a) ordered
before (16b). In Ch. 3 I proposed that one difference between levels 2–3 and level 4 was that Prefix Vowel Deletion shuts off after levels 2 and 3. However, suppose that only (16b) shuts off after level 3. Then (16a), Schwa Deletion, will be available to remove the epenthetic vowel if a level 4 prefix is added by the morphology. This analysis is illustrated in the derivation of (14) -ehkwi:

\[
\text{h-kwi} \rightarrow e-\text{kwi}
\]

Epenthesis
\[ e \]
level 4
morphology
\[ e-\]
Schwa Deletion
\[ e-\]
eventually \[ \text{[ehkwi]} \]

Thus in verbal forms which lack syllabic levels 2 and 3 prefixes, the epenthetic vowel surfaces in only two cases: when no level 4 prefix is present, or when a level 4 prefix which ends in a consonant is added.

3. Formulation of Epenthesis

In the formulation of Epenthesis given in (15), I included the level 1 (verb stem) bracket \([v]\), without any real justification for including it in the rule:

\[
\emptyset \rightarrow e / \text{C}_0 [v]
\]

In this section I will show that it is indeed necessary to include stem bracketing in the rule. I will consider two alternative formulations of this rule. One of these does not rely crucially on stem bracketing, and is not observationally ade-
quate. The other formulation I will consider is that proposed by Rice (1983c), in which stem bracketing is available on a later level through an ingenious use of syllable structure.

3.1 The importance of stem bracketing

One possible interpretation of Epenthesis is that it is simply the manifestation of a surface constraint on well-formed verbs:

(17) [ 6  6 v]

Verbs must fit a syllabic template consisting of at least two syllables. Of course, verbs would be allowed to exceed this template, as they often do, but the template might be regarded as a lower bound on the phonetic length of verbs.

However, note that Epenthesis applies even before verb stems which are disyllabic:

(18) s -whāse
    1sS itch
    12 stem

   éswhāse

   'I itch'

(19) h -whāse
    clf tickle O
    13 stem

   ahwhāse

   'he, she tickles [O]'

(20) ?ēlā h -t'oghes
    boat clf paddle O
    13 stem

   ?ēlā ah't'oghes

   'he, she paddles the boat'

If Epenthesis simply counted the number of syllables in a word, then it presumably would not need to apply in forms like (18)-(20). However, if Epenthesis is sensitive to stem bracketing,
then the epenthetic vowel will correctly be inserted in these forms.

3.2 A syllable-based rule of Epenthesis?

So far we have seen that an epenthetic vowel is present in surface forms under the following conditions:

\[
\begin{align*}
\text{C-final level 4 prefix} & \quad \text{no syllabic levels} \\
\text{no level 4 prefix} & \quad 2, 3 \text{ prefixes}
\end{align*}
\]

The syllabic element added by Epenthesis is present only when no syllabic levels 2 or 3 prefixes are added. To capture this generalization, Rice (1983c) has proposed a syllable-based version of this rule to account for data in Slave which are analogous to these Sekani facts.

In recognition of the need for Epenthesis to refer to stem bracketing, Rice proposes that the following word formation rule applies to verb stems on level 1:

\[
\begin{array}{c}
\text{[ [ v] v]} \\
\text{6}
\end{array}
\]

As a level 1 rule, the word formation rule in (22) ensures that every verb stem is preceded by at least one syllabic prefix in its surface form. The syllable added by the level 1 word formation rule can be filled by a syllabic prefix which is added on levels 2-3 by the morphology. However, if no syllabic prefix is added, then a vowel fills the empty syllable position, by the rule of Epenthesis:

\[
\begin{array}{c}
\emptyset \rightarrow e / \quad 6
\end{array}
\]

(The epenthetic vowel in Slave is \(e\).) Rice argues that
Epenthesis applies on level 4 to fill any empty syllable positions that have not been filled by the levels 2-3 word formation rules. She also argues that Epenthesis must precede the level 4 word formation rules.

This analysis has several nice consequences. First, a level 4 analysis of Epenthesis does not overgenerate: the epenthetic vowel is inserted only when no syllabic levels 2 or 3 prefixes are present. Second, the empty syllable provides a way of identifying the stem or level 1 domain on a later level which is not adjacent to level 1.

Theoretically, the analysis is also quite appealing. Since level 4 Epenthesis, a phonological rule, precedes the level 4 word formation rules, it indicates that levels 3 and 4 are linked through the phonology, providing strong support for the Lexical Phonology model. Moreover, if one takes the position that syllable structure is an autonomous, rather than derived, property of phonological structure (Anderson (1982c), Lowenstamm and Kaye (1983)), the analysis is very much in keeping with the research strategy suggested by Anderson (1982:18c):

...there is reason to believe that segmental rules of epenthesis can be completely prohibited.

However, there is really no evidence that Epenthesis in the Athabaskan languages is crucially a syllable-based rule. "Epenthesis" is something of a misnomer for this rule. This rule inserts a prothetic vowel in certain environments, much like the rule of Prothesis in Mohawk described by Michelson (1981). Thus the epenthetic vowel does not break up consonant clusters, or
perform similar functions, as do syllable-based rules of epenthesis in other languages.

In what follows I will assume a linear version of Epenthesis. Given the conclusion in Ch. 5 that stems are marked with labelled brackets, a syllable-based version of this rule is not required to circumvent the Bracketing Erasure Convention.

4. Rule Ordering

To summarize, we have seen that Epenthesis applies in verbal forms which lack syllabic level 2 and 3 prefixes. The epenthetic vowel surfaces only when no level 4 prefix is present, or when a level 4 prefix which ends in a consonant is added, suggesting that Epenthesis is ordered somewhere between the level 2 and level 4 word formation rules.

Having seen that Epenthesis must refer to stem bracketing, one's first thought might be that Epenthesis is an early rule of the phonology. The data presented in Ch. 3 indicated that most of the rules of levels 2 and 3 are identical. Thus we might hypothesize that Epenthesis is a rule of levels 2 and 3. This analysis would have the immediate advantage of allowing Epenthesis to be formulated as a local rule. In this section I would like to explore this hypothesis. I consider the necessary orderings of a level 2 rule of Epenthesis with other level 2 phonological and word formation rules, and conclude that Epenthesis must be assigned to a later level.
4.1 Conjugation rules

We have already seen from section 1 that Epenthesis must apply to the output of Conjugation a Deletion in certain forms (Ch. 3, 5.2.5.2). An epenthetic vowel appears in verb forms which contain d classifier and the /sa/ or /nə/ conjugation prefixes, and in which the conjugation prefix is word-initial or preceded by a consonant-final level 4 prefix. An example is given in (24):

(24)  se -d -shq
     cnj clf grow

    æsjq              'he, she is old'
    /se-d-shq/

Conjugation a Deletion          Ø
Epenthesis                          æ

[æsjq]

This derivation indicates that Epenthesis must follow Conjugation a Deletion.

Epenthesis must also follow Conjugation Tone Mapping (i.e., Glottal Stop Absorption; see Ch. 3, 5.2.2, 7.2). Recall that Conjugation Tone Mapping applies on levels 2 and 3 of the verb prefixes. The low tone of the conjugation prefixes /sa/ and /nə/ is mapped to a preceding levels 2 and 3 vowel:

(25)  \[\begin{array}{c}
L \\
V \\
L \\
\end{array} \]

V se V nə

Consider the forms æsjq (24) and yəhiyəh (26). Since the vowel inserted by Epenthesis does not have a low tone in these forms, this suggests that level 2 Epenthesis follows Conjugation Tone
Mapping, as the following derivation indicates:

(26) ye -qh$qh$-"n$\sim$-yah  'he, she gets to him, her,
4s0 P  cnj sq go  walking'
1 1 10 stem

y$qh$iyah

"n-yah

Conjugation Tone Mapping  --

Epenthesis  ø n -yah

later rules:
Nasalization  ð -yah
酉 Raising  i -yah

eventually  [y$qh$iyah]

Epenthesis must also follow two additional level 2 rules
that involve the conjugation prefixes. These are the rules of
s- and ñ-Conjugation ø Fronting, Ch. 3, 4.2. Recall that on
level 2, /ø/-final (position 9) prefixes become [e] in certain
forms when followed by the conjugation prefixes se or ne. In ñ-
Conjugation forms, only those forms in which the conjugation
prefix is syllable-final with the preceding prefix (3s, 1p, 3p)
undergo the rule of ñ-Conjugation ø Fronting:

(27) ñ-Conjugation ø Fronting:
 ø  -->  e /  n]syll

An example of the application of this rule can be seen with the
position 9 prefix /ø/ 'wooden 0':

(28) yidda  -ø  -nø -leh
inside wood cnj handle pl 0
2 9 10 stem

yiddådøleh  'he, she carries [pl 0] inside'

cf.
cf.
(29) dəcʰən 'wooden'

In s-Conjugation forms, only forms which contain a low tone (this excludes 1d forms) undergo the rule of s-Conjugation e Fronting:

(30) s-Conjugation e Fronting:

\[ e \rightarrow e / \text{L} \quad s \]

Alternations involving the position 9 prefix /nə/ 'face' illustrate this rule:

(31a) nə -sə -kät
  face cnj slap
  9 10 stem

  nēzkät 'he, she slapped [O] on the face'

cf.
(31b) nə -kät 'he, she slaps [O] on the face'
  face slap
  9 stem

The /se/ conjugation prefix is not present in the imperfective form in (31b).

In a form like [əʃyq], it is clear that the vowel inserted by Epenthesis has not undergone s-Conjugation e Fronting:

s-d-shq

Cnj e Fronting --

Epenthesis V-s-d-shq

And in a form like [yqhiyah], n-conjugation e Fronting has not applied to the output of Epenthesis. Thus a level 2 rule of Epenthesis would have to follow the Conjugation e Fronting rules.

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4.2 Position 12 Subject Word Formation Rules

The rule of L Deletion discussed in Ch. 3, 5.2.3 indicated that the position 12 subject prefixes are added on level 2. Level 2 Epenthesis also cannot precede these position 12 word formation rules: the subject prefixes must be added before Epenthesis applies. Since the first person singular subject prefix /s/ contains no syllabic element, Epenthesis will apply in this form. The effect of Epenthesis will be apparent in the surface forms of verbs which contain this prefix and no syllabic prefixes:

(32) s -h -ch'ês
    1sS clf roast O
    12 13 stem

   _esch'ês  'I roast [O]'

(33) s -d -shæn
    1sS clf sing

   _esjæn  'I sing'

(34) s -tægh
    1sS cry

   _estægh  'I cry'

Level 2 Epenthesis cannot apply until after /s/ has been added by the morphology:

stem  tægh

level 2
subject WFRs  s-tægh

Epenthesis  æs-tægh

The reverse ordering will result in the wrong form: *sætægh.

Notice that in this case, Epenthesis must be ordered after a word formation rule, rather than a phonological rule. The
most general way to derive this necessary ordering in the grammar of Sekani would be to assume that the first rule of level 2 must be morphological, rather than phonological; that is, that levels 1 and 2 are linked through the morphology, rather than the phonology. However, as seen in Ch. 4, 2.2.2 the interaction of Glottal Stop Absorption and Possessive Suffixation indicated that the levels are linked through the phonology. If the direction of linking is a universal, these two analyses are contradictory.

5.3 Summary

In this section we have seen that if Epenthesis is a levels 2-3 rule, it must follow several level 2 rules, given in (35):

(35) Conjugation & Deletion
     s- and n-Conjugation & Fronting
     Conjugation Tone Mapping
     position 12 word formation rules

Epenthesis must be ordered after many level 2 rules, but not before a single level 2 rule.

This ordering seems quite suspicious. It suggests that a generalization is being missed about where Epenthesis applies in the Sekani lexicon. If Epenthesis were instead assigned to a level later than level 2, say, level 3 or 4, the level ordering assignment would accomplish what would otherwise have to be stated separately in several rules.

Suppose Epenthesis were assigned to level 3. One generalization that emerged from Ch. 3 was that if a phonological rule applies on level 3, it also applies on level 2 (but not vice
versa). A level 3 analysis of Epenthesis would undermine this generalization. Moreover, if Epenthesis were a level 3 rule, it would still be necessary to order it after Conjugation Tone Mapping.

In fact, it is not necessary to violate the "if level 3, then level 2" generalization. As I will suggest in the following section, a level 4 analysis of Epenthesis is possible.

5. Level 4 Epenthesis

Rice (1983c) suggests that Epenthesis was originally a post-lexical phonological rule. As discussed in Ch. 3, 5.3, the level 4 or "disjunct" verbal prefixes are historically the most recently incorporated of the Athabaskan verbal prefixes. Rice (1983c:10) provides a historical summary of Epenthesis and its relation to the level 4 prefixes in the Athabaskan languages:

> While these prefixes must be considered part of the verb word phonologically, they are clearly less bound to the verb than are the [levels II and III] prefixes. Epenthesis...was very likely originally a post-lexical rule. It filled a syllable position before a verb stem if there was no prefix; the disjunct prefixes were not part of the verb word.

Given the probable post-lexical origin of Epenthesis, we might suppose it is still a comparatively late rule of the phonology, applying on level 4. In this section, I will show that a level 4 analysis of Epenthesis is indeed tenable and has no apparent negative consequences (other than violating the Strong Domain Hypothesis).

5.1 Formulation of level 4 Epenthesis

First note that level 4 Epenthesis must be more complicated
than the formulation proposed in (15). As shown in 3.1, Epenthesis must refer to stem bracketing. Without the conclusion reached in Ch. 5, this in itself would have been sufficient to discard the analysis. However, given the independently reached conclusion that stems are exceptions to Bracketing Erasure in Sekani, the formulation of Epenthesis in (36) becomes possible:

$\emptyset \rightarrow o / \text{___} [C_0 \ [1, y]

Under the assumption that the Bracketing Erasure Convention removes unlabelled brackets at the end of levels 2 and 3, then the context "[C_0" will be interpreted as the maximal string that can intervene between level 4 Epenthesis and the stem.

Consider a form like (37):

(37) $d\bar{a} -s -kw\bar{a}s$
    thm 1sS cough
    9 12 stem

    dæskwæs  'I cough'

After levels 2 and 3 Bracketing Erasure has applied to this form, it will be bracketed as in (38):

(38) [dæs[1kwæs]]

Level 4 Epenthesis will be blocked from applying to (38) because a syllabic prefix is present. Now consider a form like (39):

(39) $s -tsægh$
    1sS cry
    12 stem

    ãstsegh  'I cry'

This form will be bracketed as follows on level 4:

(40) [s[1tsægh]]

Thus Epenthesis can apply to this form, as required.
5.2 Ordering with respect to level 4 rules

In Ch. 3, 6.2.1 I discussed the level 4 rule of Schwa Fronting, given in (41):

(41) ə → e

This rule is motivated mainly by distributional evidence (/ə e/ do not contrast in affixes), but there is also some evidence for this rule from alternations.

If Epenthesi$\text{e}$s were a level 4 rule, it would provide an instance of surface contrast between [ə e] in the level 4 prefixes. The epenthetic vowel is uniformly [ə] (or [a] or [i], by the rules of Schwa Lowering and Raising) but never [e]. We could, of course, simply order Epenthesi$\text{e}$s after level 4 Schwa Fronting to get the right result in forms like (39) əst$\text{e}$gh 'I cry':

stem  
level 2  
subject WFRs  
level 4  
Schwa Fronting --

Epenthesi$\text{e}$s əst$\text{e}$gh 

Level 4 ə Fronting applies to the output of level 4 prefixes like /chə/ 'into water', as (42) indicates:

(42)  

Thus the following order of the rules is required:

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(43)  level 4 prefixation
@ Fronting
Epenthesis

In sec. 2 above I suggested that Epenthesis must precede
the level 4 word formation rules. But in the ordering statement
in (43), Epenthesis follows level 4 affixation. This ordering
is possible because of the particular formulation of Epenthesis
adopted. To see why, consider a form like (44):

(44)  dah-se -h -tsus
      up  cnj  clf  handle  cloth-like 0
      2  10  13  stem

      dahahatsus      'he, she hangs up [cloth-like 0]'

After *dah* is prefixed on level 4, this form will be represented
as in (45):

(45)  [dah [se {htsus}]]

After Conjugation @ Deletion has applied, this form will meet
the structural description of Epenthesis:

      [dah [se {htsus}]]

Conjugation @ Deletion       @
Aspiration               h
Cluster Simplification      @
@ Fronting               --
Epenthesis            @
@ Lowering               a

The leftmost bracket in the formulation of the rule ensures the
correct placement of the epenthetic vowel.

We have seen how the formulation of Epenthesis in (36)
accounts for the presence of the Epenthetic vowel in forms which
contain consonant-final level 4 prefixes. One might wonder if
the analysis also accounts for forms in which the level 4 prefix
is vowel-final, and the epenthetic vowel is absent. Consider a
form like (42) above. Following level 4 prefixation of /chʔ/, this form will be represented as in (46):

(46)  [chʔ [nə [ˀʔah]]]

Following Conjugation ø Deletion, this form will meet the structural description of Epenthesis. If ø Deletion follows Epenthesis, the correct surface form will be derived, as follows:

[chʔ [nə [ˀʔah]]]

<table>
<thead>
<tr>
<th>Conjugation ø Deletion</th>
<th>ø Deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø Fronting</td>
<td>e</td>
</tr>
<tr>
<td>Epenthesis</td>
<td>ø</td>
</tr>
<tr>
<td>ø Deletion</td>
<td>ø</td>
</tr>
<tr>
<td>Nasalization</td>
<td>[chʔʔah]</td>
</tr>
</tbody>
</table>

To summarize, a level 4 analysis of Epenthesis solves the ordering problem discussed in sec. 4. The formulation of this rule given in (36) provides additional support for the version of the Bracketing Erasure Convention discussed in Ch. 5: in Sekani, stems are exceptions to the Bracketing Erasure Convention.

The data that I will discuss in the next section provide additional evidence that Epenthesis is a level 4 rule.

6. Epenthesis and Stray n Deletion

6.1 Stray n Deletion

Consider the following forms. Observe that the postposition in (47) and (48) alternates in shape between [ka] and [㶇a]:

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(47a) lədi nka-ye -ne -s -sən
tea  P  thm thm 1sS want
    1 7 9 12 stem
lədi kayənəssən  "I want tea"

(47b) sə -nka-ye -ne -n -zən
1sO  P  thm thm Pf want
    1 7 9 11 stem
sïkayənizən                "he, she wants me"

(48a) għāje nka ts'ə-ch'ɪ
goose  P  1pS  be, do

għāje  ka ts'ech'ɪ              "we are hunting a goose"

(48b) ?ə -nka ts'ə-ch'ɪ
unspO  P  1pS  be, do

? Böyle ts'ech'ɪ            "we are hunting something"

As discussed in Chs. 3 and 4, Sekani independently requires the
rules of Nasalization and ə Raising:

(49) Nasalization:
    Vn  -->  V / __ )syll

(50) ə Raising:
    ə  -->  i

Thus if /nka/ is posited as the underlying representation of
this postposition, its surface form in the (b) forms will be
automatically accounted for by these rules: 4

/se-nka-ye-ne-n-zən/

Nasalization  ə     ə
ə Raising      i      i

[sïkayənizən]  "he, she wants me"

To account for (47a) and (48a), however, we will need an addi-
tional rule. First recall that, as discussed in Ch. 1, Sekani
has no syllable onsets of the shape \([nC]\). In fact, aside from a few loan words, Sekani onsets may not contain consonant clusters. I assume that the syllabification rules of Sekani prohibit the formation of onsets containing clusters. Following Steriade (1982), I suggest that the syllabification rules in Sekani are the following:

(51) Syllabification rules

(a) Core syllable rule:

\[ \sigma \]

\[ O \quad R \]

\[ (C) \; V \rightarrow (C) \; V \]

(b) Coda rule:\(^5\)

\[ R \]

\[ (C) \; V \rightarrow (C) \; (C) \]

(Sekani, not permitting syllable-initial consonant clusters, has no rule appending consonant clusters to the onset.) Thus, in (47a) and (48a) above, no word-initial \([n]\) appears in the surface forms \([\text{ghāje}_\text{ka} \; \text{ts'ēch'i}]\) and \([\text{lēdi}_\text{kayansessen}]\) because the \(n\) cannot be syllabified into the onset of the syllable \([\text{ka}]\).

To account for the failure of \([n]\) to appear in these forms, we might simply assume, following Lapointe and Feinstein (1982), that stray segments are not phonetically realized, rather than deleted by language-specific rules. However, when additional data are considered below, it will be seen that the following rule which actually deletes the initial \([n]\) of the postposition

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is required:

(52) \[ \text{Stray n Deletion} \]
\[ n \rightarrow \emptyset / \frac{\text{syll}}{\text{\text{-h}}} \]

Any unsyllabified \( n \)'s will be deleted by this rule. As for the domain of this rule, the postposition forms above indicate that it cannot apply until after the level 1 oblique object prefixes have been added. In fact, as we will now see, Stray \( n \) Deletion cannot apply until all word formation is complete.

The verbal prefix /n/ 'perfective mode' occurs in prefix position 11. Some forms which contain this prefix are given in (53)-(59):

(53) \[ \text{bel -de -gh\-n -h -ts'agh} \]
    sleep thm cnj Pf clf yawn
    \[ \begin{array}{cccc}
    3 & 9 & 10 & 11 13 \text{ stem} \\
    \end{array} \]
    beldeg\-h\-ts'agh \quad \text{'he, she yawned'}

(54) \[ \text{i -n -h -ch\-ut} \]
    asp Pf clf take O carefully
    \[ \begin{array}{ccc}
    9 & 11 & 13 \text{ stem} \\
    \end{array} \]
    \( \text{ch\-ut} \) \quad \text{'he, she took [O] carefully'}

(55) \[ \text{esji ts'\-e-n -l\-i} \]
    smart 1pS Pf be
    \[ \begin{array}{cc}
    8 & 11 \text{ stem} \\
    \end{array} \]
    esji ts'il\-i \quad \text{'we are smart'}

(56) \[ \text{\-ya gh\-e -n -l\-i} \]
    shy 3pS Pf be
    \[ \begin{array}{cc}
    8 & 11 \text{ stem} \\
    \end{array} \]
    \( \text{\-ya ghil\-i} \) \quad \text{'they are shy'}
(57)  naʔə -n -nʔiŋ
        C  unspO  Pf  make  0  well
      5  7  11  stem

naʔiŋiŋ  'he, she makes 0 well customarily'

(58)  sa -n  -h  -gås
        sun  Pf  clf  black
      3  11  13  stem

sophgås  'pitch black'

(59)  ?a  -n  -lå
        work  Pf  make  0
      2  11  stem

?olå  'he, she made [0]'

In (58) and (59), the rules of a Raising and Nasalization have create [q]. In (53) and (55)-(57), a Raising and Nasalization have created surface [i].

In the preceding the prefix n 'perfective' is preceded by prefixes of various positions: 2, 3, 7, 8, 9, 10. Now consider forms in which the perfective prefix is word-initial. From what we know of Epenthesis, we would expect such forms to contain an epenthetic vowel: the verb stem will not be preceded by a syllabic prefix, but only by the consonantal prefix n 'perfective'. Thus we would expect surface [i] in such forms. These forms do indeed contain an epenthetic vowel, but surprisingly, the perfective prefix is absent:

(60)  øsji  n -liŋ
        smart  Pf  be
      11  stem

øsji  eliŋ  'he, she is smart'

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(61)  ñya n -lì
       shy Pf be
       11 stem

ñya _elì  'he, she is shy'

(Forms (60) and (61) should be compared with (47) and (48) above for evidence that the perfective prefix is present underlyingly.) Apparently, Stray n Deletion has applied in these forms.

6.2 Rule ordering

The forms in (60) and (61), together with those in (53)-(59), indicate that Stray n Deletion follows the level 4 word formation rules. Thus, if level 4 is a cyclic domain, then Stray n Deletion must be a post-lexical rule. Notice, however, that if Epenthesis precedes Stray n Deletion, Stray n Deletion will have to precede the post-lexical syllabification rules. If post-lexical syllabification precedes Stray n Deletion, then presumably the perfective prefix could not remain stray. Consider the following derivation of [elì] (61):

output of level 1  \^  
   -lì

level 2
   Perfective prefix \^  
   n -lì

   Syllabification --

level 4
   Syllabification --

   Epenthesis \^  
   ø n-lì

post-lexical
   Stray n Deletion ø

   Syllabification

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The ordering of syllabification rules after segmental rules is a marked ordering. Harris (1983:77) has suggested that:

..prosodic rules precede segmental rules of the same (lexical or postlexical) type, at least in the unmarked case.

If this hypothesis is true (though it is not clear to me why it should be), then it suggests Stray n Deletion should precede Epentheses.

Given the formulation of Epentheses in (36), Epentheses cannot be a post-lexical rule. It must apply before level 4 Bracketing Erasure in order to apply in forms like dahihtsus (44). Fortunately, there is independent evidence (discussed in Ch. 7), that level 4 is not a cyclic domain in Sekani. Thus the following rule ordering is possible:

(62) level 4 word formation rules
Stray n Deletion
Epenthesis
Bracketing Erasure

Now consider the derivation of [əli], under this analysis:

output of level 1

level 2
Perfective WFR

level 4
Stray n Deletion
Epenthesis

post-lexical
Syllabification

\[ \delta -l_i \]
If Epenthesis were a level 3 or earlier rule, it would not be possible to order Epenthesis after Stray n Deletion, and forms like (61) alî would be difficult to account for.

7. Conclusion

We have seen that there is good evidence for analyzing Epenthesis as a level 4 rule. A level 4 rule of Epenthesis eliminates the need for ordering Epenthesis after many level 2 rules. Moreover, if Epenthesis is a level 4 rule, it can follow Stray n Deletion, which clearly follows all word formation.

This analysis has certain theoretical implications. First, Epenthesis presents another counter-example to the Strong Domain Hypothesis. More interestingly, Epenthesis provides evidence that the weaker version of the Bracketing Erasure Convention proposed in Ch. 5 is required: stems are exceptions to Bracketing Erasure. Since Epenthesis refers to stem bracketing, it could only apply on level 4 if stem bracketing is still available on level 4.

Notes.

1. The vowel inserted by Epenthesis is sometimes referred to in the Athabaskan literature as the "peg element" or the "pepet vowel".

2. I believe that syllable structure should be regarded as a derived, rather than autonomous, property of phonological representations. I will argue in Ch. 8 that two rules of the phonology which apply on the first cycle in non-derived environments do so by virtue of the fact that they are syllable-based. If syllable structure is a derived phonological property, an account of these apparent violations of the Strict Cycle Condition is available.
3. In Ch. 8, I will propose that the interaction of a Raising and possessive suffixation provides additional evidence for linking through the phonology.

4. Underlying representations like /nka/ are a marked shape for stems, suggesting that /n/ might be a prefix. There is some evidence that the initial i- of stems like (63)-(66) is a prefix:

(63) i-la-  
    hand  'hand'

(64) i-za(-nah)  
    sun  'month'

(65) i-lin -è  
    thigh psd  'thigh'

(66) i-ghò  
    nose  'nose'

There are no stems in which i- is followed by a voiceless fricative. If i- is analyzed as a prefix, this fact will be accounted for by Continuant Voicing (Ch. 4, sec. 4), as pointed out to me by Keren Rice. There are many more stems which contain the prefix i- than those which contain the prefix n-. It is necessary to posit both /n/ and /in/ (or /ən/) as prefixes. Alternatively, perhaps Epenthesis could be generalized to account for forms like (63)-(66) as well as for verbs; the postposition /n-ka/ would only need to be marked as an exception to Epenthesis. This analysis would eliminate the need to posit two prefixes, i- and n-.

5. The only pre-nasal segment within the rhyme [V ? n C] may be /ʔ/. However, the final (post-nasal) consonant may be /ʔ/. I assume that /ʔ/ may occupy both positions within the syllable because of the contrast between the following stems:

(67) /səʔn/  
    [sən]  'star'

(68) -/sən -ʔ/  
    smile dur

    -[sʔʔ]  'smile' Pf, Op

In (67), Nasalization does not apply (see Ch. 8.). In (68), the glottal segment causes Nasalization (and o Raising), before undergoing Glottal Stop Absorption. See Ch. 3, 7.1 for further discussion of (68). I note also that (68) suggests that o Raising is a lexical rule, as predicted by the Strong Domain
Hypothesis.

6. Harris (1983) concludes that the word level in Spanish must be a non-cyclic domain in order to avoid ordering certain segmental rules before post-lexical (Re)syllabification rules. See also Kiparsky (1983a) for further discussion of the word level.
Chapter Seven

The Cycle

The need for cyclic rule application has been, and continues to be, a controversial topic in phonological theory. Whether the cycle is needed is an empirical question, and much of the controversy has centered around the validity of proposed cyclic analyses. In this chapter I will argue that Sekani presents good evidence for the cycle, as well as evidence for non-cyclic rule application.

I begin this chapter with a brief discussion of the need for cyclic rule application. I discuss in some detail the current controversy over the cycle in Lexical Phonology, which involves the question of whether cyclicity is a predictable or stipulated property of domains. In section 2 I present two pairs of Sekani rules which must apply cyclically, and in section 3, two rules which are clearly post-cyclic. I conclude this chapter by noting that the cyclic and non-cyclic domains in Sekani are more consistent with the hypothesis of Kiparsky (1983a) and Harris (1983) than that of Halle and Mohanan (1985): the non-cyclic rules in Sekani are all late rules of the lexical phonology, suggesting that cyclic and non-cyclic rules form two separate blocks.

1. Background
1.1 The SPE cycle

Chomsky and Halle (1968) (SPE) were the first to apply to
phonology the theory of rule ordering they called the 'transfor-
mational cycle hypothesis'. The principle of the cycle is an
intuitively simple one: the whole is equal to the sum of its
parts. In a cyclic derivation, phonological rules apply to
successively larger domains which are defined by morphological
or syntactic structure. Rules apply exactly once on a given
cycle, thus preserving linear ordering assignments.

As an example, consider the following cyclic derivation.
Given a word containing morphemes A, B, C, the phonological
rules 1 and 2 apply in that order first to the layer of morpхо-
logy defined by [A], next to the domain [B [A]], and finally to
[C [B [A]]]:

```
rule 1
  2
1
2

1
2
```

In Ch. 2, 3.1 I provided a real example of cyclic rule applica-
tion, using data from Catalán (Mascaró 1976).

Chomsky and Halle argued that cyclic rule application was
needed to account for the stress patterns of morphologically
complex words. The famous pair in (1) and (2) are nearly iden-
tical in terms of their segmental composition, yet the second
syllables of the pair contain different degrees of stress:

(1) 3 0 1
    compensation
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of Spanish stress, which was criticized by Suñer (1975), but later upheld by Harris (1983). Kuroda (1967) proposed a cyclic analysis of certain segmental rules in Yawelmani, which was criticized by Rice (1969). Kisseberth (1973) proposed a cyclic analysis of vowel deletion and epenthesis rules in Klamath, which was widely criticized (cf. White (1973), Thomas (1974), and Feinstein and Vago (1981), for example). However, the need for the cycle in the analysis of Klamath has been reaffirmed in some of the most recent work on Klamath (Clements and Keyser 1983). These are but a few examples; a complete list of proposed cyclic analyses and their counter-analyses is quite long.

Despite the appearance of what I believe to be good examples of the need for the cycle, such as the Catalán rules discussed by Mascaró (1976), many phonologists have expressed skepticism about the need for the cycle. At one point in the development of phonological theory, it was thought that no segmental rules were cyclic; only stress rules or rules which referred to stress required the cycle (Brame 1972, Thomas 1975). This view is still found in recent phonological literature (Anderson 1982a). Thus, given these hypotheses, the evidence from Sekani for the cycle is especially interesting in that the rules which apply cyclically are segmental, rather than prosodic.

1.3 The cycle in Lexical Phonology

As discussed in Ch. 2, the cycle plays an important role in the theory of Lexical Phonology. The hypothesis that all phonological rules that apply in the lexicon are cyclic can be cre-
dited to Pesetsky (1979) and also to some extent to Booij (1981). In the classic (Pesetskian) LP model, phonological rules of the lexicon apply to the output of each word formation rule. The effect of this interweaving of phonology and morphology in the lexicon is cyclic rule application, as seen below:

\[ [B [A]] \rightarrow \text{phonology} \]

\[ [C [B [A]]] \rightarrow \text{phonology} \]

Thus the previously unexplained need for cyclic rule application is a natural consequence of the way the lexicon is organized, given the LP model.

Moreover, the cyclic version of the Bracketing Erasure Convention adopted by Pesetsky (1979) provided another reason for considering that all lexical rule applications to be cyclic. The elimination of boundaries and particularly of all internal bracketing at the post-lexical level entailed that boundary-sensitive phonological rules apply in the lexicon and apply cyclically. Pesetsky adopted a cyclic version of the SPE Bracketing Erasure Convention:

(5) The last rule of cycle n is: erase internal brackets.

The cyclic erasure of internal bracketing entails that all rules which require access to morphological structure are also cyclic.

With subsequent research in Lexical Phonology, however, many of the characteristics of the classic, Pesetskian model are gone forever. Cyclic Bracketing Erasure is a thing of the past, for reasons discussed in Ch. 5. Thus since internal bracketing is available throughout the level in even the strongest of
current formulations of the BEC, the cyclic application of all lexical rules is no longer absolutely required. Level ordering, for example, is completely compatible with a non-cyclic model of the phonology.

Whether or not the lexical phonological rules apply cyclically or non-cyclically is thus still an empirical question. Of course, it would be nice for the LP model if it turned out that lexical rule applications are cyclic. However, recent work has suggested that some lexical rules are non-cyclic, and that some post-lexical rules are cyclic.

1.3.1 Are all post-lexical rules non-cyclic?

Recall that in the classic Lexical Phonology model, all lexical rule applications were predicted to be cyclic, and all post-lexical rules, non-cyclic. This follows from the assumptions that all word-formation takes place in the lexicon, and that no purely syntactic rules are cyclic.

A growing body of evidence indicates that some post-lexical rule applications are cyclic. See Drescher (1983) for Tiberian Hebrew, McHugh (1984) for Chaga, and Shih (1984) for Mandarin. If these analyses stand the test of time, they suggest that the point at which cyclicity "shuts off" is a language-specific parameter, under the usual assumption of cyclic phonology (Rubach 1984b), that all of the cyclic rules apply in a block, followed by the non-cyclic rules:

```
cyclic
------
non-cyclic
```
Thus the dividing point between cyclic and non-cyclic derivations might be level 1 in some languages, and it might not exist at all in others. For Sekani, I will suggest that the dividing point is between levels 3 and 4.

1.3.2 Are all lexical rules cyclic?

Several recent studies have challenged the hypothesis that all and only rules which are sensitive to word-internal structure are cyclic. As these are a more serious challenge to the LP model than cases of cyclic rule application in the syntax, I will consider them in some detail here.

1.3.2.1 Kikuyu

One reported case of a non-cyclic, morphologically conditioned rule is Dahl's Law in Kikuyu (Myers 1973, cited in Pulleyblank 1983:49 ff.). This rule changes k to gh if the next consonant sound is t, k, c or dh [h]. The rule applies to /k/ in prefixes and stems but not in suffixes, which suggests that it is a lexical rule:

(6) \[ k \rightarrow gh / [ \underline{V_1(t)} \underline{k} \underline{c} \underline{dh} ] \]

Myers argues that the rule cannot apply cyclically because of forms like (7):

(7) [ke[ke[ke[dhok]a] ghegheghedhoka 'and thus it was spoiled'

Ordinarily, gh does not trigger Dahl's Law, as the prefixed stem in (8) indicates:

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(8) [ko[ghit]a]
    koghita  'to thatch a house'
    *ghoghita

If Dahl's Law had applied cyclically to (8), the form *ghekege-dhoka should result. A left-right iteration of Dahl's law, however, will correctly derive (8).

These data appear to provide a good example of non-cyclic, yet lexical rule application. However, as is typical of cyclic analyses, some aspects of this analysis are problematic, which call into question the theoretical conclusion drawn. Pulleyblank notes that some forms exist in which the pattern ..gh..k..gh.. is found, just as would be predicted by a cyclic application of Dahl's Law. Pulleyblank concludes that 'more detailed work on Dahl's Law and the relevant morphology is required before concluding positively that the morphological and phonological operations are non-cyclic.'

1.3.2.2 Spanish

Another case of non-cyclic, lexical rule application might be provided by Spanish (Harris 1983:79). However, the argument that the rules in question are not cyclic rests on assumptions about the unmarked ordering of prosodic rules with respect to segmental rules. As mentioned in Ch. 6, 6.2 Harris believes that prosodic rules precede segmental rules in the same component, in the unmarked case.

Given this assumption, the Spanish rules of Velarization and Aspiration cannot be regarded as cyclic, but must apply before post-lexical Resyllabification. Consider Velarization
(Harris 1983:45 ff.):

(9)  \( n \rightarrow p/_\text{___}/\text{syll} \)

This rule has applied in (10) and (11):

(10)  Ramón entró.  'Ramón entered.'
       [p]

(11)  instituto  'institute'
       [p]

However, it has not applied cyclically in the morphologically complex form in (12):

(12)  trenes  'trains'
       [n]
       *[p]

Velarization apparently follows all of the lexical syllabification rules, but precedes those of the post-lexical component. Since Harris does not want to order segmental rules before prosodic rules in the same component, as would be necessary if Velarization and Aspiration were post-lexical, he is forced to regard Aspiration and Velarization as non-cyclic. He suggested that Lexical Phonology must include a set of last-cyclic rules which apply once at the word level, as well as the fully cyclic set of lexical rules.

1.3.2.3 English

Halle and Mohanan (1985) and Mohanan and Mohanan (1984) have proposed that cyclicity is a stipulated property of each level which varies across languages. Some levels may be cyclic domains, while others may be non-cyclic. Under their analysis of certain segmental rules, level 2 in English is to be considered a non-cyclic domain. However, I believe that some of
their analyses are questionable—in particular, Stem-final tensing, "y"-insertion, Vowel Shift, # Lowering, and g-deletion—and thus do not provide good evidence that level 2 is not a cyclic domain in English.¹

Their best evidence for the non-cyclic nature of certain lexical rules apply non-cyclically is provided by the rules of prenasal g deletion, ∅ deletion, and b deletion. These rules account for alternations like the following:

(13) sign signature signing
    [n]    [gn]    [n]

(14) damn damnation damming
    [m]    [mn]    [m]

(15) bomb bombard bombing
    [m]    [mb]    [m]

The deletion rules which simplify underlying /gn/, /mn/, and /mb/, to [n], [m], and [m], respectively, must apply before the suffixation of -ing to underived stems like sign, etc. These rules thus present a problem for the Strict Cycle Condition: they must apply in the lexicon to non-derived stems. Halle and Mohanan propose that if level 2 is not cyclic, it will follow that rules such as these do not necessarily obey the SCC. However, even this analysis is open for reinterpretation. It is possible that the deletion rules in question are syllable-based, and that a derived environment for these rules is created by the application of syllabification rules. If English has two lexical levels, as suggested by Kiparsky (1983a), and the deletion rules are ordered after the level 1 word formation rules, then no violation of the Strict Cycle Condition is created, and thus
the argument for non-cyclicity fails.

Kiparsky (1983a:8) has also recognized the apparent problem for the Strict Cycle Condition presented by these forms. As just mentioned, Kiparsky analyzes the English lexicon as having two levels, whereas according to Halle and Mohanan, English has four levels. Like Harris (1983), Kiparsky proposes that the last level of any language ('the word level') is not a cyclic domain. Thus in English, level 2 is predictably non-cyclic if English has only two lexical levels.

1.3.3 Stipulated vs. predictable cyclicity

To summarize, a number of competing theories of non-cyclic, lexical rule application in Lexical Phonology have appeared, to complicate the question of the cycle even further than allowing the point at which cyclicity shuts off to be language-specific, as discussed in 1.3.1.

Mohanan and Mohanan (1984) and Halle and Mohanan (1985) have claimed that cyclicity is a stipulated, rather than predictable, property of levels. See Mohanan and Mohanan (1984) for possible additional support for this hypothesis from Malayalm.

Kiparsky (1983a) and Harris (1983) have claimed that non-cyclic rules are to be found at the word level (as well as post-lexically) in languages.

Rubach has (1984a) suggested that each level contains a last-cyclic rule component, as well as a fully cyclic component. There is some theory-internal motivation for this hypothesis. As has been observed, level-final Bracketing Erasure must be a
last-cyclic rule.

As I have attempted to show here, many of the non-cyclic analyses of lexical rules that have appeared in the recent literature are not uncontroversial. Thus the theoretical conclusion that some lexical rule applications are not cyclic still requires empirical confirmation, and an answer to the question of whether cyclicity is stipulated or predictable appears to lie in the future.

With the need for better empirical justification for cyclic and non-cyclic rule application thus in mind, I would now like to turn to Sekani. In the following section I will present evidence that certain (segmental) rules apply cyclically, and in the next section, evidence that certain rule applications are non-cyclic.

2. Cyclic rule application in Sekani

In this section I discuss two pairs of rules which I will argue apply cyclically, concluding that levels 1-3 are cyclic domains in Sekani.

2.1 Diphthongization and \( \_\_ \) Vocalization

In this section I will argue that the levels 2 and 3 rules of Diphthongization and \( \_\_ \) Vocalization must be unordered with respect to each other and must apply cyclically. As will be seen, non-cyclic derivations lead to ungrammatical forms.
2.1.1 Diphthongization

The rule of Diphthongization is informally stated in (16):

(16)  \( o \rightarrow \text{wə} / \text{velar} \)

In Ch. 8, sec. 2 I will present detailed arguments for the need for this rule in Sekani. To summarize these arguments briefly, positing a rule of Diphthongization accounts both for the marked distribution of labio-velars (most labio-velars occur before the vowel \( \text{ə} \)), as well as a gap in the distribution of velars before surface (non-nasal) [o]. In rare cases, underlying /o/ is preserved after velars, creating alternations between [o] and [wə] after velars. Surface velar + [o] sequences are found before syllable-final ɬ (in stems), as can be seen in (17) and (18), or \( \text{n} \) (in prefixes), as seen in (19)-(21):

(17)  -goɬ  'crawl to O' Fut

(18)  -gwəts  'crawl to O' C

(19)  gho-s -tsəg  
Op  1sS cry
wətsəg  'I cry' Op

Recall that \( \text{w} \) is a labio-velar ([ghw]), as is \( \text{wh} \) ([xw]).

(20)  gho-təg  
Op  cry
wətəg  'he, she cries' Op

(21)  gho-n -təg  
Op  2sS cry
ghətəg  'you [sg] cry' Op

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Diphthongization
Nasalization  

These blocking conditions on Diphthongization are incorporated into the rule as follows:

(22)  o  →  we / velar\( (C) \)  \( \text{syl}_y \), C ≠ n, I

2. 1.2  \( \text{w} \)  Vocalization

The rule of \( \text{w} \)  Vocalization was discussed in Ch. 3, 5.2.4.

(23)  we  →  u /  \( V \)  \( \text{domain: levels 2, 3} \)

Recall that the only forms in which this rule applies are optative forms (yet there is no need to assume that the rule is morphologically conditioned). As seen in (19) and (20) above, the optative prefix /gho/ is [we] in the 1s and 3s forms, but not in the 2s form in (21), in which the syllable-final [n] blocks Diphthongization. Now consider an optative paradigm in which the optative prefix occurs to the right of the level 2 prefix ne:

(24)  ne -gho-s  -d  -dash

thm Op  1sS  clf  dance
9  11  12  13  stem

\( n\text{usdash} \)  'I dance' Op

(25)  ne -gho-d  -dash

thm Op  clf  dance

\( n\text{udaash} \)  'he, she dances' Op

Vocalization has applied to the output of Diphthongization in the forms above.
It is worth considering a possible reanalysis of this rule. Suppose that Vocalization were instead formulated as in (26):

(26) \( gho \rightarrow u / \phi \)

In this analysis, Vocalization would not interact with Diphthongization at all:

\[
\text{Vocalization} \quad u \\
\text{Prefix Vowel Deletion} \quad \phi
\]

Instead of going through the intermediate representation created by Diphthongization, Vocalization would apply directly to the underlying form of the prefix /\( \text{gho} /\). My objection to this analysis is that it is forced to state the same generalization twice in the grammar of Sekani. Vocalization, like Diphthongization, is blocked by a syllable-final nasal. Consider the 2s form of the optative 'dance' paradigm:

(27) \( \text{ne-gho-n -d -dash} \)  
    \( \text{thm Op 2sS clf dance} \)  
    \( \text{nə-gho-dash} \quad 'you [sg] dance' \) Op

A gho \( \rightarrow u \) analysis of Vocalization would miss the generalization that only forms in which Diphthongization has applied (namely, 1s and 3s forms) also undergo \( u \) Vocalization. For this reason, I propose that Vocalization applies to the intermediate representation \( [\text{wə}] \).
Aside from the fact that the domain of this rule is restricted to levels 2 and 3 prefixes, as discussed in Ch. 3, an additional restriction must be placed on \( w \) Vocalization. In forms in which the optative prefix is preceded by the level 2 prefix /u/, Vocalization does not apply:

(28) \( u \ -gho-t\ddot{o}n \)
    thm Op hold O
    uw\(\dot{a}t\ddot{o}n \)
    'he, she holds [O]' Op

(29) \( u \ -gho-h \ -ch'u\)h
    thm Op clf shoot O
    uwa\(h\)'ch'u\)h
    'he, she shoots [O] repeatedly' Op

\( w \) Vocalization is appropriately revised:

(30) \( w\dot{e} \to u / V \_\_\_ \quad V \neq u \)

This fact is of considerable importance, as will soon be apparent.

2.1.3 Rule ordering: the gho-gho forms

So far we have seen that Vocalization applies to the output of Diphthongization; the two rules apply in feeding order. Now consider the "gho-gho" forms, forms in which two /o/-final prefixes occur. When the vowel which precedes [w] is underlingly /o/, Vocalization appears to apply optionally, as the following forms indicate:

(31) gho-gho-h \ -tl\ddot{a}gh
    ar Op clf rub O
    7 11 13 stem

(a) w\(\ddot{a}wahtl\ddot{a}gh \)
    \( = \quad wuhtl\ddot{a}gh \)
    'he, she rubs [area] with medicine' Op

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(32) \[ \text{xø -gho-h -whæse} \]
\[ \text{1pO Op clf itch, tickle} \]

(a) \[ \text{whawawhæse} \]
\[ 'he, she tickles us [pl] Op \]

(b) \[ \text{"whuhwhæse} \]

How are we to make sense of these data? One possible analysis would be to formulate the following two rules of \( w \) Vocalization:

(33a) Vocalization I
\[ w\text{e} \rightarrow u / C \ V \quad \text{optional} \]
\[ [+\text{round}] \]

(33b) Vocalization II
\[ w\text{e} \rightarrow u / V \quad V \neq u \quad \text{obligatory} \]

By applying the first of these rules to the forms in (31) and (32), the two surface forms will be generated in accordance with whether or not Vocalization has applied:

(34)
\[ \text{xø -gho-h-whæse} \]

Diphthongization \[ \text{whæ we} \]
Vocalization I \[ u \]
(chooses to apply)
Prefix Vowel Deletion \[ \emptyset \]

[whuhwhæse]

(35)
\[ \text{xø -gho-h-whæse} \]

Diphthongization \[ \text{whæ we} \]
Vocalization I \[ -- \]
(chooses not to apply)
Schwa Lowering \[ a \]

[whawawhæse]

In the second derivation, Vocalization has not applied.

However, a considerably less complicated analysis of these forms is also available. Recalling that Vocalization is blocked
when the preceding vowel is /u/, we can make use of the fact that the output of Diphthongization is a [-round] vowel, while the input to Diphthongization is a [+round] vowel. Thus the two possible surface forms of the gho-gho forms above will be generated if \( w \) Vocalization and Diphthongization are left unordered. A unitary formulation of \( w \) Vocalization can be adopted:

\[
(36) \quad \text{\textit{we} } \rightarrow u / V \quad [-\text{rnd}]
\]

When the rules apply in feeding order, the forms with [u] will be derived, as in (31b) and (32b) above:

\[
(37) \quad \text{xo -gho-h-whêse}
\]

Diphthongization \quad \text{whê-\textit{we}}
Vocalization \quad \text{whê-u}
Prefix Vowel Deletion \quad \text{wh-u}

[\text{whuhwhêse}]

When the rules apply in counter-feeding order, Diphthongization will be blocked because the vowel which precedes the optative prefix is [+round]:

\[
(38) \quad \text{xo -gho-h-whêse}
\]

Vocalization \quad --
Diphthongization \quad \text{\textit{we} \textit{we}}
Schwa Lowering \quad \text{a}

[\text{whêwhêwhêse}]

In (38), Vocalization is blocked because the vowel which precedes /gho/ is round.

2.1.4 Diphthongization and Vocalization are cyclic

In the preceding section we have seen that Diphthongization and Vocalization must be unordered with respect to each other,
in order to account for both variants in the gho-gho forms. These forms are compatible with either a cyclic or a non-cyclic analysis of the rules. We have seen how a non-cyclic derivation correctly generates the two forms. Now consider a cyclic derivation of (32), which works equally well. Since only the levels 2 and 3 cycles are relevant here, I have suppressed earlier cycles of word formation and phonology:

(39) \( \text{xo -ghohwhāse} \)

gho cycle
Diphthongization \( \text{wə} \)
Vocalization --
Prefix Vowel Deletion --

xo cycle
Diphthongization \( \text{wə} \)
Vocalization \( \text{u} \)
Prefix Vowel Deletion \( \text{wh -u} \)

[whuhwhāse]

As seen above, when the two rules apply in feeding order, the form with [whu]- is generated. When the two rules apply in counter-feeding order, the form with [whəw]- is generated:

(40) \( \text{xo -ghohwhāse} \)

gho cycle
Vocalization --
Diphthongization \( \text{wə} \)
Prefix Vowel Deletion --

xo cycle
Vocalization --
Diphthongization \( \text{wə} \)
Prefix Vowel Deletion --

[whəwahwhāse]

As in (38), Vocalization is blocked on the xo cycle because the vowel which precedes it is [+round].
So far we have seen that a cyclic and a non-cyclic analysis work equally well. However, when the original data (presented in 2.1.2) are reconsidered, it will be seen that only a cyclic analysis can generate all and only the correct forms, whereas a non-cyclic analysis of the CV-gho forms, in which Diphthongization and \(\_\) Vocalization are unordered with respect to each other, will generate incorrect forms.

First consider a cyclic analysis of nudash 'he, she dances'. If we assume the feeding order Diphthongization, Vocalization in this derivation, only nudash will be generated.

(41) \(\text{n}\_\text{e-gho-d-dash}\)
    \thm Op clf dance
    9 12 13 stem

\[\text{n-e-gho-d-dash}\]

\(\text{gho cycle}\)
Diphthongization \(\_\text{we}\)
Vocalization \(-\)
Prefix Vowel Deletion

\(\text{n-e cycle}\)
Diphthongization \(-\)
Vocalization \(\text{u}\)
Prefix Vowel Deletion \(\text{n-u}\)

\[\text{[nudash]}\]

Even if the rules apply in counter-feeding order, only nudash will be generated:

(42) \(\text{n-gho-d-dash}\)

\(\text{gho cycle}\)
Vocalization \(-\)
Diphthongization \(\_\text{we}\)
Prefix Vowel Deletion

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ne cycle
Vocalization \quad u
Diphthongization \quad --
Prefix Vowel Deletion \quad n - u
[nudash]

The required feeding order of these rules for this form will be obtained in a cyclic analysis regardless of how these rules are ordered with respect to each other on any one cycle. Only the structural description of Diphthongization is met on the gho cycle, and only the structural description of \( \_w \) Vocalization is met on the ne cycle.

Not so in a non-cyclic analysis. As seen in the derivation of (25) above, a non-cyclic analysis will correctly generate the form nudash when the rules apply in feeding order. However, when the rules apply in counter-feeding order, \( *\text{nawedash} \) will be produced:

(43) \hspace{0.5em} \text{ne-gho-d-dash}

Vocalization \quad --
Diphthongization \quad \text{we}

\( *\text{nawedash} \)

Thus the non-cyclic derivation leads to problems in accounting for the CV-gho forms if the rules are left unordered, as required for the gho-gho forms.

In a non-cyclic analysis, the only way to generate all and only the correct forms would be to retreat to the bifurcated version of Vocalization given above:

(33a) Vocalization I

\[ \text{we} \rightarrow u / \ C \ V \quad \text{optional} \]

\[ [+\text{round}] \]
(33b) Vocalization II
\[ \text{we} \rightarrow u / \text{v} \, \, \, \text{v} \neq u \, \, \, \text{obligatory} \]

Another alternative, in the non-cyclic analysis, would be to use the gho \( \rightarrow u \) formulation of Vocalization, in which Diphthongization and Vocalization do not interact. But, as discussed above in 2.1.2, this analysis also misses a generalization. Thus either non-cyclic analysis would be considerably more complex than the cyclic analysis: the non-cyclic analysis must state in an awkward or redundant way what is a simple analysis, given the cycle.  

2.2 Possessive suffixation and Nasalization

In this section I will argue that the possessive word formation rules and Nasalization must apply cyclically. The cyclic analysis I will propose is especially interesting, in that a phonological rule must be assumed to have applied before a word formation rule. Thus this analysis provides good evidence for one of the central claims of Lexical Phonology: the cycle is the result of the interaction of phonology and morphology.

2.2.1 Nasalization

As I have suggested earlier in this dissertation, all nasal vowels in Sekani can be derived from syllable-final \([\text{Vn}]\) sequences by the rule of Nasalization:

\[ \text{Vn} \rightarrow \text{v} / \text{C} \, \, \, \text{syll} \]

The derived nature of nasal vowels is suggested by alternations
like the following:

\[(45a)\] se -tsŏn-ē 1sPsr shit psd 'my shit'

\[(45b)\] tsē 'shit'

\[(46a)\] se -gōn-ē 1sPsr arm psd 'my arm'

\[(46b)\] səgō ts'ē-lē bone 'my elbow'

\[(47a)\] shēl nē -nē -s -Ieh trap to ground cnj 1sS handle pl 0

shēlnēnēsIeh 'I set traps'

\[(47b)\] shēl nē -n -lelh to ground cnj handle pl 0

shēl nēlelh 'he, she sets traps'

The alternation between \([Vn]\) and \([\breve{v}]\) in \((47a)\) and \((b)\) is the result of the application of Conjugation a Deletion in the 3s form:

\[(48)\] nē-nē-lelh

Conjugation a Deletion
Nasalization \(\emptyset\)

In addition to accounting for alternations between \([Vn]\) and \([\breve{v}]\), this analysis also accounts for the fact that \([Vn]\) and \([\breve{v}]\) sequences are largely in complementary distribution (Ch. 8, 3.1.2.) Positing a rule of Nasalization considerably simplifies the inventory of underlying vowel segments since all nasal vowels, even non-alternating ones, are derived from syllable-final /Vn/ sequences.

In Ch. 4, I argued that Nasalization was a lexical rule,
because it must be assumed to have applied before diminutive suffixation:

(49)  tsŏn-azi
      shit dim

      tsŏqazi    'small shit'

As might be expected of a lexical rule, there are marked exceptions to Nasalization. Some stems are exceptionally marked as not undergoing Nasalization:

(51)  ?ētsibalyăn    'bald eagle'
(52)  lēgūmyo        'communion'
(53)  lēsūcham       'turnip'

As I will suggest in Ch. 8, (51) is a loan word from Carrier; (52) and (53) are loan words from French. Moreover, Nasalization plausibly does not apply to syllable-final [m]. More problematic than these exceptions, however, are stems must be exceptionally marked as undergoing Nasalization before any word formation rules apply, including possessive suffixation. One such stem is /chun/ 'son':

(53)  sēchūè    'my son'

The existence of this stem suggests that the output of Nasalization is in the process of being lexicalized. However, I believe that it would be going too far to assume that all non-alternating nasal vowels are to be taken at face value, and regarded as underlying. This analysis would miss the generalization that nasal vowels and [Vn] sequences are largely in complementary distribution.
2.2.2 Repossessed nouns

As discussed in Ch. 4, Sekani, like other Athabaskan languages, morphologically distinguishes alienably and inalienably possessed nouns. The latter always require a possessive prefix or nominal possessor. If no overt possessor is specified, the prefix ?e- 'unspecified possessor' is prefixed to the inalienably possessed nouns.

For example, the inalienably possessed noun -dzëgh-è 'outer ear' occurs with the unspecified possessive prefix ?e- in the derived nominal in (54), because no other possessor of -dzëgh- is specified:

(54) ?e -dzëghè gha-de -i -n -ya
unspPsr outer ear P der der Pf pl 0 are in position nom
?ædzëghè ghadìyai 'earrings'

However, in the compound in (55), the stem chëbâ acts as the possessor, and the prefix ?e- is unnecessary:

(55) chëbâ dzëgh -è '(a poplar fungus)'
poplar outer ear psd

The list of inalienably possessed nouns includes body parts and kinship terms, as well as some nouns that might otherwise be thought of as alienably possessed, on semantic grounds:

(56) ?aì'ë 'leaves'
(57) ?aì'oh 'nest'
(58) ?æza 'sand'
(59) ?æch'elè 'rag'
(60) ?ælà 'dugout canoe'
(61) ?æch'i 'job'

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Recall from Ch. 4 that nouns lexically specify that one of three possessive suffixes is required: \( \bar{e}, \_ \) or \( \emptyset \).

When inalienably possessed nouns are possessed by other than their natural owner, Sekani uses a "repossessed" construction, in which two layers of possessive morphology occur. Consider the following:

(62a) \[ \text{sə } -\text{\_la } -\text{\_} \]
\[ \text{IsPsr hand psd} \]
\[ \text{sələ} \]
\[ \text{\'my (own) hand\'} \]

(62b) \[ \text{tsə } -\text{\_la } -\text{\_} \]
\[ \text{beaver hand psd} \]
\[ \text{\'beaver\'s paw\'} \]

(62c) \[ \text{sə } -\text{\_\_ə } -\text{\_la } -\text{\_} \]
\[ \text{IsPsr unspPsr hand psd} \]
\[ \text{sə\_\_ələ} \]
\[ \text{\'my (its) hand\'} \]

(In 62c), the rule of Schwa Fronting has applied:

(63) \[ \text{ə } \rightarrow \text{ e / } \_ \_ [N \_ \_] \]

Another example of a repossessed inalienably possessed noun is given below:

(64a) \[ \text{sə } -\text{t\_oh } -\text{\_} \]
\[ \text{IsPsr nest} \]
\[ \text{\'my nest\'} \]

(64b) \[ \text{dət\_one t\_oh } -\text{\_} \]
\[ \text{duck nest} \]
\[ \text{\'duck\'s nest\'} \]

(64c) \[ \text{sə } -\text{\_\_ə } -\text{t\_oh-ə } -\text{\_} \]
\[ \text{IsPsr unspPsr nest psd} \]
\[ \text{sə\_\_ət\_ohə} \]
\[ \text{\'my (its) nest\'} \]

Notice that the possessive suffix -\( \_ə \) occurs in the repossessed form of 'nest', even though this stem lexically specifies that no possessive suffix is required. One characteristic of the repossessed construction appears to be that nouns which normally
lexically specify -∅ possessive suffix require -ē in the repos-
sessed construction.⁵

To summarize, two layers of possessive morphology occur in repossessed forms. The first layer of morphology, the prefix ʔe-, marks the unspecified original owner and the second layer marks the new owner.

2.2.3 An ordering paradox

The following forms suggest that the possessive word forma-
tion rule precedes Nasalization:

(65)  sə̱gōnē  'my arm'
(66)  sə̱tsōnē  'my shit'

Possessive suffixation will cause the stem-final nasal to be resyllabified with the possessive suffix, blocking Nasalization:

tsōn

possessive suffixation  tsōn-ē
Nasalization

Now consider the following repossessed nouns:

(67)  ʔe̱t'qē  '(its) leaves'
(68)  seʔe̱t'qē  'my (its) leaves'

(69)  ʔech'iqē  '(its) job'
(70)  seʔech'iqē  'my (its) job'

These forms suggest that Nasalization must apply before the possessive suffix is added:

(71)  t'ōn

Nasalization  t'qē
Possessive suffixation  t'qē

eventually  seʔe̱t'qē

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An ordering paradox has arisen. In an analysis in which non-alternating nasal vowels are derived from syllable-final /\Vn/ sequences, one would expect *seʔeʔt'ɒnè for 'my (its) leaves' if possessive suffixation is ordered before Nasalization:

(72) /seʔeʔt'ɒnè-è/

Nasalization   --
@ Fronting   e
* [seʔeʔt'ɒnè]

Now I would like to show how the cycle provides a way of resolving this paradox.

2.2.4 Nasalization and possession are cyclic

A cyclic analysis provides a way to account for the contrast between (65) and (66), on the one hand, and (68) and (70), on the other, without having to posit underlying nasal vowels in the case of the repossessed nouns. It is clear that repossessed nouns contain two layers of possessive morphology. If we assume that Nasalization applies on the first cycle of word formation, ordered after the possessive word formation rule, then it may apply both before and after possessive suffixation, as is apparently required.

The repossessed noun will thus be derived as follows:

(73) /t'ɒn/

original possessor cycle
unsp Psr wfr   ?eʔt'ɒn
Nasalization   ʧ
new possessor cycle
repossessed wfr \textls{se-\textasciitilde at\textasciitilde q\textasciitilde e} \\
Nasalization \textls{\textasciitilde e} \\
\textls{\textasciitilde e} \\
Fronting \textls{e} \\
However, in \textls{se\textasciitilde ts\textasciitilde n\textasciitilde e}, no nasal vowels are derived because this
form contains only one layer of possessive morphology. Ordering
possessive suffixation before Nasalization will bleed the lat-
ter, as discussed above:

(74) \textls{/ts\textasciitilde n/} \\
1sPsr wfr \textls{se-ts\textasciitilde n-\textasciitilde e} \\
Nasalization \textls{\textasciitilde e} \\
Nasalization is blocked in this form because the nasal is not
syllable-final.

The cycle is absolutely required here to account for the
contrast between \textls{[\textasciitilde \textasciitilde]} and \textls{[Vn\textasciitilde e]}. In a non-cyclic analysis, the
only way to account for these facts would be to posit underlying
nasals in all cases where nasal vowels do not alternate with
nasal consonants. However, as discussed above, I believe that
such an analysis of nasal vowels leads to loss of generalization
about the distribution of \textls{[Vn]} sequences with respect to \textls{[\textasciitilde]}\textsuperscript{6}.

2.3 Cyclic rules: summary

In this section I have argued that the pairs of rules
discussed in 2.1 and 2.2 must apply cyclically. Thus the evi-
dence presented here suggests that levels 1-3 are cyclic domains
in Sekani. Now I would like to turn to evidence that level 4
and the post-lexical level are not cyclic domains.

3. Non-cyclic rule application in Sekani

Given the current controversy in Lexical Phonology over

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which rules are cyclic, it is of equal interest to note that
some rules in Sekani are clearly non-cyclic.

3.1 Schwa Lowering

In Ch. 3, I referred briefly to the rule of Schwa Lowering,
which is stated informally below:

(75)  æ --- a / ___ h]yll

Recall the alternations which motivate this rule:

(76a)  zæ -s  -h  -xeh
der 1sS clf kill sg 0
  9  12  13 stem
zæsxeh      'I kill [sg 0]'

(76b)  zæ -h  -xeh
der clf kill sg 0
zæhxeh      'he, she kills [sg 0]'

(77a)  ?æ -s  -h  -xǝh
unspO 1sS clf snore
  7  12  13 stem
?æsxǝh      'I snore'

(77b)  ?æ -h  -xǝh
unspO clf snore
?ahxǝh      'he, she snores'

Schwa Lowering has applied to the prefixes /zæ/ and /?æ/ in the
3s forms, where they are followed by the classifier /h/.

The interaction of Schwa Lowering with w Vocalization sug-
gests that Schwa Lowering is not a cyclic rule. To see why this
is so, first reconsider some of the forms in which w Vocaliza-
tion does not apply.

3.1.1 w Vocalization and 2p forms

The rule of w Vocalization was just discussed in 2.1 above:
(78) \( \omega \rightarrow u / \ V^{[-\text{rnd}]} \)

In Ch. 3, sec. 5.2.4, I argued that an autosegmental formulation of this rule, given in (79), was more insightful, in that it accounted for the failure of Vocalization to apply when the vowel which follows \( w ([\text{ghw}]) \) is not \( \omega \):

(79) \[
\begin{array}{c}
V \\
C \\
[-\text{round}] \\
+\text{round} \\
+\text{high} \\
+\text{back}
\end{array}
\]

In this formulation, the features of the labio-velar consonant can only be linked to a vowel which is unspecified for melodic features.

I noted also that forms which contain the 2p subject prefix /ah/ are among those in which Vocalization does not apply:

(80) \( nə -\text{gho-ah} -?\text{ʔh} \)  
asp Op 2pS steal 0  
9 11 12 stem  
\( nə\text{wahʔh} \)  
you [pl] steal [0]’ Op  

(81) \( nə -\text{gho-ah} -d -\text{dash} \)  
thm Op 2pS clf dance  
9 11 12 13 stem  
\( nə\text{wahd} \)  
you [pl] dance’

The forms above suggest that Prefix Vowel Deletion applies before the application of \( w \) Vocalization on the next cycle, to bleed the latter of inputs:

(82) \( /nə-\text{gho-ah} -?\text{ʔh}/ \)

\( \text{gho cycle} \)  
\( \text{Diphthongization} \)  
\( \text{Prefix Vowel Deletion} \)  
\( \omega \)  
\( w -\text{ah} \)

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ne cycle
Vocalization

\[ \text{[newah?ìh]} \]

\( \mathbf{w} \) Vocalization is blocked here because Prefix Vowel Deletion has first removed the schwa of the optative prefix.

3.1.2 Schwa Lowering is not cyclic

Now consider the following forms:

(83) \[ \text{ts'\textdialect{e}-gho-h } \text{-shõI} \]
\[ \text{lpS Op clf blow} \]
\[ 8 \quad 11 \quad 13 \quad \text{stem} \]
\[ \text{ts'uhshõI} \quad \text{'}\text{we blow on \textdialect{0}'}\text{ Op} \]

(84) \[ \text{?e } \text{-gho-h } \text{-xõh} \]
\[ \text{unspO Op clf snore} \]
\[ 7 \quad 11 \quad 13 \quad \text{stem} \]
\[ ?uhxõh \quad \text{'}\text{he, she snores'}\text{ Op} \]

If Schwa Lowering were a lexical rule of levels 2 and 3 it would have to apply cyclically, since Diphthongization and \( \mathbf{w} \) Vocalization are cyclic rules. However, the wrong forms will be produced if Schwa Lowering applies cyclically, as the following derivation indicates:

(85) \[ /\text{ts'\textdialect{e}-gho-hshõI} / \]

gho cycle
Diphthongization \[ w\text{è} \]
\( e \) Lowering \[ a \]

ts'\textdialect{e} cycle
Vocalization \[ -- \]

\[ *[\text{ts'\textdialect{ewahshõI}}] \]

The cyclic application of Schwa Lowering would bleed \( \mathbf{w} \) Vocalization, because the output of Schwa Lowering would create a form which is identical to one which contains the 2p subject prefix.
/ah/, in which Vocalization does not apply. Of course, the right form will be produced if Schwa Lowering does not apply cyclically:

(86) /ts'æ-gho-hshɔI

gho cycle
Diphthongization we

ts'æ cycle
Vocalization u
Prefix Vowel Deletion ø

post-cyclic:
Schwa Lowering

[ts'uhshɔI]

Clearly, Schwa Lowering must be prevented from applying on level 2 on the cycle in which its structural description is met, in order to derive [ts'uhshɔI], as required. Therefore, Schwa Lowering must not be a cyclic rule.7

3.1.3 Is Schwa Lowering a post-lexical rule?

We have seen that Schwa Lowering cannot apply cyclically. It would be interesting to determine whether or not it is a lexical or post-lexical rule. Now the question arises: is it a word level rule or a post-lexical rule?

If Schwa Lowering is a word level, it must follow Epenthesis (Ch. 6), since it applies to the output of Epenthesis:

(87) ø -h -ch'ès
epen clf roast 0
13 stem

_ahch'ès 'he, she roasts [0]'

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(88)    α -h -ts' ex
        open clif lick
        13 stem

    ahts' ex     'he, she licks [O]'

As far as I know, there are no forms that could create the structural description of Schwa Lowering in the syntax. The following combination of words would be required:

(89)    ...α hC...

But there are no word-initial consonant clusters in Sekani, as well as no words which end in α.

It is perhaps worth noting that Schwa Lowering has many of the hypothesized characteristics of post-lexical rules. It is surface true, has no lexical exceptions, and is not sensitive to word-internal structure. There are no lexical rules which must follow it. This evidence is consistent with the assumption that Schwa Lowering is post-lexical rule.

3.2  α Deletion

The lexical rule of α Deletion was discussed in Chs. 3, 4, and 5:

(90)    α --> Ø /  __  α

Recall that this rule applies to α-α sequences that arise from the suffixation of α-final stems with an α-initial suffix, and the prefixation of an α-final level 4 prefix to a verb which contains the 2p subject prefix /ah/:

    stem-final / a /

(91a)    yâ  -azi
        louse dim

    yâzi           'small louse'
cf. (91b) yà 'louse'

(92a) chèba -azi poplar dim

chèbazi 'small poplar'

cf. (92b) chèba 'poplar'

(93a) xèda -azi moose dim

xèdazi 'small moose'

cf. (93b) xèda 'moose'

forms which contain /ah/ 2p subject prefix

(94a) nà -ah -d -ts'it

down 2pS clf sg/du fall

nàhts'it 'you [du] fall down'

cf. (94b) nà -na -d -ts'it

down 2sS clf sg/du fall

nànëts'it 'you [sg] fall down'

(95a) chu -na -ah -k'ès

term rev 2pS clean

chunahk'ès 'you [pl] wash [O]'

cf. (95b) chunak'ès 'he, she washes [O]'

(96a) ?a -ah -Ieh

adv 2pS handle pl O

?ahIeh 'you [pl] make [O]'

cf. (96b) ?a-leh 'he, she makes [O]'

The rule of a Deletion is somewhat unusual in Sekani. Normally, stem vowels are not deleted before suffix vowels, and level 4 prefixes are not usually deleted.
3.2.1 a Deletion is not a cyclic rule

In Ch. 3, I noted that forms like the following indicate that Nasalization is a lexical rule:

(97) hâ-na-ah-Ieh
    out rev 2pS handle pl 0

hḣahIeh                      'you [pl] take
                                    [pl 0] back out'

(98) dâ -na -ah -kwi
    dstr rev 2pS vomit

nadḣahkwi                      'you [pl] habitually
                                vomit separately'

I will argue here that these forms also indicate that a Deletion cannot be a cyclic rule. To see why this is so, consider the following cyclic derivation of (97):

na cycle
a Deletion
∅

hâ cycle
n Insertion
n
a Raising
∅
Nasalization
∅
na Deletion
∅

*[hḣahIeh]

Like Schwa Lowering, a Deletion cannot apply as soon as its structural description is met. a Deletion must wait until na Deletion has had a chance to apply. a Deletion can be ordered after na Deletion, but if level 4 is a cyclic domain, this will not have the desired effect: the structural description of na Deletion will not be met until the next cycle, in the preceding form.

However, if a Deletion is a post-cyclic rule, it can follow
easily accomplished:

\[ hə-na-ahIeh \]

This suggests that a Deletion is not a cyclic rule.

3.2.2 a Deletion is not a post-lexical rule

Having established that a Deletion is post-cyclic, we might next try to determine whether it is a level 4 or a post-lexical rule. There is some evidence that it is a level 4 rule, rather than a rule of the syntax. Sequences of [a a] which belong to different words do not undergo a Deletion:

\[ ūya ah-ɪɨ̞  \quad \text{"you [pl] are shy"} \]
\[ shy \quad \text{2pS be} \]

\[ ?e -nka ah -chɨ̞  \quad \text{unspO P} \quad \text{2pS be, do} \]
\[ ?ɪka ahchɨ́  \quad \text{"you [pl] are trapping"} \]

\[ ya ɪ -ah -xəl \quad \text{sky der 2pS handle stick-like O carelessly} \]
\[ ya əḥxəl \quad \text{"you [pl] threw [stick-like O] in the air"} \]

\[ naxə -tsɨ̞ -ghə ah -tl'uh \quad \text{2pPsR head hair 2pS tie} \]
\[ \text{"you [pl] braid your [pl] hair"} \]

The existence of these untouched [a a] sequences suggests that a Deletion does not apply in the syntax.
3.2.3 a Deletion is a level 4 rule

If a Deletion is not post-lexical, and it is not a cyclic rule of level 4, then it can only be a non-cyclic rule of level 4.

However, if a Deletion is a non-cyclic rule of level 4, then a slight problem arises: why do word-internal [aa] sequences exist? If a Deletion is not a cyclic rule, it should not be constrained by the Strict Cycle Condition, and should thus be free to apply in non-derived environments. But in certain 2p s-conjugation forms, the sequence [aa] arises:

(103) u -ze-se -ah -h -ts'q
      thm thm cnj 2pS clf listen
      uzâahts'q           'you [pl] listened to [0]'

(The vowel sequence is derived by level 2 rules which were discussed in Ch. 3, 4.2.1.) One possible solution would be to reformulate the rule in (90) so that it includes a bracket:

(104) a --> Ø % ___ [ a

Then, given the fact that level 2 Bracketing Erasure necessarily precedes level 4 a Deletion, forms like that in (103) will not undergo a Deletion because they do not meet the structural description of the rule.

The fact that a Deletion is a non-cyclic level 4 rule is compatible with two models of the non-cycle in Lexical Phonology. The rule could be taken as support for the hypothesis of Kiparsky (1983a) that the last lexical level is a non-cyclic word level. However, the rule is equally compatible with the hypothesis of Rubach (1984a) that every level contains a post-
cyclic rule component.

I have not been able to find evidence that any of the level 4 rules must apply cyclically in Sekani, and for this reason, I adopt Kiparsky's more restrictive model of the cycle. Thus the following picture of cyclic domains in Sekani emerges:

\[(105)\]

<table>
<thead>
<tr>
<th>Levels</th>
<th>Cyclic Rules</th>
<th>Post-cyclic Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The fact that level 4 is non-cyclic has a nice analytical consequence for Sekani. As seen in Ch. 6, Stray \( n \) Deletion must follow the level 4 word formation rules. However, if Stray \( n \) Deletion is a post-lexical rule, it must be explicitly ordered before the post-lexical syllabification rules, which is apparently a marked ordering of prosodic and segmental rules (cf. Harris (1983)). On the other hand, if level 4 is non-cyclic, it suggests that Stray \( n \) Deletion may be analyzed as a level 4 rule, ordered after the level 4 word formation rules.

Having hypothesized that level 4 is not a cyclic domain, an interesting question now arises. Is it now possible to avoid having to state that Stray \( n \) Deletion follows all level 4 affixation? Mohanan and Mohanan (1984:594) propose that:

\[\text{..in a noncyclic lexical stratum phonological rules apply only at the end of all the morphological operations at that stratum.}\]

However, it is easy to show (in the spirit of Anderson (1975)) that not all of the phonological rules of level 4 follow all of the level 4 morphological rules. The level 4 rule of \text{na Meta-}
thesis (Ch. 3, 6.2.2.3) is arguably morphological. It applies only to the prefixes na customary and na reversative, not to the nearly homophonous prefixes like nà continuative or nà down. na metathesis must follow the application of the phonological rule of a Raising. Thus I conclude that the proposal of Mohanan and Mohanan (1984) above is too strong.

3.3 Non-cyclic rules: summary

I have argued that two Sekani rules, a Deletion and Schwa Lowering, are demonstrably non-cyclic. This implies that cyclicity "turns off" at some point in Sekani. When this conclusion is compared with the fact that some post-lexical rules in other languages are cyclic, it suggests that the boundary between cyclic and non-cyclic domains may be a language-specific parameter.

4. Conclusion

Good evidence for the cyclic or non-cyclic application of rules is hard to find. In this chapter, I have presented all of the evidence that I am aware of in Sekani for cyclic or non-cyclic rule applications. Given the rich morphological structure of Sekani, it might be expected that better evidence for the cycle can be found in languages like Sekani than in languages with relatively impoverished morphology like English.

The evidence presented in this chapter is relatively independent of theoretical considerations. I have simply provided cyclic and non-cyclic derivations: in some cases, cyclic derivations yield the right output; in other cases, non-cyclic
derivations derive the correct phonetic forms. The arguments presented in Rubach (1984b), Halle and Mohanan (1985), and Mohanan and Mohanan (1984) for cyclic/non-cyclic rule application seem to me considerably weaker than those presented here, in that the arguments are based on whether the rules precede or follow other cyclic rules, or whether their formulations violate current versions of the Strict Cycle Condition.

Not surprisingly, of the three models of cyclic vs. non-cyclic rule application in Lexical Phonology discussed in 1.3.3, very little evidence which clearly favors any one of them has appeared, either in this chapter or elsewhere in the literature. The Kiparsky/Harris "word level" model of the cycle, however, appears to be the most restrictive, in that it makes the strongest predictions about cyclic and non-cyclic rule application. Since the Sekani facts do not require the less restrictive models of Halle and Mohanan (1985) and Rubach (1984a), the analysis discussed here can be construed as evidence in favor of the Kiparsky/Harris model of the cycle in Lexical Phonology.

Notes.

1. The point of this chapter is not to shoot down other analyses, but rather to put forward the cyclic and non-cyclic analyses in sections 2 and 3. However, consider one of the analyses proposed by Halle and Mohanan (1985), and what I believe is a possible counter-analysis:

The rule of g-deletion accounts for alternations like those in (106):  

\[(106)\quad \text{long} \quad \rightarrow \text{longest} \quad \rightarrow \text{longing}\]

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g-deletion must apply before -ing suffixation, which suggests that it is a lexical rule. Halle and Mohanan argue that this rule violates the Strict Cycle Condition (and is thus non-cyclic) in that it must apply to non-derived stems like /1 ng/. However, it should be noted that g-deletion applies after Nasal Assimilation, which could be argued as having created a derived environment:

(107) \( n \rightarrow ð / \_\_ g \)

(108) \( g \rightarrow ð / ð \_\_ \)

Under this analysis, g-deletion does not violate the Strict Cycle Condition, and thus does not provide evidence that level 2 in English is non-cyclic.

2. Vocalization I could be simplified to (109) if Vocalization does not apply to the output of Diphthongization:

(109) \( \text{gho} \rightarrow u / o \_\_ \) optional

3. Notice that the analysis in this section has only provided evidence that level 2 is cyclic. It has not shown that level 3 is also cyclic. The required evidence would be a sequence of prefixes in which CV and gho are wholly contained within level 3. CV-gho sequences in which the first prefix is a level 3 morpheme are easy to find. An example is given in (110):

(110) \( \text{gho-gho-} \text{tsa} \text{gh} \)

\[ \text{3pS Op cry} \]

\[ \text{8 11 stem} \]

\( \text{ghtsa} \text{gh} \) 'they cry'

gho is a level 3 prefix and gho, a level 2 prefix. Thus this form can only be derived in a cyclic manner: but the "cycle" in this case is imposed by level ordering.

4. This is true except in the case of stems which appear in the incorporated stem position. See Chs. 3 and 4.

5. Pam Munro suggested this hypothesis to me. Other examples are provided by 'my (its) skin' below and by 'my (its) leaves' in 2.2.3.

(11a) \(?e \_\_ \text{zà}s\)

\[ \text{unspPr s} \text{kin} \]

'hide, skin'

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(111b) se -?e -zæs -ë
     isPsr unspPsr skin psd

tse?ezæses
     'my (its) skin'

6. Other problematic examples of pre-vocalic, non-alternating nasal vowels may perhaps be gotten rid of by this cyclic analysis. Consider the following:

(112) jeyqæ
     'bull moose'

(113) ?æsk'qæ
     'roe'

'bull moose' might be a compound:

(114) [[je] [yon] ë]
     horn grown psd

Compounding would have to precede possessive suffixation in this form.

'roe' might contain two layers of morphology, in which ?æ-
     is an instance of ?æ- 'unspecified possessor', added on the second cycle. If the s is a separate prefix in (113), it has no meaning which I am aware of. But there are many other mysterious word-internal s's in Sekani, some of which are listed in (115)-(121). The structure of these forms also appears to be prefix-s-stem:

(115) ?æ-s-ke
     'boy'

(116) ?æ-s-ba
     'goat'

(117) ?æ-s-xu
     tooth

(118) ?æ-s-t'as
     'story'

(119) dah-de -s-ghq
     up thm ? be hairy

(120) ?æ -de -s-tl'æs
     unsp thm ? paint

(121) dæghe -s ts'ile
     ground ? bare, smooth

7. a Lowering is thus a counter-example to the Strong Domain Hypothesis (Kiparsky 1984).

8. Of course, with this move, there is also an explanation for why the post-lexical [aa] sequences fail to undergo a Deletion.
These will be bracketed as in (122):

(122)  ..a] [a..

This does not mean, however, that a Deletion could be a post-lexical rule. Presumably, level 4 Bracketing Erasure removes the internal brackets of level 4 before the post-lexical rules apply. If a Deletion were a post-lexical rule, it could not distinguish [aa] sequences which arise on level 4 from the level 2 2p s-conjugation forms.
Chapter Eight

The Strict Cycle Condition

In this chapter I consider two Sekani rules, Diphthongization and a Raising, whose lexical application violates the Strict Cycle Condition, and consider a number of possible ways these rules can be accommodated by the theory. I conclude that the best way of resolving the problem for the Strict Cycle Condition posed by these rules is to assume that the prior application of syllabification rules in non-derived environments has created a derived environment for these rules to apply in. This analysis is of some theoretical interest, given the hypothesis of Kiparsky (1983) that such cases can instead be accommodated by a non-cyclic word level.

I begin this chapter with a brief discussion of the Strict Cycle Condition. In sections 2 and 3 I review the evidence for the rules of Diphthongization and a Raising, arguing that they must apply in the lexicon in non-derived environments. In section 4 I discuss the necessary orderings of these rules with Nasalization and the possessive word formation rule, illustrate an ordering paradox, and present two analyses which might solve this ordering problem. In section 5, I discuss a number of possible solutions to the problem raised by these rules for the Strict Cycle Condition, concluding that the best solution lies in allowing the prior application of rules of syllabification to create a derived environment for these rules to apply in. Consequently, this analysis provides a way of selecting a solution
to the ordering paradox discussed in section 4.

1. Abstractness and cyclicity

As discussed in Ch. 2, sec. 6, the Strict Cycle Condition is an important part of the theory of Lexical Phonology. The Strict Cycle Condition prevents structure-changing rules from applying cyclically in non-derived environments, thus providing a way of predicting rule domains. I would like to review here briefly the major arguments from abstractness for the Strict Cycle Condition before turning to the main focus of this chapter, a discussion of the Sekani rules that are a problem for it.

The role that the Strict Cycle Condition plays in Lexical Phonology is closely connected to the largely historical issues of constraining abstractness in underlying representations and accounting for the "derived only" class of phonological rules. As we will see in this chapter, however, these issues are still closely related: it is no accident that the Sekani rules which violate the Strict Cycle Condition permit underlying representations which are quite abstract (though necessarily so, I will argue).

1.1 "Derived environment only" rules

Kiparsky (1973a) first drew attention to a class of rules which are restricted to derived environments. Rules like Finnish t → s/___i and the Sanskrit ruki rule apply only in domains which are derived by the prior application of some phonological rule, or by a combination of morphemes.
As it turns out, such rules are not uncommon in languages. We have seen an example of this sort of rule in Sekani. Suffix Vowel Deletion, discussed in Chs. 4 and 5, deletes the final vowel of a suffix when it is followed by a vowel-initial suffix:

(1)  đet'온-e -azi
duck  stm dim
det'onazi  'bird; small duck'

However, this rule does not apply to underived vowel sequences within suffixes:

(2)  đәәn-e -zәazi
person  typ
'd'әәn  'Indian person'

(3)  bүәs-әzǐʔ?
cat  ddim
'bәәzәәs  'baby kitten'

In (2) and (3), the rule has not applied to the suffixes -zәazi prototypical and -әzǐʔ double diminutive. The rule appears to distinguish morphologically derived vowel sequences from underlying vowel sequences.¹

Given the existence of such rules, Kiparsky (1973a) suggested a possible explanation for why they should exist, or at least which rules might have the property of being restricted to derived environments. He hypothesized that such rules are non-automatic and neutralizing. Notice that by prohibiting (some) neutralization rules from applying to non-derived forms, some limits are placed on the abstractness of underlying representations. Thus the existence of this class of rules is "explained" by presumably universal constraints on abstractness in grammars.

1.2 Cyclic rules

As discussed in Ch. 2, there are empirical problems with
this characterization of the class of derived environment only rules. Mascaró (1976) suggested, as an alternative hypothesis, that the derived only restriction can be captured by the Strict Cycle Condition, which is independently required to constrain cyclic rule application. Since the Strict Cycle Condition prevents cyclic rules from applying to non-derived environments, cyclic rules will not be allowed to apply to innermost constituents, such as non-derived stems. This hypothesis was bolstered by Mascaró's observation that the cyclic rules of Catalán were all non-automatic and neutralizing, suggesting that rules with the following characteristics were indeed one and the same class:

- rules which apply cyclically
- rules which are restricted to derived environments
- non-automatic neutralization rules

This is a rather powerful claim, and as seen in Ch. 2, Harris (1983) has provided evidence from Spanish against it: some rules in Spanish apply cyclically, but are not neutralizing; while other rules, which are neutralizing, are not cyclic. Harris suggested instead that the Strict Cycle Condition regulates only structure-changing rules, thereby permitting structure-building rules such as stress and syllabification to apply cyclically in non-derived environments. Kiparsky (1982a) has provided an explanation for why rules may be differently regulated by the Strict Cycle Condition. Under the assumption that lexical items with lexically specified structure are in a disjunctive relationship with rules which change structure (but not
with rules which build structure), the Strict Cycle Condition can be regarded as a special case of the Elsewhere Condition.

1.3 Resolving violations of the Strict Cycle Condition

These new developments in the theory of cyclic phonology have provided a way of dealing with violations of the Strict Cycle Condition. Any lexical rules (which are presumably cyclic) which must apply in non-derived environments should all be reformulable as structure-building rules.

As discussed in Ch. 7, however, there is another way of dealing with violations of the Strict Cycle Condition. Halle and Mohanan (1983) and Mohanan and Mohanan (1984) have proposed that cyclicity is a language-particular property of levels or strata. In their approach, lexical rules which violate the Strict Cycle Condition are interpreted as indicating that the level to which they belong is not a cyclic domain. As Mascaró originally pointed out, assuming that cyclic and non-cyclic domains are not somehow predictable increases the class of possible grammars considerably. Kiparsky (1983a) has suggested that the post-cyclic domain begins at the word level in languages, though this too may be a language-particular parameter.

To summarize, if a rule violates the Strict Cycle Condition, one of two conclusions may be drawn. (1) The domain in which the rule applies is not cyclic, or (2), if the rule is clearly cyclic or applies in a domain which is clearly cyclic, then it must be reformulable as a structure-building rule, or it must be fed by the prior application of some phonological rule.
I will argue below that the latter method is the best way of dealing with the Sekani rules that violate the Strict Cycle Condition.

First, however, let me review the motivation for assuming that Diphthongization and a Raising are genuine rules of the phonology of Sekani.

2. Diphthongization

In previous chapters I presented the following rule of Diphthongization without really justifying it fully:

(4)  o → ə / velar ___

In this section I would like to demonstrate why underived stems and prefixes like those in (5)-(8) should not be assumed to contain underlying labio-velars:

(5)  we- areal prefix
(6)  whə- 'our, us' (prefix)
(7)  kwəs 'cloud'
(8)  -gwət 'knee'

I will argue that these forms should be analyzed as containing velar+/o/ sequences underlyingly, and the rule of Diphthongization which accounts for their surface forms must apply in the lexicon.

2.1 Motivation for Diphthongization

Consider the following facts about labio-velars. They do not occur syllable-finally, unlike velars and other consonants. The majority of labio-velars in Sekani occur before the vowel ə.
Moreover, labio-velars do not occur before the vowels o and u, and surface forms in which labio-velars occur before i e a are extremely rare. The distribution of labio-velars is thus highly restricted. The only forms which contain labio-velars before vowels other than o are listed in (9)-(13):

(9) kweh 'cave, grave'
(10) ?ekwa 'over there'
(11) -kwi 'vomit'
(12) whè- inceptive prefix
(13) gwak ~ gak 'nothing'

In fact, given Diphthongization and other rules, some of these ((11) and (12)) need not be regarded as having underlying labio-velars.

Moreover, a corresponding gap in the distribution of velars also exists. Velars which occur before (non-nasal) [o] are very rare in Sekani. The only such sequences in stems that I am aware of are those in (14)-(16):

(14) naghìgo\l I 'you [sg] crawl back'
(15) mìzeke\l a 'bull moose "bell"
(16) ?ìgholì 'scraper'

In prefixes, velar + [o] sequences are found only in forms which contain the optative and areal prefixes:

(17) shìs k'eh gho-n -lí
hill on ar Pf be

shìs k'eh ghòlí 'he, she lives on a hill'

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(18) **gho-n -tsəgeh**
    Op  2sS cry

**gho'qtsəgeh**  'you [sg] cry'  Op

Notice that in (14)-(18), the sequence velar + [o] is followed by [ŋ] or [ŋ].

Thus the following picture of the surface phonology emerges:

(19)

<table>
<thead>
<tr>
<th></th>
<th>o</th>
<th>e</th>
<th>V ≠ e, o</th>
</tr>
</thead>
<tbody>
<tr>
<td>k</td>
<td><em>(ko)</em></td>
<td>kə</td>
<td>kV</td>
</tr>
<tr>
<td>kw</td>
<td>*kwo</td>
<td>kwə</td>
<td><em>(kwV)</em></td>
</tr>
</tbody>
</table>

(*) = rare

By positing a rule of Diphthongization, most of the labio-velars in underlying representations may be eliminated while the lack of velar + [o] sequences is simultaneously accounted for:

(20)

<table>
<thead>
<tr>
<th></th>
<th>o</th>
<th>e</th>
<th>V ≠ e, o</th>
</tr>
</thead>
<tbody>
<tr>
<td>k</td>
<td><em>(ko)</em></td>
<td>kə</td>
<td>kV</td>
</tr>
<tr>
<td>kw</td>
<td>*kwo</td>
<td>kwə</td>
<td><em>(kwV)</em></td>
</tr>
</tbody>
</table>

(*) = rare

The underlying representations of the stems and prefixes in (5)-(8) are thus as follows:

<table>
<thead>
<tr>
<th>underlying</th>
<th>surface</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>(21) <strong>gho-</strong></td>
<td><strong>wə-</strong></td>
<td>areal prefix</td>
</tr>
<tr>
<td>(22) <strong>xo-</strong></td>
<td><strong>whə-</strong></td>
<td>'our, us'</td>
</tr>
<tr>
<td>(23) <strong>k'os</strong></td>
<td><strong>kw'əs</strong></td>
<td>'cloud'</td>
</tr>
<tr>
<td>(24) <strong>-gət</strong></td>
<td><strong>-gwət</strong></td>
<td>'knee'</td>
</tr>
</tbody>
</table>

There is other evidence that Diphthongization is a genuine rule of Sekani. Recall from Ch. 7 that **w** Vocalization is
blocked by a preceding round vowel:

(25) uwətən  
'he, she holds O' Op

The fact that surface [we] sequences also block Vocalization in some forms indicates that, at the stage in the derivation that Vocalization applies, these are underlingly /gho/:

(26) gho-gho-h -tləgh
ar Op clf rub with medicine
wəwahtələgh  
'he, she rubs [area] with medicine'
gho-gho-h-tləgh

Diphthongization
Vocalization

Unless the underlying forms of these prefixes are /gho/, the blocking condition on Vocalization must be analyzed as the awkward disjunction [u, wə], rather than the natural class of [+round] segments.

Furthermore, the forms in (14)-(18) provide additional support for this rule. Alternations between [o] and [wə] after velars result whenever an -n or -l follows. For example, the perambulative/customary stem of 'crawl' is -qwəts:

(27) k'ēnqkwəts  
'you [sg] crawl around'
(28) naghɨgoɬ  
'you [sg] crawl back'

The areal prefix is wə in other forms:

(29a) shîs k'eh wəts'ɪlɪ  
'we live on a hill'
(29b) shîs k'eh ghoɬɪ̱  
'he, she lives on a hill'

Thus these alternations suggest that labio-velar + [ə] sequences are really velar + /o/ sequences underlingly, and that a simple blocking condition on Diphthongization exists:

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(30)  o --> we / velar __ (C) , C ≠ l, n
The nasal-final blocking condition holds for prefixes but not stems:\(^3\)

| underlying | phonetic |  |
|------------|----------|  |
| kôn        | kwën     | 'fire' |
| -gon       | -gwën    | 'dry'  |

Without a rule of Diphthongization, the alternations in (27)-(29) would be unaccounted for.

To summarized, positing a rule of Diphthongization provides a way of accounting for the restricted distribution of labio-velars, a gap in the distribution of the velars, and a better understanding of the blocking conditions on Vocalization. Rare forms in which velar [o] sequences are preserved provide additional evidence for the rule. In fact, as promised above, Diphthongization also provides a way to eliminate some of the stems and prefixes with surface labio-velars before vowels other than [ə] from the list given in (9)-(13) of forms which contain underlying labio-velars. Consider the stem -kwi 'vomit'. We need only make the further observation that [i] does not contrast with [əy] in Sekani in order to derive [kwi] from /koy/ by means of Diphthongization and the additional rule in (33):\(^4\)

(33)  əy --> i

(34)  /koy/

Diphthongization   kwaêy
əy --> i          kwi

In addition to removing one more labio-velar from an underlying
representation, positing the underlying form /koy/ has the added advantage of explaining why this stem behaves like an obstruent-final root in failing to undergo the normal aspectual suffixation pattern for vowel-final roots in the conclusive aspect. Compare the surface forms of the stems of /xe/ 'kill sg O' and /ten/ 'freeze O':

(35)    Imp     Pf     Fut     Op
/xe/    xeh     x̄l     xeI     xeI
/ten/   tən     tən     tən     tən
/xoy/   kwi     kwi     kwi     kwi

If 'vomit' is underlyingly obstruent-final, the fact that it patterns like /tən/ rather than /xe/ is accounted for.

2.2 Diphthongization is a lexical rule

Given the need for Diphthongization to apply to undervived stems and prefixes like those given in (21)-(24), the question arises of whether or not Diphthongization applies in the lexicon or post-lexically. I will show here that Diphthongization must be a lexical rule, based on the fact that it must apply before other rules which are clearly lexical.

2.2.1 Diphthongization and level 4 Schwa Fronting

The derivation of the inceptive prefix [whə] given in Ch. 3, 6.1.1, required that Diphthongization apply before level 4 Schwa Fronting:

(36)      /xə/  
Diphthongization                   whə
level 4 Schwa Fronting            whə

Because level 4 Schwa Fronting is a lexical rule, Diphthongiza-
tion must also have applied in the lexicon in this form. Notice that *whe*- can be removed from the list of morphemes in (9)-(13) which contain underlying labio-velars.

2.2.2 Diphthongization and _w_ Vocalization

As seen in Ch. 7, in some derivations Diphthongization must apply before the levels 2 and 3 rule of _w_ Vocalization:

(37)  
\[ \text{gha-gho-} \text{tsægh} \]
\[ 3pS \text{ Op cry} \]
\[ \text{ghutsægh} \quad \text{'}\text{they cry'} \text{ Op} \]
\[ \text{gha-gho-} \text{tsægh} \]

Diphthongization \quad \text{we}

_w_ Vocalization \quad \text{u}

Prefix Vowel Deletion \quad \emptyset

[ghutsægh]

Since Vocalization is restricted to levels 2 and 3, and Diphthongization must precede Vocalization in these forms, these derivations provide additional evidence that Diphthongization is a lexical rule.

2.3 Diphthongization: summary

I have argued here that Diphthongization is a rule of the synchronic phonology of Sekani. Since Diphthongization applies in the lexicon to non-derived stems and prefixes, it presents a problem for the Strict Cycle Condition. I will return to possible solutions to this problem in section 5. First, however, I would like to illustrate another rule which Diphthongization interacts closely with, and which also violates the Strict Cycle Condition in a similar way.
3. a Raising

In this section I will argue that the neutralizing rule of a Raising applies in the lexicon to non-derived stems.

I discussed this rule in Ch. 3, §6.2.2. Recall the rule in question, which is informally stated below:

(38) $a \rightarrow o / \_\_ [\text{+nasal}] \text{syll}$

Sekani has both underlying /a/ and /o/, as the following stems indicate:

(39) -t'oh 'nest'
(40) -t'ah 'under'
(41) -zogh, zox 'frost, mist'
(42) -zâgh- 'language'
(43) chos 'feather'
(44) -ch'âs 'hook, catch'

Thus a Raising neutralizes the contrast between /a/ and /o/ before nasals.

3.1 Motivation for a Raising

There is no question that this rule is required in the grammar of Sekani. As I discussed in Ch. 3, alternations between [a] and [o] provide good evidence for this rule. Such alternations are found in stems like (45)-(46):

(45a) che $\_\_n$ -?a $\_\_h$
into water cnj handle compact 0 mom:Imp
cheq?âh 'he, she puts [compact 0] in the water'
(45b) che -nə -n -ʔa -n into water cnj Pf handle compact O mom:Pf

cheniʔa 'he, she put [compact O] in the water'

(46a) dah-sə -n -ka -ʔh up cnj 2sS handle contained O mom:Imp
dahsikəh 'you [sg] hang up [contained O]'

(46b) dah-sə -n -ka -n up cnj 2sS handle contained O mom:Pf
dahsikəh 'you [sg] hung up [contained O]'

Alternations between [a] and [ʔ] are also found in level 4 prefixes:

(47a) na -s -h -xəh rev 1sS clf melt, thaw

naxəh 'I thaw out [O]'

(47b) na -n -h -xəh rev 2sS clf melt, thaw

nəḫəxəh 'you [sg] thaw out [O]'

(48a) ?a -s -h -sən adv 1sS clf make

?assən 'I have [O] made'

(48b) ?a -n -h -sən adv Pf clf make

?q̃hsən 'he, she has [O] made'

In the preceding examples, a Raising has applied in derived contexts. Its application in such forms is clearly uncontroversial. What is at issue is whether or not a Raising can be assumed to have applied in forms like the following:

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(49) /chan/
    [chq]    'rain'

(50) /kanh/
    [kqh]    'house'

In the preceding examples, and in many others like them, no
alternations between surface a and o occur. However, in the
remainder of this section I will argue that a Raising must have
applied to these non-derived stems as well as to the morphologi-
cally complex forms in (45)-(48).

3.1.1 Distribution of [an] in stems

In stems, no sequences [an] or [aq] occur. This distribu-
tional restriction is easily accounted for by a Raising, just as
Palatalization (Ch. 3, 3.2.3) accounts for the restricted dis-
tribution of coronal stops before the vowels /i e u/.

The few stems which do contain surface [an] or [aq] are
clearly loan words:

loans from French
(51) samdi    'Saturday'    Samedi
(52) wàdèldi 'Friday'    Vendredi
(53) làsùcham 'turnip'    le sous-champ ?

loan from Carrier
(54) ?atsibalyân 'bald eagle'    tsibalyan⁵

These stems are exceptional in other ways as well. m does not
otherwise occur as a syllable-final consonant. In 'bald eagle',
the stem tsi 'head' would have a low tone if it were a native

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\text{\textcopyright{}ekani word}, as the other (presumably native) word for 'bald eagle' in Sekani does:

\begin{center}
\text{\textcopyright{}55} \quad \texttt{ts\textcopyright{}} -\texttt{g\textcopyright{}}
\quad '\text{bald eagle}'
\quad \text{\textcopyright{}unsp Psr head white}
\end{center}

3.1.2 Contrasts between [on]/[q] in stems

As I have argued in preceding chapters, all nasal vowels in Sekani can be derived from underlying /Vn/ sequences by the rule of Nasalization:

\begin{center}
\text{\textcopyright{}56} \quad \texttt{Vn} \rightarrow \texttt{V /} \quad (C) \quad \text{\textcopyright{}syll}
\end{center}

Moreover, I have argued that this rule must apply in the lexicon, to account for otherwise problematic contrasts between [Vn\textcopyright{]} and [V\textcopyright{]} sequences. As described in Ch. 7, the cyclic application of Nasalization is required to eliminate this apparent contrast.

Another problematic contrast, this time between [on] and [q], also occurs in stems. However, in this case I will argue that its solution depends not on cyclic application, but on recognizing distinct underlying representations for [on] and [q].

Recall that Sekani has six underlying vowels:

\begin{center}
\hspace{1cm} i \quad u \\
\hspace{1cm} e \quad \varepsilon \quad o \\
\hspace{1cm} a
\end{center}

A curious fact about /e/ is that Nasalization fails to apply to stems which contain this vowel:

\begin{center}
\text{\textcopyright{}57} \quad \texttt{ten} \quad '\text{ice}'
\text{\textcopyright{}58} \quad \texttt{san} \quad '\text{star}'
\end{center}

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\text{Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.}
(59)  shën  
'song'

Compare nasal-final stems which contain /i e u/ with (57)-(59):
(60)  k'ê  
'saskatoon bush'
(61)  ?âtsyu  
'grandmother' voc
(62)  tlî  
'dog'

This suggests that Nasalization should be revised:

(63)  Vn --> Ÿ / ___ (C) \syll, V ≠ ø

Now consider the application of Nasalization to /an/ and /on/ sequences. As seen above, alternations in stems between -kâh and -kq, ?âh and ?q, indicate that underlying /a/, like /i e u/, does not block Nasalization, as does /ə/:

/kə-n/  'handle contained O' Pf

Nasalization
_kâ
\a Raising
_kq

Leaving aside, for the moment, the reformulation of \a Raising

that this derivation implies, simply note that there is nothing

exceptional about /a/ with respect to Nasalization.

Now consider the following forms:
(64)  ustôn  
'I hold O'
(65)  k'enæstôn  
'I'm broken, broke'
(66)  jon  
'here, up here'

Compare the forms in (64)-(66) with those in (67)-(68):
(67)  dətq  
'it is thick'
(68)  ësq  
'he, she is old'

Notice that a contrast between [on] and [q] has arisen, creating

problems for the rule of Nasalization. Since the forms in (64) --
(66) are quite rare, we might consider simply listing them as exceptions to Nasalization. But it is worth noting that (1) non-nasal [o] is itself fairly rare, and (2) it turns that all word-final [Vn] sequences, where V ≠ schwa, are sequences of [on].

\[
\begin{array}{|c|c|c|}
\hline
\text{Vn} & \text{V} \\
\hline
\text{a} & \ast \text{an} & \ast \text{a} \\
\text{o} & \text{o} & \text{o} \\
\text{e} & \text{en} & \ast \text{e} \\
\text{i, e, u} & \ast \text{Vn} & \text{V} \\
\hline
\end{array}
\]

While alternations between [q] and [a] exist, there are no alternations between [a] and [o]. This suggests that the on sequences in (64)-(66) should be interpreted as underlyingly /on/, and the nasalized vowels in q should be regarded as underlyingly /an/, with a Raising applying in these non-derived stems:

/\text{tan}/

\text{Nasalization} \quad \text{q}

\underline{a} \text{ Raising} \quad \text{o}

\text{eventually} \quad \text{[detq]} \quad \text{'it is thick'}

\text{Nasalization must be revised:}

(70) \text{Vn} \rightarrow \text{V} / \_ \_ \_ (C) \text{ syll}, V ≠ \varepsilon, o

Thus there are two vowels which block Nasalization in stems. In fact, /æ o/ pattern together in another way which sheds light on this blocking condition.

/CV/ stems are extremely common in Sekani, as seen in the following examples.
(71) k'i  
     "birch"
(72) -k'a  
     "fat"
(73) ke  
     "shoe"
(74) yʊ  
     "medicine"

However, no /CV/ stems which contain the vowels /ə o/ occur.
This suggests that a constraint against stem-final /ə o/ exists
in Sekani:

(75)  * V
     [ [+back]
     [-high]
     [-low]  ]
     stem

This filter will prevent Nasalization from applying to stem-
final /ə o/ because the output of Nasalization in those cases
would be stem-final (nasalized) [ə o]. The filter in (75)
cannot be regarded as a constraint on stem syllable structure.
/ə o/ do occur syllable-finally within the few disyllabic stems
that exist in Sekani:

(76) tl'sghёs  
     'snake'
(77) hёнёs  
     'raft'
(78) t'oghsёs  
     'paddle'

Moreover, the filter holds only of stem-final /ə o/. Prefixes
which end in /ə o/ exist, and Nasalization may apply to them:

/o/

(79) gho-n -tsёgh
     Op  2sS cry
     ghоtsёgh  
     'you [sg] cry' Op
/ə/

(80) ghe-tsegh  'they cry'
    3pS cry

(81) ghq̩h-ghe-n -l -gêt
    P  3pS Pf clf crawl
    -ghq̩ghigêt  'they crawled to [0]'

However, while prefixes with final [ə o] occur, there are no suffixes with final [ə o], as may have been observed in Ch. 4. Instead, only [e] is found:

(82)  -ē  possessive suffix
      -e  stem formative?
      -e  incorporated stem suffix
      -e  future mode
      -ne  human plural nominalizing suffix
      -ge  human plural

To account for the absence of /ə/ in suffixes, I suggest that the suffixes in (82) are derived from /ə/ underlyingly by a rule of Stem-Final Tensing:

(83)  V -->[{-back  } / ___ ]^7
      {-high  }

This suggests that the filter in (75) is more general. It is not restricted to stems, but holds throughout the lexicon:

(84)  * V
      [+back  ]
      [-high  ]
      [-low   ]

The filter does not hold of sentential morphemes. Compare the interrogative morpheme /ghon/:

(85)  de-n -bêt  ghon
      thm 2sS be hungry Q

      dîbêdq  'are you [sg] hungry?'

To summarize, positing the underlying representation /an/

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for non-alternating [q] eliminates one set of problems for Nasalization. In the following section, I will argue that such representations also eliminate potential problems for Diphthonization.

3.3 Contrasts between [kq]/[kwŋ] in stems

As discussed in sec. 2 above, Sekani requires the rule of Diphthonization to account for the lack of velar + [o] sequences in the surface phonology, the restricted distribution of labio-velar consonants, and the fact that [wə] sequences are treated like round vowels by certain rules of the phonology.

Now consider the following contrasts between velar + [o] and velar + [wə]:

(86) kwən          'fire'
(87) kəh           'house'
(88) səgwən        'it is dry'
(89) səgənə        'my arm'

The surface sequences velar + [o] provide a minimal contrast with the labio-velar consonants before schwa, thus creating a problem for the analysis sketched in sec. 2. Unless the underlying representations of (87) and (89) differ from their surface forms at the point in the derivation that Diphthonization applies, the rule of Diphthonization cannot be maintained in the phonology of Sekani.

Fortunately, two observations provide evidence that the representations in (87) and (89) should not be taken at face
value. (1) Contrasts between [ko] and [kwə] are highly restricted, occurring only before nasals. (2) The output of a Raising does not undergo Diphthongization:

(90a) dah-sə -n -ka -n

up cnj 2sS handle contained O mom:Pf
dahsiko

'you [sg] hung up [contained O]'

cf.

(90b) dahsikāh

'you [sg] hang up [contained O]'

(91a) də -gəhə -n
der hair Pf
dagho

'he, she is hairy'

cf.

(91b) ?əgəhā

'its hair`

This provides a way of reanalyzing the contrast in (86)-(89) above:

(92)

<table>
<thead>
<tr>
<th>underlying</th>
<th>surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>alone</td>
</tr>
<tr>
<td>ka</td>
<td>ka</td>
</tr>
<tr>
<td>ko</td>
<td>kwə</td>
</tr>
</tbody>
</table>

Thus the underlying forms of (86)-(89) may be interpreted as follows:

underlying       surface

(93) kon           kwən       'fire'
(94) kanh          kəh        'house'
(95) -gon          -gən       'dry'
(96) -gən          -gən       'arm'

The problem for Diphthongization is eliminated by reanalyzing the underived stems in (87) and (89) as underlying velar +

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\(/a/\) sequences, to which \( _a \) Raising must have applied.

3.1.4 Summary

The application of \( _a \) Raising in non-derived stems accounts well for the distribution of \(/a/\) in stems, and eliminates counter-examples to two well-motivated rules of the phonology, Nasalization and Diphthongization. The alternative analysis—positing underlying \([q]\) and \([kq]\)—would lead to a skewed picture of the phonology of Sekani, in which the highly restricted distribution of certain segments and sequences would remain unexplained.

In the following section I consider the domain of \( _a \) Raising and show why this rule must be allowed to apply in the lexicon.

3.2 \( _a \) Raising is a lexical rule

The loan words in (51)–(54) indicate that \( _a \) Raising has lexically marked exceptions. In the Lexical Phonology model, this suggests that \( _a \) Raising is a lexical rule.

Stronger evidence, however, is provided by the necessary ordering of \( _a \) Raising before certain lexical rules in order to preserve lexically created \([q]\). If \( _a \) Raising were a post-lexical rule, it would have to be formulated as in (95), because as we know from Chs. 3, 4 and 7, Nasalization is a lexical rule:

\[
(97) \quad q \rightarrow q
\]

Nasalization would apply to lexically created syllable-final \(/an/\) sequences, even if \( _a \) Raising could not, thus creating \([q]\) for the post-lexical phonology to apply to. But this would lead to problems, as I will show below, because \([q]\) does exist in the

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surface phonology.

3.2.1  a Raising and Suffix Vowel Deletion

One such problem would arise from the interaction of post-lexical a Raising with the lexical rule of Suffix Vowel Deletion:

(98)  \( V \rightarrow \emptyset / J X \_ \_ \_ J V \)

As seen in Chs. 4 and 5, tone and nasality remain when the vowel to which these autosegments are attached is deleted by this rule. Now consider a form which contains the human singular nominalizing suffix -i and the diminutive suffix -azi:

(99)  se-k'åh -i -azi
    my marry nom:hum sg dim
    sëk'åh-azi  'my dear spouse'

Notice that the phonetic form in (99) contains [q]. If a Raising were a post-lexical rule, it would apply to this form, creating *[sëk'åh-azi]:

(100)  se-k'åh-åzi

Suffix Vowel Deletion   -åzi
a Raising            -qzi

However, the correct output will be obtained by assuming that a Raising is a lexical rule, ordered before Suffix Vowel Deletion:

(101)  se-k'åh-åzi

a Raising
Suffix Vowel Deletion   --

-åzi

3.2.2  a Raising and Perambulatory Reduction

Similar evidence that a Raising is a lexical rule comes from its interaction with the level 4 rule of Perambulatory Reduction:

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(102) \( k'è-na \rightarrow k'an \) / ___ (C) [ stem

Recall from Ch. 5, 3.2, that this rule accounts for alternations like the following:

(103a) \( k'è-na-n \ -d \ -beh \)
per C 2sS clf swim

\( k'èŋqebh \)  'you [sg] swim around'

(103b) \( k'è-na \ -d-beh \)
per C clf swim

\( k'qebh \)  'he, she swims around'

(103c) \( k'è-na-ah \ -d \ -beh \)
per C 2pS clf swim

\( k'q̱hbeh \)  'you [pl] swim around'

The forms in (103b) and (c) are easily accounted for if \( å \) Raising and Perambulative Reduction apply in counter-feeding order:

(104) \( k'è-na-d-beh \)

\( å \) Raising

Perambulative Reduction an

Nasalization \( q̱ \)

If \( å \) Raising were a post-lexical, across the board rule, it would apply to the output of Perambulative Reduction, wiping out the lexically created nasal vowel \( [q̱] \):

(105) \( k'è-na-d-beh \)

Perambulative Reduction an

\( å \) Raising \( *k'q̱qebh \)

\( å \) Raising and \( å \) Deletion

So far we have seen that the lexical rules of Suffix Vowel Deletion and Perambulative Reduction suggest that \( å \) Raising is a lexical rule. In this section I will argue that the level 4
rule of a Deletion also provides evidence that a Raising applies in the lexicon.

Recall from Ch. 7 that a Deletion applies in stems and prefixes:

(106) nā -ah -chēh
down 2ps handle animate O

nāhchēh 'you [pl] lower [animate O]'

(107) ts'ā -azi
plate dim

ts'āzi 'small plate'

If a Raising were a post-lexical rule, a Deletion would presumably have applied to these [q]–final stems. As the application of Suffix Vowel Deletion to sek'ahazi above and other forms suggests, nasality and tone are autosegments: they are not affected by the vowel deletion rules. Now consider the diminutive form of a stem like /tsān/ 'shit':

(108) tsān-azi
shut dim

tsqätzı 'small piece of shit'

Clearly, level 4 a Deletion has not touched the stem-final vowel in this form. Under a post-lexical analysis of a Raising, however, we would expect this stem-final [q] to be deleted by a Deletion just as in [ts'āzi] above:

(109) tsān-azi

Nasalization tsā-azi
a Deletion tsätzı
a Raising tsqätzı

*tsqätzı

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However, if a Raising precedes a Deletion, the right form will result.

3.3 a Raising: Summary

The rule of a Raising, like Diphthongization, must be allowed to apply in the lexicon to non-derived forms. By assuming that a Raising has applied to such forms, other well-motivated generalizations about the phonology can be preserved. a Raising must precede certain clearly lexical rules which create [a], and must also precede other lexical rules which apply to [a-] sequences.

Both Diphthongization and a Raising are problems for the Strict Cycle Condition. However, before considering possible solutions to the problem for the Strict Cycle Condition raised by these rules, I would first like to consider the necessary ordering of these rules with respect to two other rules. As these facts affect the formulations of the rules, this will be important later on.

4. Rule ordering

It is clear that Diphthongization must counter-feed a Raising, since the output of a Raising could, but does not, undergo Diphthongization. Moreover, since /on/ sequences, like /ən/ sequences, do not undergo Nasalization, the latter must also be ordered before a Raising:
(110) daḥšǐkq ḳ'you [sg] hung up [contained 0]
    ka-n

Diphthongization   --
Nasalization      ḳ('
ā Raising         ḳ'

-[kq]

There is no evidence that Diphthongization must precede Nasalization, or vice versa.

Another set of forms indicate that the possessive suffix -ē must be added before Nasalization applies:

(111) səgǒnē 'my arm'
cf.

(112) səgǒ ts'ē 'my arm bone'

(113) gān

possessive suffix  gān-ē
Nasalization      --
ā Raising         gōn-ē

Otherwise, if Nasalization had applied on the first cycle, forms with nasal vowels rather than nasal consonants would result:

(114) gān

Nasalization      ḳ('
possessed suffix   ḳē
ā Raising         ḳē

In fact, we already know this from the discussion in Ch. 7 of the contrast between forms like (111) and (115) below:

(115) seʔeṭ'qē 'my (its) leaves'

The following order of the rules is apparently required:

(116) Possessive word formation rule
Diphthongization, Nasalization
ā Raising

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4.1 An ordering paradox

In the preceding discussion I assumed the following version of a Raising in some forms:

\[(117) \ a \rightarrow o / \text{___ n}_\text{syll} \]

In other forms, however, I assumed a different version of the rule:

\[(118) \ \text{a} \rightarrow q \]

The difference depended on whether or not a Raising applied before or after Nasalization. Not surprisingly, then, an ordering paradox has arisen. In the possessed nouns, a Raising must precede possessive suffixation (and therefore Nasalization), because as we have seen from the level 4 verb prefixes, a Raising does not apply if the nasal consonant is not syllable-final:

\[(119) /gân/ \ 'arm' \]

\[
\begin{array}{ll}
\text{a Raising} & \text{gôn} \\
\text{Possessive suffixation} & \text{gônè} \\
\text{Nasalization} & --
\end{array}
\]

But in other forms, Nasalization must precede a Raising, because /on/ sequences do not undergo Nasalization:

\[(120) /\text{chan}/ \ 'rain' \]

\[
\begin{array}{ll}
\text{Nasalization} & \text{chà} \\
\text{a Raising} & \text{chò}
\end{array}
\]

In the following section, I will propose that the solution to this ordering paradox requires a distinction between stems and roots to be posited, and also requires the introduction of a new feature [tense].

4.2 Stems vs. roots, and the feature [tense]

Clearly what is needed is some way of preventing Nasalization from applying on the first cycle, on which a Raising may
apply. Other forms support this conclusion. Consider the following compound:

(121) tli ya -n -e
      dog grow Pf stm

   tli yone        'old dog'

The nasal in yone is clearly the perfective suffix -n; compare the imperfective root /yeh/ in (111):

(122) ghaje ne -yeh -i       'domestic goose'
      goose thm grow nom

(The stem vowels are related by ablaut rules.) The question arises: why is the second member of the compound in (121) not *yoe; that is, why has Nasalization not applied on the first cycle, if -n is a suffix?

One explanation might be that Nasalization cannot apply to roots, but only to stems. Then if the possessive and -e suffixation rules are regarded as stem-forming rules, Nasalization will automatically be prevented from applying on the first cycle:

(123) ya 'grow'

perfective suffixation      ya-n
Nasalization                -- (blocked: ya-n is root)
a Raising                    yo-n

-e suffixation              yo-n-e
Nasalization                -- (s. d. not met)

In forms like sāgønè and se?æt'æ above, Nasalization will be prevented from applying on the first cycle to the root /tsän/ until this after it becomes a possessed stem. However, a Raising, and presumably Diphthongization, are not so restricted. a
Raising must apply to roots before possessive suffixation occurs:

(124)  roots  syllabification  
       Diphthongization  
       a Raising  

       stems  possessive suffixation  
       syllabification  
       Nasalization  

Otherwise, possessive suffixation (and the resyllabification that it entails) will bleed a Raising of inputs.

Of course this analysis raises its own complications. We saw above that Nasalization must precede a Raising because /on/ sequences do not undergo Nasalization. Yet the [on] output of a Raising does undergo a Raising in this case. Now what is needed is some way of distinguishing underlying /o/ from derived [o]. To do this, I suggest that the feature [tense] categorizes /ə o/ as [-tense], while /i e u a/ are [+tense].\(^\text{10}\) Then the constraint against stem-final /ə o/ can be reformulated:

(125)  \[ * \]  
       \[ [-\text{tense}] \]  

The output of a Raising, [o], will be distinguished from underlying /o/ by the filter by virtue of the fact that derived [o] is still [+tense].

Of course, the cost of this analysis is that the phonology is more complicated. Not only is the extra feature [tense] required, but it leads to the conclusion that two kinds of [o]'s exist in the surface phonology of Sekani:\(^\text{11}\)

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(126) \( i e a o o u \ \\
\text{[tense]} + + + + - - - \\
\)

Underlying /o/ is [-tense], while the output of A Raising is [+tense]. Suppose A Raising is formulated as in (127):

(127) \( V \rightarrow [-\text{low}] / _\text{___} [+\text{nasal}] \)_{\text{syll}}

The underlying feature specifications of /a/ and /o/ will include the features in (128) and (129), respectively.

(128) /a/\n\[
\begin{array}{c}
+\text{back} \\
+\text{low} \\
+\text{tense} \\
-\text{round} \\
\end{array}
\]
\text{etc.}

(129) /o/\n\[
\begin{array}{c}
+\text{back} \\
-\text{low} \\
-\text{tense} \\
+\text{round} \\
\end{array}
\]
\text{etc.}

The output of A Raising will be a vowel with the features in (130), among others:

(130) [o] \n\[
\begin{array}{c}
+\text{back} \\
-\text{low} \\
+\text{tense} \\
-\text{round} \\
\end{array}
\]
\text{etc.}

A Raising cannot change the value of [tense] along with the other structural change that it performs, because the later application of Nasalization (really, the filter in (125)) must distinguish between derived and underlying [o].

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4.3 A reformulated version of a Raising in stems?

It is worth considering a possible alternative to this analysis which preserves the order given in (116) (repeated here), and which thus does not require the feature [tense]:

(116) possessive suffixation
     Diphthongization, Nasalization
     a Raising

The feature [tense] is required to preserve the ordering of a Raising before possessive suffixation and Nasalization: level 4 a Raising does not apply if the nasal is not syllable-final.

However, there is no evidence that a Raising in stems is blocked if the nasal is not syllable-final, only the assumption that the level 1 and level 4 rules are identical. Consider the following formulation of level 1 a Raising, which differs from the level 4 rule in that it does not care whether the nasal is syllable-final:

(131) level 1 a Raising
     a --> o / ___ n

(132) level 4 a Raising
     a --> o / ___ n ]syll

Under this analysis, possessive suffixation and the resyllabification that it entails will not bleed a Raising of inputs:

(133) /gän/ 'arm'

possessive suffixation gän-è
Nasalization --
a Raising gän-è

Of course, the cost of this analysis is that two rules, instead
of one, are required in the grammar.

4.4 Conclusion

In 4.2 and 4.3 I outlined two solutions to the ordering problem discussed in 4.1. Each solution is associated with a certain cost. As a consequence of ordering a Raising before Nasalization, the stem/root solution in 4.2 requires an additional feature [tense], and a complication of the surface phonology; whereas the linear version of a Raising discussed in 4.3 leads to duplication of rules in the language.

At the moment, I will not attempt to decide between these two analyses. However, keeping these two solutions in mind, now consider some possible ways of dealing with the problem for the Strict Cycle Condition which is posed by the need for Diphthongization and a Raising to apply on the first cycle.

5. Reconciling Diphthongization and a Raising with the Strict Cycle Condition

As discussed in 1.3, a number of possible ways of resolving violations of the Strict Cycle Condition have appeared in the literature, which I will consider in turn in this section.

First let me review what needs to be accounted for:

(134) \begin{align*}
\text{Diphthongization} & \quad \text{a Raising} \\
\text{applies in:} & \\
\text{stems} & \quad \text{non-derived environment} & \quad \text{non-derived environment} \\
\text{prefixes} & \quad \text{non-derived environment} & \quad \text{derived environment}
\end{align*}

With respect to a Raising, only its application to non-derived stems poses a problem for the Strict Cycle Condition. In level
4 prefixes, this rule applies only to forms which are derived by some combination of prefixes.

Diphthongization, however, applies in non-derived environments in prefixes as well as in stems. Although one might argue that prefixes constitute derived environments by virtue of the fact that the forms in which they occur are always morphologically complex, this clearly does not fit the definition of "derived" given by Halle (1978) in his definition of the Strict Cycle Condition, which I quoted in Ch. 2. I repeat the relevant part of it here:

(135) Strict Cycle Condition

A cyclic rule $R$ applies properly on cycle $j$ only if ...[either] $R$ makes specific use of information, part of which is available on a prior pass through the cyclic rules, and part of which becomes available on cycle $j$...[or] $R$ makes specific use of information assigned on cycle $j$ by a rule applying before $R$.

Since the segments which undergo Diphthongization are wholly contained within the cycle on which the prefix is added, the prefixes /gho/ and /xo/ clearly do not constitute derived environments, because the rule does not refer to adjacent segments.

In this section I will consider three possible solutions to the problem for the Strict Cycle Condition. First I will discuss the possibility that the rules do not apply within a cyclic domain; next I will consider structure-building formulations of the rules; finally, I will propose a way in which the contexts in which the rules have applied might be interpreted as derived. Throughout, I will mention whether a particular solution to the
problem for the Strict Cycle Condition has an effect on the solution to the ordering problem discussed in section 4 above.

5.1 Cyclic vs. non-cyclic domains

The first solution to be considered is that the domain in which the rules apply is not cyclic.

5.1.1 Level 1

As discussed in Ch. 7, Halle and Mohanan (1985) and Mohanan and Mohanan (1984) have proposed that the cyclicity of levels is a language-specific parameter. In this way they propose to account for alleged violations of the Strict Cycle Condition in English and Malayalam.

As seen in the preceding section, Diphthongization and a Raising must apply on the first cycle of level 1. However, the evidence from Nasalization discussed in Ch. 7 indicated that level 1 is a cyclic domain. Presumably, then, all level 1 rules obey the Strict Cycle Condition. Thus this is not a possible solution.

5.1.2 Level 4

Kiparsky (1983a) has proposed that rules which violate the Strict Cycle Condition may be relegated to the non-cyclic word level. Since there is some evidence that level 4 is not a cyclic domain in Sekani, this might be a possible solution.

As discussed in 3.2, there are no levels 1, 2, or 3 rules which a Raising must precede. However, in order to preclude the application of a Deletion to [a]-final stems, discussed in 3.2.3, a Raising must precede level 4 a Deletion. However,
there are other forms in which a Deletion must follow a Raising, which were discussed in Ch. 7. This solution would lead to an ordering paradox, which would not be easily resolved if level 4 is not a cyclic domain.

As for Diphthongization, this rule must precede the levels 2 and 3 rule of w Vocalization. Clearly, Diphthongization cannot wait until the word level to apply in non-derived environments.

A word level solution to the problems for the Strict Cycle Condition seems dubious for a Raising, and is clearly out for Diphthongization.

5.2 Underspecification

Another solution to violations of the Strict Cycle Condition has been suggested by Kiparsky (1983a). If Diphthongization and a Raising can be reformulated as structure-building, rather than structure-changing rules, then they will not be required by the Elsewhere Condition to be in a disjunctive relationship with underived lexical items.

5.2.1 Diphthongization

In Ch. 3, sec. 5.2.3, I argued that Diphthongization should be autosegmentally formulated, as in (136):

\[(136) \text{Diphthongization} \]

\[
\begin{array}{c}
C \\
+\text{high} \\
+\text{back} \\
+f \\
\end{array}
\]

\[
V
\]

\[
\begin{array}{c}
+\text{round}
\end{array}
\]
As it stands, this formulation of Diphthongization is structure-changing, since it delinks the autosegment [+round] from the vowel if a velar precedes it. To reformulate it as a structure-building rule, we would only need to assume that the autosegment is not underlyingly linked to the vowel slot:

\[(137)\]
\[
C \quad V
\]
\[
\left[ \begin{array}{c}
[+\text{high}] \\
[+\text{back}] \\
[\text{+[round]}]
\end{array} \right]
\]

Under this analysis, an additional rule would be required to link the autosegment to the vowel if not preceded by a velar:

\[(138)\]
\[
\backslash V
\]
\[
[\text{+[round]}]
\]

(The correct ordering relation between these two rules would be supplied by the Elsewhere Condition.) Since autosegmental theory allows autosegments to be either linked or unlinked in underlying feature matrices, this solution seems feasible.

Now let us consider an underspecified analysis of a Raising.

5.2.2 a Raising

A plausible formalization of the rule of a Raising was given above in (127):\(^{12}\)

\[(127)\]
\[
V \rightarrow [\text{[-low]}] / \quad [\text{[nasal]}]_{\text{syll}}
\]

Assuming that vowels are underlying specified as in (139), a Raising can be regarded as a structure-building rule: it assigns values of the feature [low] in appropriate contexts.

There are several ways in which the features could be specified
underlyingly. Since there is no theory of underspecification which might suggest that one particular analysis is more highly valued than another, I have chosen the following analysis:

(139) Underspecified vowel matrices

i e a o u e

[high] + +
[back] - -
[round] +
[low]
[tense] +

The feature [round] distinguishes /ə/ and /o/. [high] is distinctive for [-back] vowels. The feature [back] distinguishes /e/ and /a/. Notice that this analysis requires us to use the feature [tense] to distinguish /ə/ from /a/ underlyingly, if [low] is not used for this purpose.

Default rules supply the unmarked values of these features:

(140) [ ] --> [+back]
(141) [ ] --> [-high]

Raising may be considered a context-sensitive default rule:

(142) [ ] --> [-low] / ___ [+nasal] syll

Other rules which supply non-distinctive values of the feature [low] are given below:

(143) [+high] --> 
[low]
[tense]

(144) [-back] --> 
[low]
[tense]

Finally, default and redundancy rules will supply the correct
values of the features [round] and [tense]:

(145) -low  -->  [+round]
      +back
      +tense

(146) [ ]  -->  [-tense]

(147) [-tense]  -->  [-low]

(148) [ ]  -->  [+low]

The preceding rule applies to the output of a Raising, whereas
the following rule supplies the default specification:

(149) [ ]  -->  [-round]

The filled-in feature matrix for the vowels is given below:

(150) i  e  a  o  u  ə  a/\_n
[high]  +  0  0  0  +  0  0
[back]  -  -  +  +  +  +  +
[round] 0  0  0  +  +  0  0
[low] 0  0  +  +  0  0  0
[tense] +  +  +  +  +  +

The redundant values are circled.

While underspecification provides a way to reformulate a
Raising as a structure-building rule, and is thus a possible
solution to the problem, we should consider carefully some of
the implications of this analysis.

5.2.3 Consequences of underspecification

5.2.3.1 Distinctive vs. redundant features

One nice consequence of this analysis concerns Diphthongi-
ization. Consider the unexplained fact that Diphthongization
applies to /o/ but not to /u/: there are no [u] ~ [wi] alterna-
tions to parallel the [o] ~ [we] alternations. Notice that in the underspecification analysis above, only the vowel /o/ is specified underlyingly as [+round]: [round] is not distinctive for high, back vowels. This provides an explanation for why Diphthongization applies to /o/ but not to /u/. If /u/ is not marked as a [+round] vowel at the point in the derivation that Diphthongization applies, then Diphthongization will not apply to it.

5.2.3.2 Underspecification and structure-preservation

In Ch. 3, sec. 7 I pointed out that the lexical rules of Nasalization and Glottal Stop Absorption are problems for structure-preservation. As an additional consequence of the analysis in 5.2.2, other violations of structure-preservation are created, two of which I will mention here. Given the way in which structure-preservation is formalized, we could formulate the marking condition:

(151)  * V
      \[ \begin{array}{c}
          \text{+high} \\
          \text{+round}
        \end{array} \]

However, the output of V Vocalization is a vowel which contains the feature specifications of a labio-velar:

(152) output of Vocalization

\[ \begin{array}{c}
          \text{+high} \\
          \text{+back} \\
          \text{+round}
        \end{array} \]

The marking condition in (152) clearly cannot hold throughout
the lexicon, since Vocalization is a levels 2 and 3 rule.

Notice, also, that only /a/ is specified underlyingly as [+tense]. So we could formulate the marking condition:

(153)  * [-tense]

However, the level 1 filter in (125) explicitly rules out stem-final /ə o/; it must mention [-tense]. Thus the marking condition in (153) does not hold throughout the lexicon.

These violations of structure-preservation in themselves do not seem like a good reason for abandoning the analysis, since structure-preservation seems problematic in other respects. Moreover, an advocate of structure-preservation might be able to rearrange the underlying feature values and come up with a feature matrix which avoids these problems. I will not pursue such solutions here, however, because I would now like to point out what I believe to be a serious problem with this underspecification analysis.

5.2.3.3 Which rules are structure-building?

We have seen that the neutralization rule of a Raising can be reformulated as a structure-building rule. Underspecification raises the possibility that the wrong rules might be reformulable as structure-building.

Rules of the sort given in (154) which insert structure, segments, or features are clearly structure-building:

(154)   \emptyset \rightarrow X / ... 

Rules which delete structure, segments, or features, as in (155), are clearly structure-changing:
(155)  $x \rightarrow \emptyset / ...$

In between these two types of rules, however, is a murky area, as far as the structure-building and structure-changing typology is concerned. In particular, underspecification allows us to formulate neutralization rules as either structure-building or structure-changing, depending on the choice of underlying features.

5.2.3.3.1  $e$ Raising

To illustrate this weakness in the theory, I would like to turn to another neutralization rule in Sekani, $e$ Raising, which closely resembles $a$ Raising except that it is restricted to derived environments.

(156)  $e$ Raising

\[
e \rightarrow i / \text{___} \text{} n
\]

Like $a$ Raising, $e$ Raising neutralizes the contrast between the underlyingly distinct stem vowels /i e/ before nasals. Consider the following pairs, which illustrate this contrast:

(157)  -dzi  \hline
'inner ear'

(158)  -dze-  \hline
'heart'

(159)  che  \hline
'son' voc

(160)  -chi  \hline
'old, venerable'

(161)  -zǐ  \hline
'body'

(162)  -zē  \hline
'belt' psd

\text{$e$ Raising applies to verbal roots ending in /e/ which are suffixed with perfective -n:}
(163a) tā-se -n -h -cē  
up cnj 2ss clf handle animate 0 mom:Pf

tasīhchī  'you [sg] carried  
[animate 0] uphill'

cf.
(163b) tāsihchēh  'you [sg] carry  
[animate 0] uphill'

(164a) nā -sē-i -che -n  
cont cnj 1sPf dream cont:Pf

nāsičī  'I dreamed'

cf.
(164b) nā -s -che  
cont 1sS dream

nāsche  'I dream'

(165a) yēghā -sē -n -ke  
across cnj 2sS travel by boat mom:Pf

yēghāsīkī  'you [sg] went across by boat'

cf.
(165b) yēghāsīkēh  'you [sg] go across by boat'

(166a) zē -sē -h -xe  
thm cnj clf kill sg 0 con:Pf

zēhxi  'he, she killed [sg 0]'  

cf.
(166b) zahxēh  'he, she kills [sg 0]'

(167a) nā -sē -d -ghe -n  
cont cnj clf pack cont:Pf

nāsgī  'he, she packed [0] around'

cf.
(167b) k'ē-na-d -ghe -h  
per C clf pack C

k'āgeh  'he, she packs [0] around'

But it does not apply to root-final (non-derived) -en sequences:

(168) nā -h -xen -h  
rev clf thaw, melt Imp

nahxēh  'he, she melts [0]'

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(169) k'ê e -nê -ts'ênI
broken term limp
k'ênêts'êI 'he, she limps'

(170) ya î -n -tsênI
sky der 2sS handle compact O carelessly
ya îtsêî 'he, she throws [compact O] out, up'

(171) ?ê -nê -ts'enk
unspO thm hiccough
?ênêts'êk 'he, she coughs'

(172) k'ê-na-n -h -xênl
per C 2sS clf roll
k'ênôghxêîl 'you [sg] roll [O] around'

Thus e Raising, like Suffix Vowel Deletion and the other rules
discussed by Kiparsky (1973a), must somehow be restricted to
derived environments.14

5.2.3.3.2 e Raising vs. a Raising

Given the underspecified analysis in (139), we would want
to formulate e Raising as follows:

(173) V
[-back] --> [+high] / ___ [+nasal]

We would probably prefer to state the rule in this form anyway,
in a fully specified analysis of the vowel features. However,
since /e/ is not specified for a value of the feature [high],
under this analysis, nothing would prevent this rule from ap-
plying in non-derived contexts. Yet as seen in 5.2.3.3.1, e
Raising is a "derived only" rule.

Of course, it would be a simple matter to rearrange the
underlying feature matrices so that e Raising overrides the
lexical specification [-high] for the vowel /e/, forcing this rule to be in a disjunctive relationship with lexical entries by the Elsewhere Condition, so that it applies in derived environments only:

(174)  i e a o u æ
[high]  - -
[back]  - -
[round] +
[low]
[tense] +

A different set of default rules would be required, given this new specification of the features.

Underspecification can be useful, even insightful. In Ch. 3 I suggested that analyzing /a/ as an underlingly unspecified V slot provided a better formulation of w Vocalization, and also provided insight into why the level 4 rule of Schwa Fronting does not apply to incorporated stems. In this section, we have seen that the fact that [+round] is distinctive only for [-high] back vowels goes some way towards explaining why Diphthongization applies only to /o/. However, questions remain about underspecification. How underspecified should the feature matrices be? Why should the underlying feature specification in (174) be preferred over that in (139), without looking ahead to the rules to see the answer? That is, there seems to be no way of predicting why θ Raising is to be formulated in structure-changing terms, while the very similar rule of θ Raising is to
be formulated as a structure-building rule. This seems like a serious weakness in the theory of underspecification, and suggests that alternative ways of dealing with the rules which violate the Strict Cycle Condition should be considered.

5.3 Derived environments

As Kiparsky (1973a) first discussed, an environment may be "derived" by some combination of morphemes or by the prior application of some phonological rule. In this section I explore the possibility that the contexts in which a Raising and Diphthongization are in fact derived, though seemingly undervived.

5.3.1 Ø-derived stems

Many of the forms in which a Raising and Diphthongization must apply on the first cycle are stems. This fact suggests that perhaps such stems are actually zero-derived from underlying roots, and that the process of zero-derivation creates a derived environment for these rules to apply in:

(175) /kɔn/ 'fire'

stem formation

[[kwɔn] Ø ]

root stem

Diphthongization kwɔn

Of course, this analysis would require that the linear formulation of a Raising in 4.3, rather than the syllable-based version of the rule, be adopted, since a Raising would have to apply after the stem formation rules (including possessive suffixation):

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(176) /gàn/ 'arm'
possessive suffixation gàn-è
Nasalization --
a Raising o
-gônè

However, the same objection to this analysis can be raised as was made above at the beginning of this section. I argued that allowing Diphthongization to apply in prefixes simply because the prefix occurs in a morphologically complex form is a misinterpretation of "derived": the segments which are input to Diphthongization are completely within the prefix cycle. In this case too, then, the segments which are input to Diphthongization and a Raising are contained wholly within the root. The zero suffix contributes nothing which the rules crucially refer to.

5.3.2 Syllabification rules

In Ch. 7, I suggested that Nasalization can apply in non-derived environments by virtue of the fact that it is clearly a syllable-based rule. Similarly, I argued in Ch. 4 that Glottal Stop Absorption could apply on the first cycle because it refers to syllable structure, which is a derived phonological property. Here too I suggest that it is the prior application of the syllabification rules that creates a derived environment for a Raising and Diphthongization to apply in on the first cycle, in apparent violation of the Strict Cycle Condition.

If a Raising in stems is identical to level 4 a Raising, as suggested in 4.2, then it is clearly a syllable-based rule. a

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Raising can apply to the output of the syllabification rules:

(177) /xanh/ 'house'

\[ \begin{array}{c}
\text{Syllabification} \\
\rightarrow \\
\text{kanh} \\
\text{Raising} \\
\rightarrow \\
\text{konh}
\end{array} \]

\[ \begin{array}{c}
\text{stem formation} \\
\rightarrow \\
[konh]\text{stem} \\
\text{Nasalization} \\
\rightarrow \\
[kq\text{h}]
\end{array} \]

The root must also undergo a zero-derivation stem formation rule in order for Nasalization to apply, under the assumption that Nasalization applies only to stems.

It is not so clear that Diphthongization is a syllable-based rule, and thus that this analysis could also work for Diphthongization. However, consider the following. In 2.1 I showed that Diphthongization is blocked by a following nasal or by I. There is some evidence that the nasal must be syllable-final in order to block Diphthongization.

(178) gho-ne -tsægh
Op 2sS cry
ghçtsægh 'you [sg] cry' Op

(179) gho-ne -zù
ar thm good
ghoqzù '[area] is good'

In the preceding forms, the rule of ne Absorption has applied, and Diphthongization is consequently blocked:

\[ /\text{gho-ne-zù}/ \]

Absorption \( \bigcirc \)
Diphthongization ---
Nasalization ghqzù

However, in the following form, ne Absorption has not applied, and Diphthongization is free to apply:
(180)  gho-na-ts'it
       thm 2sS tell lie

    wənəts'ít             'you [sg] tell a lie'
    gho-na-ts'ít

Absorption
Diphthongization    we

Since Diphthongization is only blocked if the nasal consonant is
syllable-final, I assume that Diphthongization is thus a syl-
labable-based rule. The prior application of the syllabifica-
tion rules thus creates a derived environment for this rule to
apply in, in stems as well as prefixes:

(181)    /sə-Î-d-ghōse/  'we [du] itch'

    [sɫẘ̥∅se]

Notice that Syllabification must apply after na Absorption, and
before Diphthongization:

(182)    /gho-na-tsągh/  

Absorption
Syllabification
Diphthongization
Nasalization

There is no evidence that Syllabification must precede na Ab-
sorption.

5.4 Strict Cycle Condition: Summary

In this section I have suggested a number of possible
solutions to the problem for the Strict Cycle Condition posed by
the rules of Diphthongization and a Raising. I have shown that
these rules apply on level 1, which is a cyclic domain; they
cannot wait until the word level to apply. I have explored a
possible solution to the problem using underspecification, and
discussed the problematic contrast between a Raising and e
Raising. Since underspecification does not predict why a Rais-
ing should be formulated as a structure-building rule, but e
Raising as a structure-changing rule, I chose to abandon this
line of investigation.

The least problematic analysis for these rules, as well as
Nasalization and Glottal Stop Absorption, seems to be recognize
the fact that they are all syllable-based, and to allow the
prior application of the syllabification rules in stems as well
as prefixes to create a derived environment for the rules to
apply in. As pointed out above, this analysis requires the
recognition that a Raising in stems is a syllable-based rule, as
is a Raising in prefixes.

6. Conclusion

The analysis I have proposed in this chapter has a number
of theoretical consequences.

The analysis supports the conclusions of Harris (1982) and
Kiparsky (1982a, 1983a) that structure-building rules are not
constrained by the Strict Cycle Condition. As we have seen, the
syllabification rules must be allowed to apply on the first
cycle, in order to feed a Raising and Diphthongization. How-

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ever, it provides a counter-example to the suggestion of Kiparsky (1983a) that structure-building rules cannot be allowed to create a derived environment for the application of later rules. Thus the theoretical conclusion required by the Sekani rules is at odds with that which is apparently required by Trisyllabic Shortening in English (see Kiparsky (1983a)).

This analysis provides support for the position that syllabic structure is a derived, rather than underlying, property of phonological representations. If syllable structure is an underlying property of stems, then the syllabification rules could not possibly create a derived environment for these rules to apply in.

Finally, we have seen that derivations in which a Raising precedes possessive suffixation are required; i.e., a phonological rule must precede a morphological one. Such derivations could only be possible in a lexical model of the phonology of Sekani.

Notes.

1. As discussed in Ch. 4, the vowel sequences in (2) and (3) may in fact be derived, in which case the morphemes -zâ and -i?p must be marked as exceptions to Suffix Vowel Deletion.

2. The data are more complicated than this. See Hargus (to appear), and note 15 below.

3. The nasals in prefixes which block Diphthongization are reflexes of the palatalized velar nasal *m, whereas the root-final nasals are reflexes of *n (Krauss and Leer 1981). A synchronic /n/ vs. /ŋ/ contrast would not require this conclusion.

Alternatively, the following formulation of Diphthongizat-
tion would not require the blocking condition to distinguish between level 1 and 2 nasals:

(183)  o $\rightarrow$ we / velar $^\#$ (C) , C $\neq$ I  
       $^\#$ [+nasal]

This formulation takes advantage of the fact that all syllable-
final nasals in prefixes undergo Nasalization, whereas stem-
final nasals do not undergo Nasalization after /æ o/, as will be
discussed below. With this formulation of Diphthongization,
Nasalization would have to precede Diphthongization.

4. Michael Krauss suggested the underlying form /køy/ for
'vomit'.


6. The filter seems empirically superior to the rule in (70).
As noted in Ch. 3, 7.2, the non-imperfective stems of 'smile'
undergo Nasalization and Raising:

(184)  $^-$/sæn  $^-/?$
       smile dur: Pf
       $^-/[s\tilde{\imath}]$

As noted in Ch. 6, this form suggests that $\varnothing$ Raising is a
lexical rule. Otherwise, Glottal Stop Absorption would be
blocked by the filter.

7. As for the absence of /o/ in suffixes, this is probably a
historical accident. However, note the following alternation:

(185a) ?ækwâne  'they, them'
(185b) ?æku  'those'

The alternation between [wæ] and [u] suggests the following
underlying representations:

(185a) /?ækə-ne/
(185b) /?æko/

In 4.2 I will argue that /æ o/ are underlingly [-tense]. This
suggests a reformulation of Stem-Final Tensing as follows, which
will account for the alternations in (183):

(186)  V $\rightarrow$ [+tense] / ___ 

8. Keren Rice suggested this analysis to me.
9. This derivation implies that the aspectual suffixes are not stem-forming suffixes, or else Nasalization would have been able to apply to ya-n.

10. With some historical perspective on the phonology, the feature [tense] or its equivalent makes a lot of sense. Proto-Athabaskan vowels are classified as either "full" or "reduced" (see Krauss 1978, Leer 1979). This corresponds to the use of the feature [tense] here:

<table>
<thead>
<tr>
<th>Proto-Athabaskan</th>
<th>full</th>
<th>reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>i̯, e̯, a̯, u̯</td>
<td>\</td>
<td>\</td>
</tr>
<tr>
<td>Sekani</td>
<td>i, e, a, u</td>
<td>e, o</td>
</tr>
</tbody>
</table>

[+tense]          [-tense]

11. In closely related Beaver (Story 1979), the cognates of Sekani underlying /o/ and the output of \_ Raising are phonetically distinct:

<table>
<thead>
<tr>
<th></th>
<th>Sekani</th>
<th>Beaver</th>
</tr>
</thead>
<tbody>
<tr>
<td>underlying</td>
<td>o</td>
<td>U</td>
</tr>
<tr>
<td>output of _ Raising</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

Thus, although unattractive for Sekani, this analysis would generalize easily to Beaver.

12. This rule generalizes nicely to Beaver. In Beaver (Story 1979:11), there are seven oral vowel phonemes:

i̯, u
I \ U
\ e \ a

but only two nasal vowels:

\_Q \_Q

(The vowels I, U and block Nasalization as in Sekani.) Story states that the Beaver nasal vowels \_Q and \_Q are "the merged reflexes in stems of [Proto-Athabaskan] *i̯n and *en, and of *an and *un respectively." Thus it is clear that there is a height restriction on nasal vowels in Beaver: nasal vowels must be [-high, -low]. The Sekani situation is simply a less dramatic manifestation of this height restriction on nasal vowels.

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13. As pointed out to me by Bruce Hayes, structure-preservation thus ceases to be a falsifiable hypothesis if underspecification is allowed. I will return to this point below.

14. The perfective suffix is reconstructed as *n (a palatalized velar nasal), whereas most root-final nasals were *n (Krauss and Leer 1981). Thus if this contrast between nasals still existed in Sekani, there would be no need to regard e Raising as a "derived only" rule. Cf. also note 3.

15. The alarmed reader may want to know why ne Absorption is blocked in (180), but not in (178) and (179). The explanation illustrates part of the murkiness associated with Diphthongization which was alluded to in note 2 above.

First recall from Ch. 3, 5.2.6 that ne Absorption is blocked if the preceding vowel is /u/:

(187) u -ne -tôn
    thm 2sS hold 0

(188) u -ne -h -ch'âs
    thm 2sS clf hook
    unahch'âs

    'you [sg] go fishing'

This provides an explanation for why Absorption should be blocked in (180). Next note that (180) and (189) have variant pronunciations:

(180a) wənəst's'ît
    'you [sg] tell a lie'

(180b) wi'ts's'ît

(189a) wənəjeh
    'you [sg] talk'

(189b) wi'jeh

Making use of the solution arrived at in Ch. 7 for explaining the free variants in the gho-gho forms, I assume that Diphthongization and Absorption are unordered with respect to each other. The fact that the output of Diphthongization is not a round vowel accounts for the (b) forms:

\[ /\text{gho-ne-ts'ît}/ \]

Diphthongization \hspace{1em} wə
Absorption \hspace{1em} \emptyset
Nasalization \hspace{1em} wə-
\( e \) Raising \hspace{1em} wi'-ts's'ît

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If Absorption and Diphthongization apply in the reverse order, the (a) forms will be accounted for:

/gho-na-ts'lt/

Absorption   ø
Diphthongization  we

[wənəts'lt]

Returning to the forms in which the optative and areal prefix occur, I assume that these prefixes are exceptionally marked as triggers for n Absorption, just like the na prefixes discussed in Ch. 3, 5.2.6, and that if prefixes are so marked, the only possible ordering of the rules is Absorption --> Diphthongization. The thematic (i.e. lexically specified) /gho/ prefix in position 7, differs from /gho/ 'area' in not being exceptionally marked as requiring nê Absorption.
Appendix

Sekani Rules

In this appendix, I have listed in alphabetical order the Sekani rules posited in this dissertation. I have included a formulation of each rule and a reference (chapter, section, page) to some portion of the text where the rule is discussed.

\_ Deletion
\[ a \rightarrow \emptyset \% a \]

Ch. 3, 5.2.1, p.139
Ch. 7, 3.2, 399 ff.

\_-Low Tone Mapping
\[ \begin{array}{c}
\text{L} \\
\text{a} \\
\end{array} \]
\[ \begin{array}{c}
\text{a} \\
\end{array} \]

Ch. 5, Notes, p.334

\_-Raising
\[ a \rightarrow o / \_n \text{ syll} \]

Ch. 3, 6.2.2, 192 ff.
Ch. 8, 3., 422 ff.

Aspiration
\[ s \rightarrow h / \_h \{ \text{stem} \} \]

Ch. 3, 3.1.2.4.2, p.88

Assimilation to a
\[ e \rightarrow a / \_a \]

Ch. 3, 4.2.1, p.121

Assimilation to e
\[ V \rightarrow e / e \_ \]

Ch. 3, 4.2.1, p.122
Cluster Simplification

$$C \rightarrow \emptyset \ C \ ___ \ \text{syll}$$

Conjugation s Deletion

$$s \rightarrow \emptyset / e \ ___ \ V$$

Conjugation e Deletion

$$e \rightarrow \emptyset / V \left\{ \begin{array}{c}
s \\ gh
\end{array} \right\} [i]$$

Conjugation Tone Mapping

\[ \begin{array}{c}
\text{L} \\
\text{V} \ s e \\
\text{V} \ n e
\end{array} \]

See also Glottal Stop Absorption.

Continuant Voicing

$$[+\text{cont}] \rightarrow [+\text{voice}] / X \ [i \ ___ ] \ 1 = N, P$$

D-Effect Rule

$$d-z \rightarrow dz$$
$$d-l \rightarrow dl$$
$$d-y \rightarrow j$$
$$d-gh \rightarrow g$$
$$d-? \rightarrow t$$

i.e.,
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Gamma Lowering

gh → a / ___ [1

Glottal Stop Absorption

? → L / ___]syll

Glottal Stop Insertion

Ø → ? / L

h Loss

h → Ø / C ___

h Voicing

d+h → C

[+clf] [+]voiced

i Lowering

i → e / ___ {s 3

œ Metathesis

œ gho → 11 g / ___ œ

L Deletion

L → Ø / ___ L [ stem

Level 4 Schwa Fronting

V → e

*
Insertion

∅ → n / a ___ na

Conjugation → Fronting

ə → e / L | n]syll

Nasalization

Vn → V / ___ (C) ]syll

Deletion

na → ∅ / q ___ optional

Absorption

ə → ∅ / V n ___

Raising

o → u / ___ i

Palatalization

d,t,t' → j,ch,ch' / ___ i,e,u

i.e.

\[
\begin{bmatrix}
\text{C} & \text{V} \\
[+cor] & [+high] \\
[-back] & \text{stem}
\end{bmatrix}
\]

Perambulative Deletion

na → ∅ / k'ə ___
Perambulative Reduction

\[ k'ë-na \rightarrow k'an / \_\_ \ (C) \_1 \]  
Ch. 3, 6.2.2, p.193  
Ch. 5, 3.2, 312 ff.

Prefix Vowel Deletion

\[ \_a \rightarrow \emptyset \% \_V \]  
= Schwa Deletion  
Ch. 3, 5.2.1.1, 134 ff.

Preglottal \_a Fronting

\[ \_a \rightarrow e / \_\_ \ [\_N ? \] \]  
Ch. 4, 2.2, p.235

s Conjugation \_a Fronting

\[ e \rightarrow e / \_L \]  
\[ s \]  
Ch. 3, 4.2.1, p.120

s Voicing

\[ s \rightarrow z / \_\_ \ [\_stem \] \]  
Ch. 3, 3.1.2.4.2, p.89

Schwa Deletion

See Prefix Vowel Deletion

Schwa Fronting rules

See Preglottal \_a Fronting
Level 4 \_a Fronting
\_n Conjugation \_a Fronting
\_s Conjugation \_a Fronting
Stem-Final Tensing

Schwa Lowering

\[ e \rightarrow a / \_\_h]_{syll} \]  
Ch. 7, 3.1, p.395

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Schwa Raising
q --> i

Stem-final, suffixal vowels are tense
* V
   [-tense]

Stem-Final Tensing
V --> [+tense] / ___ ]

Stray n Deletion
n --> ø / ___
   x
   syll

Suffix Vowel Deletion
V --> ø / ]₁(X) ___ ] V

Syllabification
σ
  O
  R
  (C) V --> (C) V

  R
  V' (?) (n) (C) --> V (?) (n) (C)

ts'e gha Metathesis
ts'
gh
8 9 --> 9 8

Ch. 1, 3.1.2, p.79
Ch. 8, Notes, p.462
Ch. 8, 3.1.2, p.428
Ch. 8, 3.1.2, p.429
Ch. 6, 6.1. p.359
Ch. 5, 3.4, 322 ff.
Ch. 6, 6.1, p.358
Ch. 3, 4.1.4.1, p.113
Ch. 3, 4.2.1.2, 125 ff.
Unlinked L Deletion

\[ L \rightarrow \emptyset / \frac{\ast}{\ast} \]

Ch. 3, 5.2.1.2, p.141

Velar Loss

\[ [+\text{cont}] \rightarrow \begin{cases} [+\text{high}] \\ [+\text{back}] \\ [+\text{round}] \end{cases} \]

Ch. 1, 6.3, p.16

Voicing Assimilation

\[ [+\text{voice}] \left[ \begin{array}{c} [+\text{cont}] \\ [-\text{son}] \end{array} \right] \rightarrow \left[ \begin{array}{c} C \\ \text{...} \end{array} \right] \text{stem} \]

Ch. 3, 3.2.1, p.94

W Vocalization

\[ \text{we} \rightarrow \text{u} / \frac{V}{-\text{round}} \]

Ch. 3, 5.2.4, 151 ff.

\[ \text{i.e.,} \]

\[ \frac{V}{*} \frac{C}{*} \frac{V}{*} \frac{[+\text{round}]}{[+\text{high}]} \frac{[+\text{back}]}{[+\text{round}]} \]

Ch. 7, 2.1.2, p.383
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