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THE PHONOLOGY AND MORPHOLOGY
OF TONE AND LARYNGEALS IN COPALA TRIQUE

by
Barbara Elaine Hollenbach

A Dissertation Submitted to the Faculty of the
DEPARTMENT OF LINGUISTICS
In Partial Fulfillment of the Requirements
For the Degree of
DOCTOR OF PHILOSOPHY
In the Graduate College
THE UNIVERSITY OF ARIZONA

1084

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As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Barbara Elaine Hollenbach entitled The Phonology and Morphology of Tone and Laryngeals in Copala Trique and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy.

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4/10/84  

Dissertation Director  

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4/10/84  

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

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SIGNED: Barbara Elaine Hollenbeck
This dissertation, which culminates three years of graduate study in linguistics at the University of Arizona, began, in a very real sense, over twenty years ago, when I first started studying Copala Trique. In November, 1962, I began to live in the village of San Juan Copala, Oaxaca, Mexico. As a field linguist working under the auspices of the Summer Institute of Linguistics, my first major assignment was to learn to speak this Otomanguean language. My tools for the task consisted of pencils, notebooks, training in field linguistics, and the chance to interact daily with some of its 8,000 speakers.

Within a few weeks, however, I found myself wondering, "How can I ever learn this language? All the words sound alike!" As a speaker of English, I had learned, quite unconsciously, to pay attention to ordinary consonants and vowels for distinguishing among words, and to ignore, for this purpose, such things as pitch. In Copala Trique, however, much of the functional load in distinguishing among words is carried by tone, glottal stop, and postvocalic h, features that are not found in English—or in most other Indo-European languages either. These are the features that Trique children learn first, and, furthermore, it is extremely difficult to make Trique adults consciously aware of them, even though they control them precisely. It seems to be the
case that tone and laryngeals are more deeply embedded in the speaker's unconscious than ordinary consonants and vowels are.

Over the years of fieldwork, I learned to control tone and laryngeals in speaking and understanding Trique, and I was able to analyze the way they functioned in the phonological and morphological systems. An early description of the phonology that differs somewhat from the one found in this dissertation is found in Hollenbach (1977). On various occasions I attempted to write a description of the tonal morphology, both in a structuralist model and in an early generativist model, but I was never able to finish the task to my satisfaction. I tried several times to find an abstract analysis of the tone system that would eliminate one (or even two) of the five levels and provide an insightful description of tonal morphology, but each attempt did such violence to phonetic reality and/or so complicated the morphology that I abandoned it. In this dissertation, I have finally returned to this topic.

When linguists describe languages of which they are not native speakers, it is customary for them to acknowledge by name the consultants who supplied the data. I do not do this here, partly because it would be impossible. I have collected data from dozens of Copala Trique speakers over the years, analyzed it, sifted it, and internalized much of it. Also, in Copala Trique society, names are not used freely, and I do not wish to subject my friends to the potential embarrassment of having their names appear in print. I am deeply grateful to these
people for their friendship and help over the years. In addition to allowing our family to live in their village and teaching us their language, they have provided a mirror that has helped me to evaluate some of my cultural presuppositions, and I am richer for the experience.

I would also like to thank a number of others who have helped to make this dissertation possible. The Graduate College of the University of Arizona provided a Graduate Academic Scholarship for five of the six semesters I was enrolled there; the Linguistics Department also provided various teaching and research assistantships that helped to cover the expenses involved in attending school. The Summer Institute of Linguistics, Inc., also provided some scholarship help.

My dissertation director, Richard A. Demers, and my other committee members, Ann K. Farmer, Richard T. Oehrle, Susan M. Steele, Deirdre W. Wheeler, and Chisato Kitagawa (who served for a time), have all taught me a great deal and have been helpful in many ways. I also wish to mention, with special thanks, Richard D. Janda. Even though he was unable to serve on my committee, much of the research that developed into this dissertation, in particular, the material on tone features and on tone sandhi and clitic pronouns, grew out of papers written under his direction. Undoubtedly, none of these scholars agrees with all of the theoretical positions I have taken in this study, yet each has respected the facts about Trique and has been willing to allow me to analyze them as I deemed best. For this I am especially grateful.
Finally, many thanks go to my family. My husband, Bruce E. Hollenbach, who has also carried out extensive fieldwork on Copala Trique, shared his insights into Trique structure and checked abstruse examples with a native speaker for me. He and our children, Jed and Shana, have endured a general lack of domestic tranquillity for three years. They all look forward to the day this manuscript is turned in.
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ABSTRACT

In the first part of this study, autosegmental phonology is applied to Copala Trique, an Otomanguean language spoken in Oaxaca, Mexico. This language has five contrastive tone levels, for which three features are proposed: [HIGH], [CENTRAL], and [EXTREME]. Tone occurs distinctively, however, only on the word-final syllable and, in some words, also on a nonfinal syllable that has a lexically linked tone pattern. The predictable tone on the remaining syllables is supplied by an epenthesis rule. The postvocalic laryngeals ʔ and h interact closely with tone, and they are analyzed as part of the tonal tier, rather than as part of the segmental tier. A third postvocalic laryngeal, ʰ, is also posited; this is an abstract segment that imposes ballistic features on the vowel with which it is associated.

In the second part of the study, the above phonological analysis is applied to the description of three morphological phenomena that involve tone and laryngeals. The first is a set of three tone-laryngeal replacements. These replacements constitute an intermediate level of abstraction between the morphosyntactic category that they realize, such as potential aspect or denominal adjective, and individual morphological rules. The second phenomenon is tone sandhi, in which the tone of a word is raised in a complex, but completely predictable, way immediately preceding certain pronouns. The third phenomenon is clitic pronouns.
which pattern syntactically as heads of noun phrases, but are invariably realized as a change in the tone-laryngeal representation of the preceding word. Because both sandhi rules and clitic pronoun attachment apply postlexically, yet require access to morphological information, these two phenomena constitute significant counterexamples to the current theoretical claim that all rules that require morphological information apply in the lexicon.

A brief concluding chapter evaluates the analysis, summarizes the theoretical implications of the findings, and suggests areas for future research.
CHAPTER 1

INTRODUCTION

This study investigates the ways in which two closely related phenomena, tone and laryngeals, function in the grammar of Copala Trique. Both carry a heavy functional load, as can be seen in the following sets of examples:

(1) a. \( \text{yu}_3\text{we}_3^3 \) 'palm mat'
b. \( \text{yu}_3\text{we}_3^2 \) 'maguey'
c. \( \text{yu}_3\text{we}_3^2\text{h} \) 'cliff'

(2) a. \( \text{yu}_3\text{we}_3^2 \) 'marketplace'
b. \( \text{yu}_3\text{we}_3^2\text{h} \) 'thread'
c. \( \text{yu}_3\text{we}_3^2\text{r} \) 'ice'

Even though this characteristic of Copala Trique is very unlike English, or any other Indo-European language, it is typical of languages within the Otomanguean stock, to which Trique belongs. As an indication of the salience of tone and laryngeals, consider the fact that Rensch (1976), in his description of the phonology of Proto-Otomanguean, devoted fourteen pages out of forty-seven to them. Also, Longacre (1957), in his reconstruction of Proto-Mixtecan, the family within Otomanguean...
that includes Trique, devoted thirty-eight out of eighty-one pages to these two phenomena.

Within Copala Trique, tone and laryngeals function not only lexically, i.e., to distinguish among completely unrelated words, as seen in example sets (1) and (2), but also morphologically. For example, the replacement of one tone pattern or tone-laryngeal pattern by another one is used to express a variety of morphosyntactic information. One category that is realized by such replacements is verb aspect, as seen in the following examples:

(3) a. \( \underline{ka^{3}r\underline{a^{3}}} \) 'filled'
    b. \( \underline{ka^{3}r\underline{a^{1}5}} \) 'will fill'

(4) a. \( \underline{ki^{3}n\underline{a^{3}5}} \) 'washed'
    b. \( \underline{ki^{2}n\underline{a^{1}h}} \) 'will wash'

My original goal in this study was to analyze tone and laryngeals according to recent developments in phonological and morphological theory within the framework of generative grammar. In particular, I hoped to provide a description of the phonology that would be more than merely observationally adequate, and that would make the statement of the morphological alternations as simple as possible.

As soon as I began to apply generative theory to Copala Trique, however, certain problems emerged. Often some proposed universal simply did not fit the facts of the language, and any attempt to make it fit resulted in a distortion of the facts or a loss of generalization.
Wherever such problems have arisen, I have consistently given a higher value to providing an accurate description of Copala Trique than to supporting some claim made for universal grammar, and I have sometimes suggested modifications in accepted theories based on the facts about Copala Trique. I have taken this position because I have a strong conviction that, in the long run, the goals of universal grammar—and of linguistic theory—are better served by providing adequate descriptions of individual languages than by imposing a universal model on them.

In the remainder of this introduction, I review briefly some of the apparently atypical characteristics of Copala Trique. I cover first the phonology of tone, then the phonology of laryngeals, and finally morphology.

Perhaps the most unusual characteristic of Copala Trique is the fact that it has five contrastive levels of tone. This constitutes a degree of complexity that some linguists have claimed is impossible or unlikely. Evidence in support of the five-level analysis is given in Chapter 4, Section 4.1. Furthermore, even though a number of feature sets have been proposed in the literature to characterize five-level tone systems, none of them captures the relationship among the five levels that I need in order to write certain crucial rules. This problem is discussed in Chapter 4, Section 4.2.

A third unusual aspect of Copala Trique tone is its skewed distribution. In most words, distinctive tone occurs only on the word-final syllable, and the tone of other syllables is predictable from the first
distinctive tone to their right. It is not, however, an exact copy of that tone. Even though there is good reason to claim that tone is autosegmental in this language, the way in which it is distributed does not fit either Pike's original definition of a tone language as one with contrastive tone on each syllable (1948:3-5), or the standard autosegmental method of associating one tone with each vowel, working from left to right (Goldsmith 1976:38, 1979:207). It does, however, fit in certain respects the approach developed by Haraguchi (1977:9-10, 319-48), and largely adopted by Clements and Ford (1979:180-86), in which a language-particular initial tone association rule applies first, after which the universal conventions operate. In other respects, however, Copala Trique conflicts with the approach of Clements and Ford. In Copala Trique, extra tones are associated with vowels that already have a tone associated with them, thus creating contour tones, rather than being left as unassociated floating tones; Clements and Ford (1979:186) make no provision for associating such extra tones.

The above procedures account for the tone of final syllables, but there is still no way to correctly account for the tone of nonfinal syllables within the standard autosegmental framework. In order to provide the correct tone for such syllables, I have found it necessary to posit a tone epenthesis rule that applies after underlying tones are associated. My treatment of tone association is presented in detail in Chapter 4, Section 4.3. The problem is also discussed in Chapter 2, Section 2.1.
Still another unusual fact about Copala Trique tone is the fact that the language has very few productive tone rules. In fact, it has very few segmental rules of the sort that generative phonology was developed to handle, either. This is because it contains very little conventional morphology, in which morphemes come together in agglutinative strings and trigger the operation of regular processes that adjust their shape.

Because there are a number of ways in which tone interacts with postvocalic laryngeals, I have analyzed these laryngeals as part of the tonal tier, rather than as part of the segmental tier, following the approach proposed by Yip (1982). Laryngeals in the onset position, however, show no interaction with tone, and they are assigned to the segmental tier. This problem is discussed in Chapter 2, Section 2.2.

Still another unusual feature of Copala Trique is the existence of a third postvocalic laryngeal, \textsuperscript{\textprime}, which is essentially a ballistic accent. This abstract laryngeal is posited to account for a contrast which, on the surface, appears to be mainly one of vowel length. In Copala Trique, "long" vowels are the unmarked case; they consist of simple vowels, unassociated with any laryngeal, that are phonetically lengthened in word-final syllables. "Short" vowels, on the other hand, consist of simple vowels associated with the abstract laryngeal \textsuperscript{\textprime}, which blocks the application of the lengthening rule and has a variety of other phonetic effects. A defense of this highly unorthodox treatment of a "length" contrast is given in Chapter 5, Section 5.1.
There are two distinct kinds of morphology in Copala Trique. One of these is word-internal morphology, which takes place in the lexicon, before tone association is carried out. The second kind is word-external morphology, which consists of various interactions between a word and a following pronoun.

In order to handle the word-internal morphology of Copala Trique, which consists largely of changes in the laryngeal tier representation, three distinct levels of abstraction are necessary. The first level is morphosyntactic category, for example, potential aspect or denominal adjective; this level relates to the syntax. The third level is morphological rule; at this level the phonological shape of the stem is altered in some specific way to realize the category. Because the mapping relationship between categories and phonological change is fairly complex, however, an intermediate level is needed between the other two, which I call formative. A single formative may realize two or more different categories, and a single category may be realized by a combination of two different formatives. Also, a single formative may comprise several individual morphological rules, and a single rule may belong to two different formatives. This three-level view is described in Chapter 7, especially in Section 7.2.

The need for three levels in Copala Trique shows that the traditional view of the morpheme as a form-meaning composite is inadequate for at least some languages because it assumes too direct a realization of meaning by form. The three-level view is also relevant to the
current controversy as to whether the morpheme should be viewed as a thing or a process. At the category and formative levels, it is easy to conceptualize the entities involved as things, but at the rule level, they are clearly processes.

The morphological structure of Copala Trique is also relevant to certain other questions in the theory of morphology. One of these questions is the place of derivational and inflectional morphology in the grammar. A single formative is used in Copala Trique to create denominal adjectives, which is clearly a derivational process, and to create the possessed form of nouns, which is clearly an inflectional one. If derivation and inflection are assigned to two distinct components of the grammar, there is a loss of generalization. See the discussion in Chapter 7, Sections 7.2 and 7.4. A second question is the place of irregular versus regular inflectional morphology. Because there are various degrees of irregularity, it does not seem useful to assign the two to different levels or components of the grammar.

Word-external morphology comprises two phenomena: tone sandhi and clitic pronouns. In tone sandhi, described in Chapter 8, the tone-laryngeal pattern of words is changed preceding certain pronouns. In clitics, described in Chapter 9, pronouns that are separate syntactic nodes are fused to the end of the preceding word and show up on the surface as a change in the tone-laryngeal pattern of that word. In these two areas, Copala Trique constitutes a strong counterexample to the claims of lexical phonology, as found in Kiparsky (1982), Mohanan
(1982), and Klavans (1983). This theory claims that all processes that require access to morphological information must take place in the lexicon; only exceptionless processes can be postlexical. In Copala Trique, however, both tone sandhi and cliticization are clearly postlexical processes, yet both require access to morphological information.
CHAPTER 2

SOME ISSUES IN WORD STRUCTURE

In this chapter I address certain important issues in the structure of Copala Trique words. The first issue involves the vertical partitioning of the word into such divisions as syllable, and the second involves its partitioning into autosegmental tiers. It is essential to propose a basic analysis in each of these areas before proceeding to a detailed description of various aspects of the phonology in Chapters 3-5, but each area involves a difficult choice between alternative analyses. In Sections 2.1 and 2.2, I discuss each of these divisions in turn, and in Section 2.3, I present a summary of my analysis of the word as a framework for the detailed description given in Chapters 3-5.

In the next two sections, I use a transcription that indicates tone by raised superscript numbers following each vowel. I show the surface tones, omitting only the lowest level of phonetic detail from the transcription at this point. I also show degrees of stress. In the consonants and vowels, however, I use a more abstract representation, in which predictable detail has been eliminated.

2.1 Tone Versus Stress

Copala Trique words have from one to four syllables, though four-syllable words are rare. Words fall into two types, which I call
simple and complex. I discuss the structure of simple words first.

A simple word in Copala Trique has a single primary stress (•), which always falls on the final syllable, as seen in the following examples:

(1) a. \( \text{y}^{3} \) 'palm fiber'
    b. \( \text{n}^{2} \text{t}^{3} \) 'stringbean'
    c. \( \text{ti}^{3} \text{ka}^{3} \text{w}^{3} \) 'killed'

Each syllable of a Copala Trique word has a perceptible pitch. In a simple word, however, only the pitch of the final syllable is distinctive; the pitch of the remaining syllables can be predicted from it. If the final syllable starts at a low pitch level, i.e., at levels 1 or 2, the tone of any preceding syllables will be 2, as seen in the following examples:

(2) a. \( \text{w}^{2} \text{t}^{1} \) 'six'
    b. \( \text{k}^{2} \text{ka}^{2} \) 'will burn'
    c. \( \text{k}^{2} \text{a}^{13} \text{h} \) 'four'
    d. ti\( ^{2} \text{ka}^{2} \text{w}^{13} \) 'will kill'

If, however, the final syllable starts at a high pitch, i.e., at level 3 or above, the tone of any preceding syllables will be 3, as seen in the following examples:

(3) a. \( \text{k}^{3} \text{ra}^{3} \) 'put in'
    b. \( \text{k}^{3} \text{nu}^{31} \) 'exploded'
In addition to carrying both primary stress and distinctive tone, word-final syllables also contain considerably more phonological information of other kinds than nonfinal syllables. This information is found in both nuclei and onsets. I consider nuclei first.

Vowels are specified contrastively for the feature [nasal] only in word-final syllables; example (4) shows a nasalization contrast:

(4) a. \( ka^3\text{nyu}^3 \) 'was punished'  
b. \( ka^3\text{yu}^3 \) 'became sour'

There are three laryngeals that can check a vowel: \( ? \), \( h \), and \( ! \) (an abstract segment that has certain dynamic effects, including shortening the preceding vowel). These laryngeals are limited to final syllables; examples are given in set (5):

(5) a. \( na^3\text{ri}^3 \) 'found'  
b. \( ki^3\text{na}^3h \) 'lay down'  
c. \( ku^3\text{no}^3! \) 'heard'

In onsets, there are also a number of phenomena that are limited to the final syllable. There is a tense-lax opposition in stops and sibilants that occurs only in final syllables; elsewhere, a neutralized set occurs, which I have chosen, with few exceptions, to identify with

c. \( yo^3\text{no}^35 \) 'earth'  
d. \( ka^3\text{no}^43 \) 'grabbed'  
e. \( na^3\text{ru}^3\text{ku}^3? \) 'became wrinkled'
the tense series. Example sets (6) and (7) show the contrast in final syllables, and set (8) shows the neutralized obstruents:

(6) a. \( \text{u}^{3} \text{tu}^{3} \) 'puts down'
    b. \( \text{ru}^{3} \text{da}^{3} \) 'mano' (grindstone)

(7) a. \( \text{l}a^{3} \text{so}^{43} \) 'braid' (Spanish lazo)
    b. \( \text{k}l^{3} \text{zi}^{35} \) 'arrived'

(8) a. \( \text{ta}^{3} \text{nu}^{3} \) 'soldier'
    b. \( \text{se}^{3} \text{e}^{32} \) 'ring'

Affricates occur only in final syllables; examples are given in set (9):

(9) a. \( \text{ka}^{3} \text{zi}^{32} \) 'honey'
    b. \( \text{ka}^{3} \text{zi}^{35} \) 'fever'

There are two laryngeals that occur in onsets, \( \_ \) and \( \text{h} \), and these are limited to final syllables; see the examples in set (10):

(10) a. \( \text{ne}^{3} \text{e}^{3} \text{h} \) 'baby'
    b. \( \text{ta}^{3} \text{ya}^{32} \) 'door'
    c. \( \text{ka}^{3} \text{hwe}^{34} \) 'coffee' (Spanish cafe)

Sonorants, however, occur in both final and nonfinal syllables. Example set (11) shows a nasal in both positions, and set (12) shows a glide:

(11) a. \( \text{ku}^{3} \text{nu}^{3} \) 'fought'
    b. \( \text{na}^{3} \text{r}^{3} \) 'found'
Monosyllabic words show all the contrasts that occur on the final syllable of longer words. In the nucleus, there are contrastive tone, nasalization, and laryngeals, as seen in example sets (13)-(15):

(I write primary stress on monosyllabic words because they are pronounced with it, even in the absence of any other less prominent syllable in the word.) In the onset of monosyllabic words, the tense-lax opposition in stops and sibilants occurs; and affricates, laryngeals, and sonorants all occur there, as seen in example sets (16)-(20):
(17) a. "si\textsuperscript{32}\textsubscript{h} 'leader'
b. "zi\textsuperscript{35}\textsubscript{h} 'arrives'

(18) a. "ci\textsuperscript{1}\textsubscript{h} 'sweet'
b. "zi\textsuperscript{3} 'man'

(19) a. "\textae\textsuperscript{1} 'heavy'
b. "\textnu\textsuperscript{35} 'corn kernels'
c. "\texthi\textsuperscript{34} 'chalk' (Spanish \textgls{gis})

(20) a. "\textna\textsuperscript{31} 'cornfield'
b. "\textyo\textsuperscript{32} 'sugarcane'

It is clear from the above facts that the final syllable is the locus of important phonological information in Copala Trique simple words. It is also clear that a number of important facts are predictable and can therefore be omitted from lexical representations and supplied by a general, though language-particular, rule. One obvious candidate for such omission is stress: it invariably falls on the word-final syllable and can therefore be predicted by rule. Another candidate for omission is the tone level of nonfinal syllables, which is predictable from the first tone level of final syllables. Still a third candidate for omission is the placement of contrastive tone. Given an autosegmental approach to tone, in which tone is on a separate tier from segments, the contrastive tone can be placed on the final syllable by a general, though language-particular, rule, and this placement is
therefore another fact that does not need to be specified in lexical representations.

What is less clear, however, is the relation among these facts. Both the position of primary stress and the placement of tone can be specified in relation to the linear order of syllables. It is possible, however, to account for these facts in at least three ways. One way is to say that stress and tone placement are each independently derived from linear order; this analysis makes the implicit claim that stress and tone placement are related to each other only accidentally. It seems very unlikely that this is the case, however, and so I will limit the discussion to two other possibilities that seem inherently more plausible. One is that stress is predictable from linear order, and that tone placement is based on stress. The other is that tone placement is predictable from linear order, and that stress follows from tone placement. Either analysis is observationally adequate in the case of simple words. In order to choose between them, it is necessary to consider complex words, including certain morphological alternations involving them.

Complex words comprise fewer than twenty percent of the polysyllabic words in the Copala Trique lexicon. Etymologically, they are usually compounds or Spanish loanwords. Like simple words, complex words contain a final syllable that bears primary stress, contrastive tone, and the full range of other contrasts described above. Complex words also contain one nonfinal syllable that bears secondary stress
and/or nonpredictable tone. The stress- or tone-bearing nonfinal syllable does not, however, permit the other contrasts found in final syllables: they do not show a contrast between tense and lax obstruents, nor do they contain affricates, laryngeals, or nasalized vowels.

I consider first complex words that contrast with simple words only in stress. The (a) part of the following examples contains a complex word, and the (b) part contains a phonetically similar simple word; the complex word is distinguished by the presence of secondary stress (\(\dagger\)):

\[(21)\]

\begin{align*}
\text{a. } & 'y\hat{a}a^{n}ta^{35} & \text{ 'six more'} \\
\text{b. } & ya^{35}ta^{35} & \text{ 'foam'}
\end{align*}

\[(22)\]

\begin{align*}
\text{a. } & 'ya^{35}nu^{35}h & \text{ 'three more'} \\
\text{b. } & ya^{35}nu^{35}h & \text{ 'manure'}
\end{align*}

Other complex words contrast with simple words only in the number of syllables that bear distinctive tone, not in stress. The (a) part of the following examples shows a complex word that contains a tone on the penultimate syllable that cannot be predicted from the tone of the final syllable, and the (b) part shows a similar word with a predictable tone on the penultimate syllable; these examples involve two different aspects of a single verb:

\[(23)\]

\begin{align*}
\text{a. } & ka^{n}ra^{35} & \text{ 'will cover'} \\
\text{b. } & ka^{35}ra^{35} & \text{ 'covered'}
\end{align*}
Still other complex words contrast with simple words both in stress and in tone. Again, the (a) part of the following examples shows a complex word, and the (b) part shows a similar simple word:

(25) a. 're'\textsuperscript{3}\textsubscript{w}t'o\textsuperscript{2}! 'blanket'
   b. ko\textsuperscript{2}"t'o\textsuperscript{2}! 'will become moldy'

(26) a. 'sno\textsuperscript{35}\textsuperscript{w}t'o\textsuperscript{32}! 'man (man speaking)'
   b. no\textsuperscript{3}\textsubscript{w}t'o\textsuperscript{32}! 'man (woman speaking)'

Some complex words have more than two syllables. In such cases, the location of the nonfinal syllable that bears secondary stress and/or contrastive tone is not predictable. In a three-syllable word, it may fall on either the first or the second syllable. If it falls on the first syllable, the tone of the second syllable is predictable from the tone of the final syllable, as described above for simple words; this is seen in example (27):

(27) a. 'ka\textsuperscript{3}n\textsuperscript{2}i\textsuperscript{2}"k\textsuperscript{1}h 'turned'
   b. 'na\textsuperscript{3}ra\textsuperscript{2}"\textsuperscript{13}a 'got married'

If a three-syllable word has secondary stress and/or contrastive tone on the second syllable, the tone of the first syllable is predictable from the tone of the second syllable, not from the tone of the final
syllable, as seen in example set (28):

(28) a. ku'li3"le32' 'a cricketlike insect'
b. ka3'ra35"ce32' 'sighed'
c. ka ra2"ce32' 'will sigh'

A few words in the language have four syllables; all are complex. In those I have recorded, the nonfinal syllable that bears secondary stress and/or contrastive tone always happens to be the second one. I assume, however, that this is an accidental restriction that results from limited data, rather than a structural limitation of the language, because there is no constraint against two adjacent syllables with stress or contrastive tone, as seen in (28), nor against two adjacent syllables that do not bear stress or contrastive tone, as seen in (1c), (2d), and (3e). In four-syllable words the tone of the first syllable can be predicted from the tone of the second one, and the tone of the third syllable can be predicted from the tone of the fourth (final) one, as seen in example set (29):

(29) a. ka3'ra35"ya2"13' 'made a fuss over'
b. tu3'kwa3ni2"ka1' 'caused to turn'

To summarize the above description, complex words are characterized by having two special syllables, the final syllable and one nonfinal syllable, but the location of the nonfinal syllable that is special cannot be predicted by a simple rule. In this it is unlike
the final syllable, which, of course, can be. The tone of a syllable that is not special can, however, invariably be determined from the tone of the nearest special syllable to its right.

I return now to the question of whether tone placement or stress placement should be considered to be the primary organizing principle of the language. On the surface, the evidence is mixed: some complex words are characterized only by extra stress, some only by unpredictable tone, and some by both. It seems desirable, however, to attempt to make one basic and to derive the other from it. I consider each alternative below.

If stress is basic, then Copala Trique words can be considered to have a metrical structure in which simple words contain a single foot, and complex words contain two feet. Two kinds of information are needed to determine stress and tone placement. First, the location of foot boundary must be included as part of the lexical representation of complex words. Also, there is a language-particular principle that the metrically strong (s) node invariably occurs to the right of the weak (w) one. From this information, stress can be placed on the final foot (F) of each word (W), and on the final syllable (S) of each foot. Contrastive tone can then be placed on the stressed syllables. The two following trees show how such an analysis would work:
There are a number of advantages to such an analysis. First, by positing a foot level, the location of secondary stress becomes as predictable as the location of primary stress: both fall on the final syllable of the metrical domain. And second, there is a phonetic rationale for allowing a stressed syllable to contain more phonological information than an unstressed syllable, because it is more prominent.

There are also some disadvantages to a metrical analysis, however. First, not every special nonfinal syllable has a secondary
stress; some have only a break in the predictability of tone, as seen in examples (23a), (24a), and (28c). It turns out that all of these have tone 2, while the special syllables that have a clear secondary stress all have a higher tone, and so this is not an insuperable problem: it would be possible to posit a late rule that deleted stress on nonfinal syllables with tone 2. There is, however, a second problem with this analysis. Copala Trique has a number of morphological processes involving tone; there are rules that insert, delete, and replace tones, sometimes to realize some morphosyntactic category, such as potential aspect (see Chapter 7, Section 7.3), and sometimes as an automatic consequence of an immediately following pronoun (see Chapter 5, Section 8.2). These morphological processes sometimes turn a complex word into a simple word, or a simple word into a complex word. In the following example, which shows the completive and potential aspect forms of a single verb, a tone replacement (which could also be viewed as a tone deletion) turns a complex word into a simple one:

(32) a. $\text{nə}^2\text{rə}^2\text{rə}^1\text{a}^3$ 'got married'
b. $\text{na}^2\text{rə}^2\text{rə}^1\text{a}^3$ 'will get married'

In the next example, the tone replacement conditioned by the pronoun $\text{zo}^1$ 'second person singular' creates a break in tone within the word and therefore turns a simple word into a complex one:

(33) a. $\text{ka}^2\text{rə}^1\text{a}^3$ 'will fill'
b. $\text{ka}^2\text{rə}^3\text{rə}^1\text{a}^1$ 'you will fill'
In a metrical analysis, it is necessary to coalesce two feet into one as a consequence of the tone replacement for potential aspect, and to divide one foot into two as a consequence of the tone raising before pronouns. This involves either building the metrical change into the tone rules or adding extra rules. Either alternative complicates the analysis considerably.

The alternative to an analysis that gives priority to stress is one that gives priority to tone placement. The placement of contrastive tone in simple words is accomplished by a language-particular initial tone association rule that associates the first underlying tone with the vowel of the final syllable, which is the primary tone-bearing unit of Copala Trique. The second tone, if there is one, is associated with the same vowel by the universal convention that association lines do not cross. The placement of contrastive tone in nonfinal syllables, because it is not predictable, is accomplished by having one or two linked tones as part of the lexical representation. The presence of the linked tone(s) indicates the somewhat marked status of complex words. Stress placement is accomplished by rules based on tone placement. One rule places primary stress on the final tone-bearing syllable of a word, and the other places secondary stress on any remaining tone-bearing syllable that has tone level 3, or a higher level, in it. This explains the lack of stress on syllables with nonpredictable tone 2, as in examples (23a), (24a), and (28c). The complex words that, on the surface, are characterized by having secondary stress, but not a nonpredictable tone, such
as (21a) and (22a), can also be handled easily in a tone-based analysis. Such words are analyzed as having a nonfinal syllable with lexically linked tone, which conditions the placement of secondary stress, even though the lexically linked tone does not differ in pitch from the predictable tone that would be otherwise supplied on such a syllable. For examples of lexical representations employing linked tones, see Section 2.3, and for a detailed description of tone association, including sample derivations, see Chapter 4, Section 4.3.

The chief disadvantage of a tone-based, rather than a stress-based, analysis is that it does not provide a principled explanation for the fact that so much of the phonological information in the word is packed into the final syllable. Even though this fact is tied to stress historically (cf. Rensch 1976:11), tone placement seems to be more important than stress synchronically. I therefore use a tone-based analysis in the remainder of this study.

2.2 A Laryngeal Tier Versus a Tonal Tier

In classical generative phonology, as presented in Chomsky and Halle (1968), all phonological features, including tone, are viewed as properties of individual segments. A theory of tone using this approach was developed in detail by Woo (1969). Beginning with Williams' work on Margi and Igbo in 1971, which was published in 1976, and Leben's dissertation in 1973, however, there has been a return to the position originally developed by Pike (1945, 1948) that tone is a suprasegmental phenomenon, rather than a segmental one. Most recent work on tone
within generative phonology has been carried out within the suprasegmental framework known as autosegmental phonology, which was originally proposed by Goldsmith (1976). In this theory, tones are placed on a separate tier from consonants and vowels, and the two tiers are associated by a set of conventions that are largely universal.

In Copala Trique, there is good reason to favor the autosegmental analysis of tone, rather than the segmental analysis. Probably the best argument for this position is the fact that sequences of two tones occur on single vowel segments, as seen in the following example set:

\[
\begin{align*}
(34) & \quad a. \overbrace{\text{ka}^2}^{\text{ra}^{13}} & \text{will fill}' \\
& \quad b. \overbrace{\text{ka}^3}^{\text{nu}^{31}} & \text{exploded}' \\
& \quad c. \overbrace{\text{ka}^3}^{\text{yu}^{32}} & \text{became sour}'
\end{align*}
\]

It is not possible to reduce any of these sequences to single tones at the underlying level because there is a clear contrast between each sequence and the tones that enter into it, as seen in the following examples:

\[
\begin{align*}
(35) & \quad a. \overbrace{\text{ka}^3}^{\text{yu}^{32}} & \text{became sour}' \\
& \quad b. \overbrace{\text{ka}^2}^{\text{yu}^2} & \text{will become sour}' \\
& \quad c. \overbrace{\text{ka}^3}^{\text{yu}^3} & \text{spilled}' \\
& \quad d. \overbrace{\text{ka}^2}^{\text{yu}^{13}} & \text{will spill}'
\end{align*}
\]

\[
\begin{align*}
(36) & \quad a. \overbrace{\text{ka}^3}^{\text{nu}^{31}} & \text{exploded}' \\
& \quad b. \overbrace{\text{ka}^2}^{\text{nu}^1} & \text{will explode}'
\end{align*}
\]
(There are, however, three other phonetic tone sequences, 34, 43, and 35, that I treat as single tones at the underlying level; this is discussed in Chapter 4, Section 4.1.) Furthermore, there is no basis, either phonetic or structural, for claiming that the vowels that bear tone sequences are geminate at the underlying level. Such vowels have the same duration as vowels that bear level tones, and they pattern in every way as single segments. The tone sequences, on the other hand, pattern as clusters of two tones because the first one is often inserted or deleted to signal potential aspect (and certain other morphosyntactic categories as well), as seen in examples (35) and (36).

Tone is not the only aspect of phonological structure for which an autosegmental analysis has been proposed. For example, nasality has been treated autosegmentally in Guaraní (Goldsmith 1976) and Gokana (Hyman 1982), vowel harmony has been treated autosegmentally in Akan (Clements 1981a) and Ogori (Chumbow 1982), and Semitic morphology has been treated autosegmentally by McCarthy (1981). None of these approaches seems relevant for Copala Trique. There is, however, one recent proposal that seems to be highly relevant to Copala Trique, namely, Yip's intriguing claim that laryngeal consonants should be placed on the same tier as tone (1982). Before considering this approach in detail, however, it is necessary to discuss briefly the criteria that form the basis for autosegmentality.
It seems clear that the most important one is autonomy. The phonological material that is placed on a separate tier should exhibit significant interaction with material on its own tier, and a minimum of interaction with material on other tiers. It is not necessary that there be no cross-tier interaction. That is almost certainly too strong a requirement for any natural language to meet; see Clements and Ford (1979:180). We are probably justified in positing a separate tier if the statement of alternations and phonotactic constraints is significantly simplified by doing so, even if there should remain a residue of cross-tier rules and constraints.

It is important to point out that the autonomy criterion is phonological, rather than phonetic. It would be possible, for example, to posit a laryngeal tier that is based solely on articulatory activity in the larynx. According to such a definition, voicing would be part of this tier. In that voicing in Copala Trique (and in English) is clearly a property of segments and is quite unrelated to the tone (or intonation) system, there are no structural advantages to be gained by assigning voicing to the laryngeal tier. Of course, the rejection of purely phonetic criteria, such as this absolute cavity hypothesis, means that the composition of tiers must be defined separately for each language.

A second criterion for autosegmentality is that the association between the tiers should be more than a simple one-to-one mapping in at least some cases, as seen in the examples of tone sequences on simple vowels given above. Nevertheless, the relation between the tiers should
be easy to state using the conventions of autosegmental phonology, augmented by a minimum of language-particular principles.

There are undoubtedly other criteria, but these two provide a sufficient basis for the evaluation of alternative proposals involving a laryngeal tier in Copala Trique. I consider three alternatives: first, that only tone should be on an autosegmental tier; second, that laryngeals in postvocalic position should be on the same tier as tone; and third, that all laryngeals, whether in onset position or in postvocalic position, should be on the same tier as tone.

In the light of the autonomy criterion, there is solid evidence for placing tone on a separate tier, and also fairly solid evidence for placing postvocalic laryngeals on the same tier. There are problems, however, with onset laryngeals.

In Copala Trique, tone shows no systematic interaction with any other element in the phonology except postvocalic laryngeals. There are no distributional restrictions between any tone level or sequence and any consonant, vowel, or onset laryngeal; see Tables 9-11 in Chapter 4, Section 4.4. Nor are there any alternations involving tone and any of these categories. There are, however, a number of ways in which tone interacts with postvocalic laryngeals.

First, there are certain phonotactic constraints between tones and postvocalic laryngeals. Tone level 4 does not precede h, sequences 31 and 32 do not precede ʔ, and level 5 and sequence 31 do not precede ʔ.
Second, there exist morphological alternations in which potential aspect and certain other categories are realized by tone replacement rules (see Chapter 7, Sections 7.3 and 7.4). These rules also sometimes insert or delete a postvocalic ʰ, as seen in the following examples, but they never involve any other "segmental" material:

\[
\begin{align*}
(37) \text{ a. } &\text{ ki}_3^n\text{na}_3^{35} & \text{ 'washed'} \\
&\text{ b. } &\text{ ki}_2^n\text{na}_1^{1h} & \text{ 'will wash'} \\
(38) \text{ a. } &\text{ ki}_3^n\text{ra}_3^{35}\text{h} & \text{ 'bought'} \\
&\text{ b. } &\text{ ki}_2^n\text{ra}_2^{2} & \text{ 'will buy'} \\
\end{align*}
\]

Third, there are tone sandhi rules (see Chapter 8, Section 8.2) that raise some stem tone patterns preceding certain pronouns, as seen in example (39). If the stem has a postvocalic ʰ, however, the ʰ is lost, and the tone is raised further, as seen in (40).

\[
\begin{align*}
(39) \text{ a. } &\text{ ka}_3^n\text{ra}_3^{3} & \text{ 'filled'} \\
&\text{ b. } &\text{ ka}_3^n\text{ra}_1^{4} & \text{z}_0^{1'} & \text{ 'you filled'} \\
(40) \text{ a. } &\text{ ki}_3^n\text{na}_3^{3h} & \text{ 'was lying down'} \\
&\text{ b. } &\text{ ki}_3^n\text{na}_3^{5} & \text{z}_0^{1'} & \text{ 'you were lying down'} \\
\end{align*}
\]

These sandhi rules do not affect any other "segments" of the word.

Fourth—and finally—there are two clitic pronouns whose lexical representations consist solely of a postvocalic laryngeal (see Chapter 9, Section 9.3.1). These pronouns attach to a preceding stem by
interacting with the postvocalic laryngeal, if any, of the stem, and with the tone of its final syllable, as seen in (41)-(43):

(41) a. $\text{ra}_3\text{na}_3$ 'hand of'
b. $\text{ra}_3\text{na}_4$ 'our hands'

(42) a. $\text{ka}_3\text{no}_3\text{ko}_3$ 'followed'
b. $\text{ka}_3\text{no}_3\text{ko}_3\text{h}$ 'I followed'

(43) a. $\text{ki}_3\text{ya}_3\text{h}$ 'made'
b. $\text{ki}_3\text{ya}_3\text{h}$ 'I made'

These clitic pronouns show no interaction with other "segments" of the word.

All of the above interactions between tone and laryngeals strongly suggest that postvocalic laryngeals should be placed on the same tier as tone. If this is done, it then becomes possible to state that tone is completely autonomous from the segmental tier. At the same time, however, it becomes necessary to examine the autonomy of the new, combined tone-laryngeal tier by seeing whether postvocalic laryngeals show autonomy with respect to the segmental tier. It turns out that, with a single exception, they do. The postvocalic laryngeals ? and h show no distributional restrictions whatever with respect to any material on the segmental tier, nor do they enter into significant alternations with such material. The laryngeal 1, however, shows one significant restriction with respect to the segmental tier; it does not
check high vowels. If postvocalic laryngeals are on the tonal tier, this is a cross-tier constraint, and it is therefore more costly to state than if postvocalic laryngeals are on the segmental tier. When this single constraint is weighed against the many rules and constraints in which postvocalic laryngeals interact with tone, however, it seems preferable to place postvocalic laryngeals on the tonal tier.

If postvocalic laryngeals are placed on the tonal tier, the question then arises as to whether or not onset laryngeals should also be placed there. The laryngeal ŋ does not occur in onsets, but h occurs there occasionally in Spanish loanwords, and ŋ occurs there commonly in native words. Both h and ŋ occur there either alone or together with another consonant; ŋ sometimes occurs with two other consonants. Example sets (44) and (45) show onset h and ŋ, respectively:

(44) a. \(\text{te}^3\text{n} \text{ha}^{43} 1\) ‘roof tile’ (Spanish teja)
    b. \(\text{ka}^3\text{n} \text{he}^{34} 1\) ‘coffee’ (Spanish café)

(45) a. \(\text{ne}^3\text{n} \text{e}^{3} 1\) ‘knows’
    b. \(\text{ta}^3\text{n} \text{lu}^{35} 1\) ‘malaria’
    c. \(\text{ka}^3\text{n} \text{nga}^{32} 1\) ‘was born’

The laryngeals in examples (44) and (45) must be assigned to the onset of the final syllable, rather than to the nucleus of the penultimate syllable, because such laryngeals also occur at the beginning of monosyllabic words, as seen in example set (46):
Onset \( \text{h} \) shows somewhat more oral friction accompanying its articulation than postvocalic \( \text{h} \), while onset and postvocalic \( \text{?} \) are phonetically very similar. The phonetic differences between the two positions are well within the range typically considered allophonic, however, and so onset and postvocalic laryngeals could be considered to be positional variants of the same phonemes. It certainly seems desirable to place all instances of a phoneme on the same tier, and therefore, on phonetic grounds, onset laryngeals appear to belong on the tonal tier along with their postvocalic counterparts.

By the autonomy criterion, however, there is more reason to place onset laryngeals on the segmental tier than on the tonal tier. Onset laryngeals show no significant interactions with either tone or postvocalic laryngeals, whereas they show a number of interactions with segments. There are no systematic phonotactic constraints between onset laryngeals and tone or postvocalic laryngeals; see Table 10 in Chapter 4, Section 4.4, and Table 15 in Chapter 5, Section 5.5. There are, however, various constraints between onset laryngeals and segments. One of the most important ones is that onset laryngeals can occur in a cluster only if the following segment is a sonorant; see examples (44b), (45b), and (45c) above.
Furthermore, onset laryngeals do not enter into any alternations with tone or postvocalic laryngeals. In fact, their presence on the tonal tier makes the analysis more complicated. For example, the predictable tones on most nonfinal syllables can be generated by an epenthesis rule on the tonal tier. If onset laryngeals are assigned to the tonal tier, it is necessary to include an optional onset laryngeal in the environment of the rule so that it can generate the tone for the (b) and (c) parts of example set (47):

$$(47) \begin{align*}
\text{a. } & \text{ti}^2\text{ka}^2\text{wi}^{13} \quad \text{'will kill'} \\
\text{b. } & \text{ke}^2\text{ne}^2\text{e}^{13} \quad \text{'will see'} \\
\text{c. } & \text{ti}^3\text{ka}^3\text{mi}^{32} \quad \text{'knocked'}
\end{align*}$$

These examples illustrate the fact that onset laryngeals do not constitute any sort of barrier to tonal influence in Copala Trique. (A second example is discussed in Chapter 7, Section 7.3.) If onset laryngeals were on the tonal tier, we might expect them to constitute such a barrier.

On the grounds of autonomy, therefore, it turns out that the evidence favors placing onset laryngeals on the segmental tier, even though postvocalic laryngeals are on the tonal tier.

The second criterion for autosegmentality to be discussed is association: if laryngeals are placed on the tonal tier, can they be associated with the segmental tier in a way that is not invariably a one-to-one mapping and that does not require complex language-particular
association conventions? By this criterion also, postvocalic laryngeals can easily be placed on the tonal tier, but onset laryngeals are easier to describe if they are assigned to the segmental tier.

Before considering the association of laryngeals, it is necessary to consider tone association. In complex words, the leftmost tone or tones are lexically linked to a nonfinal vowel, and the remaining tone or tones are not. In both simple and complex words, therefore, there are one or two unassociated tones that form part of each lexical representation. A language-particular initial tone association rule associates the first unassociated tone in the representation with the final vowel. The second unassociated tone, if there is one, is also associated with the final vowel, but no language-particular rule is needed to accomplish this; it falls out naturally from the universal convention that association lines do not cross.

If postvocalic laryngeals are placed on the tonal tier, the lexical representations of some words will contain a laryngeal following the last tone. This laryngeal, like the second tone, is associated with the final vowel by the universal convention that prohibits crossing association lines. The association process is described in detail in Chapter 4, Section 4.3, and in Chapter 5, Section 5.3; sample derivations are included in these sections.

Note that, for both tone alone, and for tone plus postvocalic laryngeals, the two association criteria are met. First, the mapping is not one-to-one because from one to three tonal tier segments are
associated with a single vowel on the segmental tier. Second, only one language-particular rule is needed.

The question of associating laryngeals with vowels is perhaps unorthodox enough to merit further discussion. In one sense, laryngeals are quite unlike tones. Tones can be articulated simultaneously with a vowel, whereas laryngeals stop the articulation of a vowel. Post-vocalic \( \tilde{n} \) and \( h \), however, are realized partly by a creaky (laryngealized) or breathy (murmured) portion at the end of the vowel, and \( i \) is realized entirely by its effect on the vowel (and sometimes on the onset consonant). It is therefore less arbitrary than it might seem at first to claim that postvocalic laryngeals are associated with vowels. Furthermore, if postvocalic laryngeals are not placed on the tonal tier and associated with vowels, it would be necessary to place them on the segmental tier, where they would be the only postvocalic consonants in the language. It would therefore be necessary to posit a special position in syllable structure, such as a coda or margin, in which to place them.

If laryngeals in onset position are placed on the tonal tier, however, the procedures for associating them with the segmental tier are quite complex and require a number of language-particular conventions. Onset laryngeals may be the only element in the onset of a word-final syllable, or they may precede a sonorant or an \( ng \) sequence, as shown in example sets (44) and (45). In no case, however, do onset laryngeals occur simultaneously with other segments; they invariably occur in
sequence with them. In order to properly handle the ordering of onset laryngeals at the beginning of the word-final syllable, the following special conventions are needed. First, it is necessary to specify these laryngeals within the tonal tier as those that are followed by some tone, to distinguish them from postvocalic laryngeals. Second, it is necessary to associate them with the word-final syllable, not with some earlier syllable. And third, they must be placed at the beginning of the syllable. If, however, onset laryngeals are on the segmental tier, then the facts about their ordering can be expressed simply as constraints on consonant clusters.

I conclude, therefore, on the basis of both autonomy and association, that onset laryngeals should be treated as ordinary consonants on the segmental tier, while postvocalic laryngeals should be treated as elements on the tonal tier. In certain respects, this conclusion is not totally satisfactory. Perhaps the language is in a transition period between two different tier structures. Nevertheless, in accord with this conclusion, I refer to the laryngeal tier, rather than the tonal tier, in the remainder of this study, and to nuclear, rather than postvocalic, laryngeals.

This brings us back to the issue of whether onset ꞑ and ꞑ are the same phonemes as nuclear ꞑ and ꞑ, a question that is not easy to resolve. It is parallel in some respects to the relationship between the high vowels ꞑ and ꞑ and the high glides ꞑ and ꞑ. These sounds differ only in their value for the major class feature [syllabic], a feature
that is used mainly to indicate distribution within the syllable, but they are usually treated as different phonemes. In this study, I adopt a similar position and treat the laryngeals as different sounds in the two positions. I distinguish the two kinds of laryngeals in the unilinear transcription system that I use by writing the onset laryngeals on the line and raising the nuclear laryngeals to superscript position. I also use different feature specifications for the two kinds of laryngeals. For the onset laryngeals, I use the specification provided by Chomsky and Halle (1968). For the nuclear laryngeals, I use the features \([\text{SPREAD}]\) from Halle and Stevens (1971) and \([\text{HEIGHTENED SUBGLOTTAL PRESSURE}]\) \((\text{HSP})\) from Chomsky and Halle (1968:321, 326). I also use the features \([\text{segmental}]\) and \([\text{GLOTTAL}]\) as major class features to define the laryngeal tier. Elements on the segmental tier are \([+\text{segmental}]\), and elements on the laryngeal tier are \([-\text{segmental}]\). Within the laryngeal tier, laryngeals are \([+\text{GLOTTAL}]\), and tones are \([-\text{GLOTTAL}]\). (Features written in capital letters are restricted to the laryngeal tier.) See Chapter 5, Section 5.2, for a discussion of these features.

The problems encountered in placing word-medial \(\_\) and \(h\) on the same tier as tone in Copala Trique raise interesting questions for linguistic theory. Does tone move or associate across laryngeals freely in other languages, or do laryngeals create a tonal barrier of some sort? Does the answer to this question vary from language to language, depending on the position of the laryngeal in the syllable or word? If laryngeals constitute a barrier, there is good reason to place them on
the same tier as tone, but if they do not, a laryngeal tier analysis is likely to encounter problems with the universal convention of autosegmental phonology that association lines do not cross (Goldsmith 1976:36, 1979:207). Unfortunately, Yip (1982) did not deal with this problem in her article.  

2.3 An Overview of Word Structure

In this section I summarize the conclusions reached in the preceding two sections by providing an overview of the underlying representations of Copala Trique words. My goal in doing this is to provide a framework into which the detailed description provided in Chapters 3-5 can be placed.

Copala Trique words are structured into two tiers: the segmental tier and the laryngeal tier. The segmental tier includes vowels and consonants (including onset laryngeals), and these sounds are organized into syllables. The laryngeal tier includes tones and nuclear laryngeals. These sounds are not organized into syllables, but are instead associated with vowels on the segmental tier. In this section I use a transcription system that shows underlying representations, rather than surface forms. Each tier is displayed on a separate line, and stress and predictable tones are not indicated.

On the segmental tier, words consist of one to four syllables. There are two kinds of syllables. The more common kind consists of an onset, which contains from one to three consonants, and a nucleus, which contains a single vowel. The second kind of syllable consists only of a
nucleus. Syllables that contain an onset may occur in any position in the word, as seen in example set (48), but syllables that contain only a nucleus may occur only in word-initial and word-final positions, as seen in example set (49):

(48) a. 30 'is wrinkled'
 naruku

b. 31h 'caused to turn'
 tukwanika

(49) a. 31h 'turns'
 anika

b. 3h 'stone'
 vai

The distribution of these syllable types in the word can be captured by the following template, in which O represents the onset, and N represents the nucleus:

(50) ((0)N(0N)²)(0)N

In order to state the distribution of vowels and consonants, it is necessary to refer to both the syllable level and the word level. At the syllable level, the nucleus position contains only vowels, and the onset position contains only consonants. At the word level, the final
syllable shows a greater range of contrasts than other syllables. Underlying nasalized vowels are restricted to the nucleus position of final syllables, and affricates, onset laryngeals, and the tense-lax opposition in obstruents are restricted to the onset position of final syllables. Examples showing these contrasts in final syllables have been given in Section 2.1.

The laryngeal tier representation of Copala Trique words consists of a patterned sequence of tones (T) and laryngeals (L), as shown in the following template:

\[
\begin{array}{c}
T(T)T(T)(L) \\
(51)
\end{array}
\]

The first two tones, which are optional, are lexically linked to a vowel; the presence of a linked tone defines a complex word. The remaining elements in the representation are unassociated with the segmental tier at the underlying level. They are associated by rules at an early stage of the derivation. The first unassociated tone is obligatory. It is invariably associated with the vowel of the word-final syllable, which is the primary tone-bearing unit in Copala Trique, by a language-particular initial tone association rule. The second tone and the laryngeal are optional; they are invariably associated with the final vowel by the universal convention of autosegmental phonology that forbids association lines to cross (Goldsmith 1976:36, 1979:207).

Example set (52) shows simple words with different combinations of
elements from the laryngeal tier, and example set (53) shows complex words:

(52) a. 3  'filled'
       kara

b. 3 2  'burned'
       kaka

c. 3 2  'found'
       nari

d. 1 3 2  'will follow'
       kaneko

(53) a. 3 1  'corn fodder'
       ko?yo

b. 3 1 3  'got married'
       nara?a

c. 3 3 2  'jail'
       taga

d. 3 1 3 h  'shoe'
       kanu
Following tone association, Copala Trique words undergo two stress rules, one of which places primary stress on the final syllable, which is the primary tone-bearing unit, and the other of which places secondary stress on a vowel that is lexically linked to a tone that is at level 3 or higher. Following stress assignment, there is an epenthesis rule that creates a tone with which the remaining vowels can be associated, and also two rules that create surface tone sequences from underlying level tones. The association process for tone is described in detail in Chapter 4, Section 4.3, and the association of laryngeals is described in Chapter 5, Section 5.3; sample derivations are included in these sections.

Even though there are two distinct tiers in Copala Trique, I use a unilinear transcription in the remainder of this study to save space, except when the autosegmental analysis is in focus. In this transcription, a lexically linked tone is written as a superscript number following the vowel to which it is linked, and all other laryngeal tier material is written as a superscript at the end of the word, i.e., after the final vowel. Such a system contains no ambiguities. The words given in example sets (52) and (53) would be rewritten in the unilinear system as (52') and (53'):

\[(52')\]
\[
a. \ kara^3 \quad \text{'filled'} \\
b. \ kaka^{32} \quad \text{'burned'} \\
c. \ nari^{3} \quad \text{'found'} \\
d. \ kanoko^{13} \quad \text{'will follow'}
\]
(53') a. ko^3\text{yo}^1 \quad \text{'corn fodder'}
b. na^3\text{ra}^3^3^3\quad \text{'got married'}
c. ta^3\text{ga}^3\quad \text{'jail'}
d. ka^3\text{nu}^1^3^h\quad \text{'shoe'}
NOTES FOR CHAPTER 2

1. Metrical phonology is a theory that views language as rhythmically structured because it is temporally ordered. It was originally developed to handle the relation of intonation to segmental material, and the assignment of stress. One of its chief mechanisms is the use of binary branching trees that define relative prominence. For a general introduction to this theory, see Liberman (1975), Liberman and Prince (1977), and Hayes (1981). The notion of a foot level, as distinct from word, was developed by Selkirk (1980) to handle secondary stress in English. Metrical theory is in many respects parallel to the view developed by Pike (1967:290-423), who insisted that hierarchical structure in phonology must be distinguished from syntactic constituent structure.

2. Yip leaves many details of her laryngeal tier proposal unexplored in the 1982 article. For example, she does not relate it to her earlier claim that tone alone should be divided into two separate tiers (1980:195-97). Also, the examples in the 1982 article show no word-medial laryngeals, and so there is no evidence in it to bear on the question of onset laryngeals in Copala Trique. There is, however, one intriguing suggestion in her article that I considered, but did not adopt in this study, namely, the notion that voiceless stops are associated with a ? on the laryngeal tier. I considered an analysis in which ? was used to carry the tense-lax opposition in obstruents; the tense
member of each pair would be considered to be associated with ?, while
the lax member would be a simple obstruent. Such an analysis is attrac-
tive in certain ways, but it introduces at least as many complications
as it resolves.

3. This study is limited to the word level; I do not discuss
the structure of phonological phrases or other higher-level units. Fur-
thermore, two kinds of words are omitted from consideration. One of
these is vocatives, which occur alone, sentence-initial, or sentence-
final. They are always separated from the rest of the sentence by
pause. The second is sentence-final particles (see Chapter 6, Section
6.1), which are always followed by pause or by a vocative. Both of
these word types differ in certain respects from the analysis presented
in this study.
CHAPTER 3

THE SEGMENTAL TIER

In this chapter I describe the vowels and consonants of Copala Trique. Because the focus of this study is the laryngeal tier, rather than the segmental tier, however, my treatment of segments is somewhat brief.

3.1 Vowels

There are ten vowels in Copala Trique. They fall into two series, oral and nasalized, each with five distinct tongue positions: ñ, ñ, ñ, ñ, ñ; ç, ñ, ñ, ñ, ñ. The following minimal sets show each oral vowel in contrast with the vowels nearest to it:

(1) a. ni₃₁
   b. ne₃₁
   'at night'
   'flesh'

(2) a. ñe₅
   b. ña₅
   'ear of'
   'back of'

(3) a. ña₇
   b. ño₇
   c. ñu₇
   d. ñ₃
   'tiny ticks'
   'tump line'
   'resentment'
   'intestines of'

45
The next set of examples shows each nasalized vowel in contrast with its oral counterpart:

(4) a. \( \text{kac} \tilde{\text{i}} \text{3}^\text{2} \) 'buried'
b. \( \text{kac} \tilde{\text{i}} \text{3}^\text{2} \) 'fever'

(5) a. \( \text{ste} \text{4}^\text{1} \) 'fingernail of'
b. \( \text{kaste} \text{4}^\text{1} \) 'oil' (Spanish aceite)

(6) a. \( \text{ria} \tilde{\text{s}} \text{3}^\text{2} \) 'face of'
b. \( \text{ria} \tilde{\text{s}} \text{3}^\text{2} \) 'bamboo'

(7) a. \( \text{to} \text{3}^\text{2} \) 'blood'
b. \( \text{to} \text{3}^\text{2} \) 'metate'

(8) a. \( \text{ayu} \text{3}^\text{2} \) 'is punished'
b. \( \text{ayu} \text{3}^\text{2} \) 'becomes sour'

Contrast among the five nasalized vowels is more difficult to establish because, for many speakers, the mid vowels ə and õ are in complementary distribution with their high counterparts i and ü: the mid vowels occur only associated with the nuclear laryngeal ɬ, and the high ones never do. Example set (9) shows nasalized vowels associated with ɬ:

(9) a. \( \text{də} \text{3}^\text{2} \) 'roasting ear'
b. \( \text{dα} \text{3}^\text{2} \) 'this (in certain frozen phrases)'
c. \( \text{tø} \text{3}^\text{2} \) 'blood'
Example set (10) shows nasalized vowels in other environments:

(10) a. \( \text{kāči}^2 \) 'wheel'
    b. \( \text{nučā}^3 \) 'pimple'
    c. \( \text{kūčū}^3 \) 'was stiff'

For some speakers, however, \( \text{ê} \) and \( \text{ô} \) occur in Spanish loanwords with no \( \text{ê} \), where they contrast with \( \text{i} \) and \( \text{u} \), as seen in (11) and (12):

(11) a. \( \text{tre}^4 \) 'train' (Spanish tren)
    b. \( \text{kārī}^2 \) 'rumbled'

(12) a. \( \text{karto}^4 \) 'box' (Spanish cartón)
    b. \( \text{itū}^3 \) 'wild pineapple'

These vowels are displayed in a traditional vowel chart format in Table 1, and their feature specification is given in Table 2. Vowels are distinguished from all other sounds on either tier by a positive value for the major class feature [syllabic]. They are distinguished among themselves by the features [high], [low], [back], and [nasal]; vowels that are [-low, +back] are also redundantly [+round].

There are a number of distributional restrictions involving vowels.

First, nasalized vowels do not occur in nonfinal syllables at the underlying level. They do, however, sometimes appear there in surface forms as a result of the nasal spreading rule described below.
Table 1. Copala Trique Vowel Chart

<table>
<thead>
<tr>
<th></th>
<th>front</th>
<th>central</th>
<th>back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>i, ñ</td>
<td>u, ť</td>
<td></td>
</tr>
<tr>
<td>mid</td>
<td>ë, ñ</td>
<td>ë, ñ</td>
<td></td>
</tr>
<tr>
<td>low</td>
<td>ë, ñ</td>
<td>ë, ñ</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Feature Matrix for Copala Trique Vowels

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>ñ</th>
<th>u</th>
<th>ť</th>
<th>e</th>
<th>ë</th>
<th>o</th>
<th>ñ</th>
<th>a</th>
<th>ñ</th>
</tr>
</thead>
<tbody>
<tr>
<td>[syllabic]</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[high]</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[low]</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[back]</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>([round])</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[nasal]</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>
A second important distributional restriction is that high vowels do not occur in final syllables that are associated with the nuclear laryngeal \( \uparrow \). There is something about the dynamic nature of this ballistic entity that is apparently incompatible with a close tongue position, i.e., with a low value for the first formant. Example set (13) shows nonhigh oral vowels with \( \uparrow \) (examples of nasalized vowels are given in (9)):

(13)  
a. \( \text{we}^\uparrow \quad '\text{pretty}' \)
b. \( \text{wa}^\uparrow \quad '\text{spins}' \)
c. \( \text{yo}^\uparrow \quad '\text{another}' \)

A third important distributional restriction concerns vowel sequences. There are no diphthongs, and so each vowel constitutes the nucleus of a separate syllable. Word-initial and word-final syllables may consist only of a nucleus, but all other syllables must have an onset as well. Because of this restriction, vowel sequences occur only in the final two syllables of a word. In such sequences, the two vowels must be unlike, and the first one must be \( \i \) or \( \v \), as seen in (14) and (15):

(14)  
a. \( \text{riu}^\v \quad '\text{whistle}' \)
b. \( \text{rio}^\v \quad '\text{trough}' \)
c. \( \text{ria}^\v \quad '\text{bamboo}' \)
(15) a. yai³ʰ 'stone'
b. yau³ʔ 'armadillo'
c. ao³ʔ 'gives'

The reason no sequences have u as the first member is that, if no other onset is present, the glide w invariably separates u from a following vowel, as seen in (16):

(16) a. yuwi³¹ 'person'
b. yuwe³² 'maguey'
c. ūwa³¹ 'cougar'

Two other distributional restrictions are worthy of mention. The first is that front vowels do not precede or follow the palatal glide y, and nonlow back vowels do not follow the labiovelar glide w. The second is that nonlow vowels show no nasalization contrast following nasal consonants. The following example set shows the contrast in low vowels:

(17) a. ana⁵ʰ 'hoes'
b. anā⁵ʰ 'weaves'

Nonlow vowels show some degree of phonetic nasalization. I consider, however, that this results from a low-level rule of progressive nasalization, and I write the underlying forms without nasalization, as seen in (18):

...
(18) a. ni$^{31}$ 'at night'
b. nu$^{32}$ 'epazote' (herb)
c. ne$^{32}$ 'knife'
d. uno$^{31}$ 'hears'

When the onset consists of a sequence of nasal plus stop, however, the following vowels show no nasalization contrast, nor any trace of phonetic nasalization, as seen in (19):

(19) a. nda$^{13}$ 'until'
b. singa$^{41}$ 'corral'

There are a number of phonological rules that affect vowels. I have already mentioned progressive nasalization following nasal consonants, which is described by the following rule:

(20) Progressive Nasalization

\[
\begin{array}{c}
(+\text{syll}) \\
(-\text{low})
\end{array} \rightarrow [+\text{nas}] / [+\text{cons}]
\]

There are four other rules that are worthy of mention: two of them involve nuclear laryngeals, and the other two involve nasalization.

In word-final syllables, vowels that are not associated with any of the three nuclear laryngeals are phonetically lengthened, as seen in example (21):
b. tiku[^32] [ti[^3]ku[^32]] 'necklace'

This process can be described by the following rule:

(22) Vowel Lengthening

\[
\begin{array}{c}
\text{[-seg]} \\
\text{[-GLOT]} \\
\text{[+syll]} \rightarrow \text{[+long]} / \\
\end{array}
\]

See Chapter 4, Section 4.2, and Chapter 5, Section 5.2, for a description of features for segments on the laryngeal tier.

The second rule involves vowel laxing. The mid vowels e, ê, o, and ò are laxed to [ɛ], [ë], [ɔ], and [ɔ], respectively, when they are associated with the nuclear laryngeal ː. This allophonic laxing of mid vowels seems to be a further manifestation of the same dynamic factor associated with ː that prevents ː from occurring with high vowels. Apparently, ː is incompatible with a close tongue position. Examples of mid vowels that have been laxed are seen in (23):

(23) a. eœ[^32] ["tsœ[^32]] 'roasting ear'
b. òœ[^32] ["tò[^32]] 'metate'

This process can be described by the following rule:
There is a second laxing process in the language that I do not attempt to formalize here: all vowels are somewhat lax and centralized in non-final syllables that do not bear contrastive tone.)

The two rules that involve nasalization are Nasal Spreading and Low Vowel Raising. In Nasal Spreading, the feature value [+nasal] is copied from the final vowel of the word to a preceding [-consonantal] segment. This rule nasalizes all [-consonantal] segments up to, but not including, a vowel that has a lexically linked tone. In Low Vowel Raising, ā is raised to a mid central vowel [A]. The following examples show the operation of these two processes:

(25) a. ꜟአ ꜛavigate ꜜi'paper'
    b. ነጱን / [a3'g9i:3] 'clangs'
    c. እሆ / [A3'yA:32] 'is punished'
    d. ከአአ / [yA3'wA35h] 'string instrument'
    e. a surveyed / [A3'wA35h] 'blows'
    f. ከሆ ከሆ / [a3'ra35yA2'wA13h] 'makes a fuss over'

These processes can be described by the following rules:
(26) Nasal Spreading (right-to-left iterative)

\[-\text{cons}] \rightarrow [+\text{nas}] / \underline{[+]\text{cons}}

Condition: vowels with a lexically linked tone do not nasalize

(27) Low Vowel Raising

\[\begin{bmatrix} +\text{syll} \\ +\text{low} \end{bmatrix} \rightarrow [-\text{low}] / \underline{[+]\text{nas}}\]

It is perhaps the case that the strong phonetic difference between a and ã that results from Low Vowel Raising contributes to the fact that only this pair of vowels shows a contrast between oral and nasalized following a nasal consonant.

All of the rules presented so far are late processes that are clearly allophonic, with the exception of Nasal Spreading. This rule must be ordered somewhat earlier than the others for two reasons.

First, it feeds Low Vowel Raising; and, second, it is sensitive to lexical linking of tones to vowels, and it must therefore precede the process by which tones are supplied on other vowels. If it is ordered to precede these processes, which are described in Chapter 4, Section 4.3, then the presence of a linking line serves as the necessary barrier to define the domain of the spreading process. If, however, tone is supplied on the remaining vowels before the application of Nasal Spreading, then all vowels will have lines associating them with a tone, and the environmental feature that defines the domain of the rule will be lost.
3.2 Consonants

The consonant system of Copala Trique consists of fifteen obstruents, five sonorants, and two laryngeals. These consonants occur alone or in cluster with other consonants in the onset position of syllables.

The consonant system has certain unusual features. One of these is the rarity of labial obstruents. This is not, however, uncommon in Otomanguean languages; Rensch (1976:12) reconstructs **kw, but no labial stops or fricatives, for Proto-Otomanguean. A second unusual feature is the existence of a heavy degree of neutralization of contrast in non-final syllables. Again, this is the norm for an Otomanguean language, according to Rensch (1976:11), who states, "The final syllable of the Proto Otomanguean (POM) stress unit is the position where maximum contrast occurred." The third unusual feature is the large number of affricates and sibilants, a few of which have liquid allophones. Unlike the other two features, this one is peculiar to Trique. Rensch (1976:12) reconstructed no affricates for Proto-Otomanguean and only a single sibilant, **s; and Longacre (1957:10) reconstructed no affricates for Proto-Mixtecan, nor any sibilants (because he chose **Q, rather than **s, for the reconstructed coronal fricative).

There are six stops, which group into two series, tense (fortis) and lax (lenis), at bilabial, dental, and velar places of articulation; these stops are p, t, k, b, d, and g. The labial stops are rare: p occurs only in onomatopoeic words and in Spanish loanwords; and b occurs
only in loanwords and in cluster with \( m \). Examples of stops are given in set (28):

\[
\begin{align*}
\text{(28) a. } & \pi^5_h & \text{'kind of frog'} \\
\text{b. } & \text{la}^3_{pe}^4 & \text{'pencil' (Spanish lápiz)} \\
\text{c. } & \text{to}^3 & \text{'milk'} \\
\text{d. } & \text{ku}^5 & \text{'bone'} \\
\text{e. } & \text{ba}^5_h & \text{'compadre of' (Spanish compadre)} \\
\text{f. } & \text{mba}^3 & \text{'furrowed squash'} \\
\text{g. } & \text{do}^4 & \text{'palm basket of'} \\
\text{h. } & \text{go}^3_h & \text{'last year'}
\end{align*}
\]

There are three affricates, at dental, alveopalatal, and alveopalatal retroflex places of articulation: \( \gamma, \check{\varepsilon}, \) and \( \check{\varepsilon} \). Note that the retroflex affricate is alveopalatal retroflex, not alveolar retroflex. Neither Chomsky and Halle (1968:312-14) nor Ladefoged (1982:145-47) discuss such sounds; in both works, the discussion is limited to alveolar retroflex sounds, such as those that occur in Malayalam, and retroflex is treated as a place of articulation. In that there is no contrast between alveolar retroflex and alveopalatal retroflex in Copala Trique, however, I employ the feature values for alveolar retroflex to characterize these sounds. Examples of affricates are given in set (29):

\[
\begin{align*}
\text{(29) a. } & \text{račl}^3 & \text{'tomato'} \\
\text{b. } & \text{kačl}^3_{2h} & \text{'cotton'} \\
\text{c. } & \text{kačl}^3 & \text{'wheel'}
\end{align*}
\]
There are six sibilants, which group into two series, tense and lax, at dental, alveopalatal, and alveopalatal retroflex places of articulation: ı̇, ı̇̇, ş, ş, z, ɾ, and r. The two retroflex sibilants have liquid allophones: ş varies freely between a tense sibilant and a voiceless apical trill; and r is a flap, rather than a lax sibilant, between vowels, following a stop, and optionally elsewhere. In spite of these liquid allophones, however, these sounds pattern as obstruents, rather than as sonorants. Examples of sibilants are given in set (30):

(30) a. şı̇3ʰ 'is torn'
b. şı̇̇1ʰ 'big'
c. şı̇̇3ʰ 'intestines of'
d. zi̇̇5ʰ 'reaches'
e. zi̇̇5ʰ 'is tucked in'
f. ri̇̇3ʰ 'obtains'

There are five sonorants: bilabial and dental nasals m and n; a dental lateral l; and palatal and labiovelar glides y and w. Examples of sonorants are given in (31)-(33):

(31) a. nā̃3ʰ 'the day before yesterday'
b. nā̃3ʰ 'carrying net'

(32) lũ̲² 'cat'

(33) a. yā̃⁵ 'is sitting'
b. wā̃⁵ 'digs'
There are two laryngeals, a glottal stop and the sound traditionally considered to be a glottal fricative: a and h. The h is, however, characterized by a relatively open glottis and weak velar friction; it occurs only in Spanish loanwords, where it corresponds to Spanish j ([x]) or f. Examples of laryngeals are given in set (34):

(34)

a. \( {\text{ko}^3} \) 'bowl'
b. \( {\text{te}^3\text{ha}^4} \) 'roof tile' (Spanish teja)
c. \( {\text{kahwe}^4} \) 'coffee' (Spanish café)

Segments that are phonetically very similar to a and h occur also on the laryngeal tier; they are described in Chapter 5.

These consonants are displayed in a traditional phonetic chart on Table 3. Table 4 provides a feature specification for each consonant according to the system proposed by Chomsky and Halle (1968:299–320). I also use the feature [segmental] to distinguish the segmental and laryngeal tiers.

All twenty-two consonants occur alone in the onset of word-final syllables, as seen in examples (28)–(34) above. In nonfinal syllables, however, there are a number of restrictions. The only class that occurs freely there is sonorants. Example set (35) shows sonorants in nonfinal syllables that bear contrastive tone, and example set (36) shows them in nonfinal syllables that do not:

(35)

a. \( {\text{me}^3\text{sa}^4} \) 'table' (Spanish mesa)
b. \( {\text{na}^3\text{na}^1} \) 'word'
### Table 3. Copala Trique Consonant Chart

<table>
<thead>
<tr>
<th></th>
<th>bilabial</th>
<th>dental</th>
<th>alveo-palatal</th>
<th>alveo-palatal retroflex</th>
<th>palatal</th>
<th>velar or labiovelar</th>
<th>glottal</th>
</tr>
</thead>
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<tr>
<td>stops</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>tense</td>
<td>p</td>
<td>t</td>
<td></td>
<td></td>
<td>k</td>
<td></td>
<td></td>
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<tr>
<td>lax</td>
<td>b</td>
<td>d</td>
<td></td>
<td></td>
<td>g</td>
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<td></td>
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<td>+</td>
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<td>([back])</td>
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<td>([nasal])</td>
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<td>([lateral])</td>
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<td>[continuant]</td>
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<tr>
<td>[delayed release]</td>
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<tr>
<td>[tense]</td>
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<tr>
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<tr>
<td>([strident])</td>
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</tr>
</tbody>
</table>
There are two classes of consonants that are restricted to final syllables: affricates and laryngeals. The remaining two classes, stops and sibilants, occur in nonfinal syllables, but show neutralization between the tense and lax series. For a variety of reasons that are beyond the scope of this study, I have chosen to group the neutralized stops with the tense series, except when they occur in cluster with nasals. The following example set shows neutralized stops:

(37) a.  pa₃₁a₄! 'shovel' (Spanish pala)
   b.  tukuno₄! 'wags'
   c.  kaws₂² 'went up'
   d.  ndoʔo²²! 'much'

In the sibilants, however, I have chosen an asymmetrical analysis: I group the neutralized dental and alveopalatal sibilants with the tense
series, but the neutralized retroflex sibilant with the lax series. The following example set shows neutralized sibilants:

\[(38)\]

a. \[\text{sigi}^3\] 'mud'
b. \[\text{šuwa}^1\] 'cougar'
c. \[\text{rumi}^1\] 'idle'

Various kinds of consonant clusters occur in the onset of both native words and Spanish loanwords. In what follows I describe briefly the kinds that are found in native words; further information about consonant clusters in Trique is found in Hollenbach (1973:86, 1977:35-40) and in Longacre (1957:10, 16-18). Two kinds of cluster, nasal plus stop and velar stop plus \(w\), developed from unit phonemes, probably by the addition of new clusters with similar patterns from Spanish loanwords. Example sets \((39)\) and \((40)\) show these two kinds of clusters in native words, and example sets \((41)\) and \((42)\) show Spanish loanwords with similar clusters:

\[(39)\]

a. \[\text{nDé}^1\] 'until'
b. \[\text{nGa}^1\] 'cloud'

\[(40)\]

a. \[\text{kwa}^1\] 'today'
b. \[\text{gwa}^1\] 'bobwhite'

\[(41)\]

a. \[\text{la}^1\text{ñca}^4\] 'boat' (Spanish lancha)
b. \[\text{ka}^3\text{ñso}^4\] 'goose' (Spanish ganso)
There are also clusters of ` plus sonorant, and the three-member cluster `ng, as seen in example set (43):

(43) a. aʔmi₃₂ 'speaks'
b. ṭnu₅ 'shelled corn'
c. taʔlu₅ 'malaria'
d. ṭva₃₂ 'flag'
e. yuʔwe₃₂ 'marketplace'
f. aʔnga₃₂ 'is born'

The remaining two kinds of clusters are sibilant plus tense stop and sibilant plus nasal. Both have developed via the deletion of an unstressed vowel. Example sets (44) and (45) show these cluster types:

(44) a. stu⁵h 'navel of'
b. štu₃² 'mouse'
c. sku⁵h 'cow'
d. šku³ 'animal'

(45) a. snu⁵ 'crazy'
b. šni³ 'boy'

A number of minor distributional restrictions between consonants and vowels have been described in Section 3.1. Front vowels do not
precede or follow y, nonlow back vowels do not follow w, nonlow nasalized vowels do not follow nasal consonants, and nasalized vowels do not follow clusters of nasal plus stop.

There are a number of rules that affect consonants. Nasal Spreading (rule (26)), described in Section 3.1, affects glides and laryngeals, as well as vowels. There are also a number of lower-level allophonic rules; I describe only a few of the most important ones here.

Lax stops are weakened to fricatives between vowels, as seen in the following examples:

(46) a. \(r\text{uda}^3\) [ru\(^3\)da\(^3\)] 'mano' (grindstone)
   b. \(\text{ta}^3\text{ga}^3\) ['ta\(^3\)ga\(^3\)] 'jail'

This process can be described by the following rule:

(47) Lax Stop Lenition

\[
\begin{array}{c}
\text{[cont]} \\
\text{[-tense]}
\end{array} \rightarrow \begin{array}{c}
\text{[+cont]} \\
\text{ [+syll]} \end{array} \begin{array}{c}
\text{[+syll]} \\
\end{array}
\]

The glide w becomes a voiced bilabial fricative before front vowels, as seen in example set (48):

(48) a. \(\text{yuwi}^3\) [yu\(^3\)bi: \(^3\)] 'person'
   b. \(\text{we}^3\) ["be\(^3\)] 'house'

This process can be described by the following rule:
The final rule I discuss is of greater relevance to the focus of this study because it is conditioned by the abstract ballistic laryngeal $\ddagger$. A sonorant consonant that occurs alone in the onset is lengthened when the following vowel is associated with $\ddagger$, as seen in set (50):

\begin{align*}
(50) & \quad \text{a. } \text{tana}_3^2 \ [\text{ta}^3 \text{n:a}^3] \ 'goat' \\
& \quad \text{b. } \text{pa}^3 \text{l}^4 \ [\text{pa}^3 \text{l:a}^4] \ 'shovel' \ (\text{Spanish pala}) \\
& \quad \text{c. } \text{kaya}_{13} \ [\text{ka}^2 \text{y:a}^1] \ 'upright'$
\end{align*}

This process can be described by the following rule:

\begin{align*}
(51) & \quad \text{Sonorant Lengthening} \\
\begin{array}{c}
\ddagger \\
\text{[-seg]} \\
\text{+[GLOT]} \\
\text{+[HSP]}
\end{array} \\
\text{[+son]} \rightarrow \text{[+long]} \ / \ \begin{array}{c}
\# \\
\text{[+syll]} \\
\end{array} \quad \ddagger \quad \text{[+syll]}
\end{align*}

See Chapter 5, Section 5.1, for further discussion of the dynamic characteristics of $\ddagger$. 
CHAPTER 4

THE LARYNGEAL TIER: TONES

Probably the most noteworthy feature about Copala Trique phonology is the fact that it has five tone levels. Because many linguists have seriously questioned the existence of tone systems with five levels, I begin this chapter by presenting minimal sets of words that differ only by tone, and also spectrographic measurements that support the five-level analysis. I next discuss the question of tone features and conclude that none of the systems that have been proposed in the literature correctly captures the relationship among the tone levels of Copala Trique. I propose instead the three features [HIGH], [CENTRAL], and [EXTREME] for this language. The third topic I cover is the way in which tone is assigned to each of the vowels of a word. In some words, one nonfinal vowel is lexically linked to one or two underlying tones; and, in all words, other underlying tones are associated with the final vowel by a combination of a language-particular rule and universal conventions. Any remaining vowels are associated with an epenthetic tone whose level is determined by that of the underlying tone to its right. The tone epenthesis rule makes crucial use of the features [HIGH] and [CENTRAL]. The concluding section of the chapter provides evidence for the autosegmentality of tone by showing that there are no systematic
distributional restrictions between any of the tones and the material on the segmental tier.

4.1 Tone Contrasts

A monosyllabic word may have any of eight different surface tone patterns: 1, 2, 3, 13, 31, 32, 34, or 35. Consider the following minimal sets:

(1) a. \(\text{ya}^1\) 'one (in compounds like twenty-one)'
b. \(\text{ya}^2\) 'unmarried'
c. \(\text{ya}^{31}\) 'scar'
d. \(\text{ya}^{32}\) 'salt'
e. \(\text{ya}^{34}\) 'corncob'
f. \(\text{ya}^{35}\) 'is sitting'

(2) a. \(\text{st}a^3\) 'bee'
b. \(\text{st}a^{13}\) 'pineapple'
c. \(\text{st}a^{35}\) 'housefly'

(3) a. \(\text{ne}^3\) 'plow'
b. \(\text{ne}^{31}\) 'flesh'
c. \(\text{ne}^{32}\) 'knife'

(4) a. \(\text{cu}^2\) 'wise'
b. \(\text{cu}^3\) 'wood'
c. \(\text{cu}^{35}\) 'box'
All of the words in the above examples end in an unchecked vowel, i.e., in a vowel that is not associated with a nuclear laryngeal. I consider only words of this type in this section because they are the only ones that show all eight patterns in contrast. Furthermore, the contrasts are maximally differentiated in this position, largely because final vowels are phonetically long. In Chapter 5, Section 5.4, I discuss distributional restrictions between tone and laryngeals, and variant realizations of tones conditioned by a following laryngeal.

Of the eight patterns, only three are preceptually level tones: 1, 2, and 3. The remaining five show movement from one level to another. Two of these gliding tones, 34 and 35, show no contrast with the level tone at which they terminate because there are no words that
contain levels 4 or 5 alone. The other three gliding tones, 13, 31, and 32, however, contrast with both the level tone at which they begin, and the level tone at which they end.

In an earlier publication (Hollenbach 1977), I treated the tone system of Copala Trique as a contour system that contained eight basic units, three of which were level, and five of which were glides. The main reason for adopting the contour analysis was that two of the five phonetic levels needed to describe the glides, 4 and 5, do not occur as simple level tones. In Pike's typology of tone systems (1948:3-13), Copala Trique does not fit the definition of a register system; it is a contour system with some register overlap because it has more than one level tone in addition to the contours.

More recently, however, I have become convinced that there are significant advantages to be gained by decomposing gliding tones into sequences of registers. By positing a tonal tier distinct from the segmental tier, autosegmental phonology easily handles gliding tones by means of multiple association of two or more tone levels with a single syllable nucleus. This view simplifies the task of phonological theory because it eliminates contour tones from the inventory of phonological units and replaces them with a sequence of level tones. It is therefore necessary to provide features to describe only the latter. Furthermore, the decomposition of contour tones usually results in a more insightful statement of tone rules, because contour tones usually act like sequences of registers in their interaction with neighboring tones. For a
detailed argument in favor of decomposition, see S. Anderson (1978: 146-61) and Yip (1980:10-30).4

In Copala Trique, a number of phonological and morphological rules are simplified by a register analysis. See, for example, rule (34), Tone Epenthesis, in Section 4.3, in which the level of the inserted tone is based on the level of the tone to its right. This rule is sensitive to the first level of a following contour, not to the entire contour. Other examples of rules that are simplified by a register analysis are rules (70), Deletion of Tone 3, and (77), Epenthesis of Tone 1, in Chapter 7, Section 7.4.1, and rule (47), Downglide Simplification, in Chapter 9, Section 9.3.1. These rules describe alternations between a contour tone and one of its component levels.

In the present study, therefore, I propose a new analysis of the Copala Trique tone system as a five-level register system that includes three sequences of two tones, in addition to the five levels. The main difference between the old analysis and the new one is in the treatment of the 34 and 35 upglides. In the old analysis, these were considered to be contours, but in the new analysis, I treat them as underlying level tones 4 and 5. The upglides are created by a phonetic rule that inserts tone 2, as discussed in Section 4.3 below. This reanalysis is possible because levels 4 and 5 show no contrast between glides and level tones. The remaining three phonetic glides, 13, 31, and 32, are analyzed as sequences of two tones.
In the remainder of this study, unless otherwise stated, words are written in their underlying tonal representations, rather than in their surface forms, in accord with the new analysis.

In simple words that consist of two or more syllables, there are only eight different tone patterns, just as there are in monosyllabic words. The contrastive tones all occur on the final syllable; the tone level of nonfinal syllables is predictable and can be generated by regular rules, as described in Section 4.3. The following examples show the eight patterns on polysyllabic words; some minimal pairs are included:

(8) a. \(\text{ači}^3\) 'lacks'
b. \(\text{ači}^5\) 'asks'

(9) a. \(\text{ka'á}^1\) 'important'
b. \(\text{ka'á}^31\) 'steam'

(10) a. \(\text{mare}^{13}\) 'red'
b. \(\text{mare}^{31}\) 'green'

(11) a. \(\text{yuwe}^5\) 'palm mat'
b. \(\text{yuwe}^{32}\) 'maguey'

(12) a. \(\text{aka}^{31}\) 'leaks'
b. \(\text{aka}^{32}\) 'burns'

(13) a. \(\text{sato}^3\) 'rabbit'
b. \(\text{koto}^4\) 'shirt' (Spanish cotón)
My original analysis of the tone system was carried out solely on the basis of auditory comparison of substitution items in frames, using the techniques developed by Pike (1948:48-67). In the fall of 1983, however, the Linguistics Department of the University of Arizona acquired a Sona-Graph, and I was able to check my impressionistic analysis by means of objective measurements of fundamental frequency.5

I prepared a set of short sentences that included frames at tone level 3 and substitution items that included all of the eight tone patterns following the frame. Two repetitions of each sentence were recorded by two native speakers of Copala Trique, both adult males; and broad- and narrow-band spectrograms were prepared. The fundamental frequency of the vowel of the final syllable was determined by measuring the tenth harmonic on the narrow-band spectrogram and dividing the result by ten. I estimate the measurement error involved in using this technique to fall within 5 Hz.

The spectrographic analysis fully corroborated the original analysis of five distinct pitch levels. There was only one new finding of any significance: the rising onglide to level 5 started near level 3, rather than near level 4, as I had previously thought. Table 5 shows the average frequency measurements at the beginning and end of each of the eight tone patterns.

(14) a. \textit{nitū}² 'slanting'
    b. \textit{titū}⁵ 'pinches'
Table 5. Average Fundamental Frequency of Tone Patterns

<table>
<thead>
<tr>
<th></th>
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<th>speaker two</th>
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<tr>
<td></td>
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<td>end</td>
<td>beginning</td>
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</tr>
<tr>
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<td>90</td>
<td>86</td>
<td>93</td>
<td>89</td>
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<tr>
<td>2</td>
<td>98</td>
<td>97</td>
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<td>3</td>
<td>117</td>
<td>116</td>
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<td>4</td>
<td>111</td>
<td>131</td>
<td>121</td>
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</tr>
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<td>5</td>
<td>116</td>
<td>159</td>
<td>122</td>
<td>156</td>
</tr>
<tr>
<td>13</td>
<td>90</td>
<td>113</td>
<td>95</td>
<td>113</td>
</tr>
<tr>
<td>31</td>
<td>123</td>
<td>90</td>
<td>131</td>
<td>91</td>
</tr>
<tr>
<td>32</td>
<td>118</td>
<td>103</td>
<td>127</td>
<td>113</td>
</tr>
</tbody>
</table>
A sample narrow-band spectrogram for each of the eight tone patterns is shown in Figures 1-8. In order to make the individual harmonics more visible, these displays were prepared using the scale magnification feature available on the Sona-Graph. The vertical dimension shows frequency from 0-2500 Hz, rather than the usual 0-8000 Hz. Calibration lines appear at every 100 Hz. The tenth harmonic of the final vowel of the word is shown in white on each spectrogram. In addition, its initial and final frequency are given at the top of the display.

In order to help the reader visualize the tone system better, Figure 9 provides a graphic display of the eight tone patterns, based on spectrographic analysis. It consists of five lines, analogous to a musical staff, representing five perceptually equidistant pitch levels. These lines are numbered from 1 to 5. Each of the eight tone patterns is drawn schematically on this background as a black line that shows its relative pitch height and its degree and direction of movement. Underneath each pattern is written the underlying representation that I assign to it.

Perhaps the most notable phonetic fact about the tone system is that none of the tones is truly level. The three patterns that are perceptually level, and which I analyze as underlying level tones 1, 2, and 3, all show a slight downdrift, never more than 5 Hz in the speech of the adult men used as consultants. The two patterns that are analyzed as falling sequences, on the other hand, 31 and 32, show much greater
Figure 1. Spectrogram Illustrating Tone Pattern

Display of kaka₁ 'will leak' in phrase kaka₁ we₃² a₁ 'the house will leak'.
Figure 2. Spectrogram Illustrating Tone Pattern 2

Display of kaka\textsuperscript{2} 'will burn' in phrase kaka\textsuperscript{2} we\textsuperscript{3} a\textsuperscript{32} 'the house will burn'.
Figure 3. Spectrogram Illustrating Tone Pattern 2

Display of kara$^3$ 'filled' in phrase kara$^3$ zo$^3$ a$^3$ 'he filled'.
Figure 4. Spectrogram Illustrating Tone Pattern 4

Display of $\text{yo}^4$ 'palm basket' in phrase $\text{a\text{\text{"c}}}^3 \text{yo}^4 \text{a}^32$ 'the palm basket is lacking'.
Figure 5. Spectrogram Illustrating Tone Pattern 5

Display of yo^o^5 'earth' in phrase a^3 y o^o^5 a^32 'earth is lacking'.
Figure 6. Spectrogram Illustrating Tone Pattern 13
Display of kara₁³ 'will fill' in phrase kara₁³ zo₃² a₃² 'he will fill'.
Figure 7. Spectrogram Illustrating Tone Pattern 31

Display of kaka³ 'leaked' in phrase kaka³ we³ a³ 'the house leaked'.
Figure 8. Spectrogram Illustrating Tone Pattern 32
Display of kaka\textsuperscript{32} 'burned' in phrase kaka\textsuperscript{32} we\textsuperscript{32} a\textsuperscript{32} 'the house burned'.
Figure 9. Schematic Display of Copala Trique Tone Patterns
movement, about 15 Hz for 32 and over 30 Hz for 31. The pattern that is analyzed as a rising 13 sequence starts at the same level as other instances of level 1, but does not rise quite as far as other instances of level 3. This can perhaps be attributed to the superimposition of the rising pattern on the general tendency of the tones to drift downward. The two highest levels are clear upglides. Level 4 does not rise very far above level 3, especially for one of the two speakers. Level 5, on the other hand, shows a very sharp rise, over 40 Hz for both speakers.

It is not clear to me why the two highest tone levels should be realized as upglides, but the phenomenon does not appear to be restricted to Trique. Maddieson (1978:341) states that a low tone often has a falling onglide in utterance- or word-initial position, and that a high tone often has a rising onglide in these positions. He claims that these onglides help the speakers to identify the tone correctly. In Copala Trique, falling onglides do not occur as surface realizations of underlying level low tones; instead, the downglides contrast with both of their component levels. The rising onglides to underlying level high tones, however, occur even in word-medial position. Note also Hombert (1978b:133), who cites a number of studies as evidence that the endpoint of a tone is perceptually more important than the beginning point.

In agreement with these observations, the display in Figure 9 clearly shows that speakers of Copala Trique receive an important aid in their decoding task from the pitch movements that are characteristic of each pattern. It is the direction and degree of movement, as much as
the frequency level relative to other tones, that provide the perceptual cues that help the listener identify a given pattern. In spite of this fact, however, there seems to be good reason to analyze Copala Trique tone as a register system at the underlying level. This will become more apparent as tone alternations are discussed in Chapter 7. The situation is somewhat parallel to the analysis of consonants and vowels as segments in spite of the fact that the borders between the two are sometimes hard to define, and in spite of the fact that the cues to the correct perception of one segment often lie in adjacent segments.

Another important cue that speakers use does not appear on a display like Figure 9. Each speaker has a comfortable pitch range, and there are voice quality features that tell a listener where a speaker is within his range. These features are easy to hear, but are much harder to see on a spectrogram. For example, even though levels 1 and 2 differ by only about 10 Hz for one speaker, level 1, in my experience, always clearly sounds as if it is near the very bottom of a speaker's range; any attempt to lower the pitch further would result in a creaky voice quality. Level 5, on the other hand, in addition to the sharp upglide, always clearly sounds as if it is near the top of a speaker's range.

On the basis of the above evidence, it is clear that Copala Trique has five levels of tone in contrast in surface forms. It is conceivable, however, that by means of some abstract analysis, one, or even two, of these levels might be eliminated from underlying representations. The alternations which are described in Chapters 7-9, taken as a
whole, provide additional evidence for the five-level analysis. They are complex at best, but they are far easier to state if five underlying tone levels are recognized than if any of them is analyzed as something else by an abstract analysis. See Chapter 10 for further discussion.

4.2 Tone Features

In this section I consider the criteria which a set of features must meet, and I examine a number of feature sets that have been proposed for tone. Because none of them proves to be adequate for describing the five tone levels of Copala Trique in an insightful way, I propose a composite set for Copala Trique consisting of the three features [HIGH], [CENTRAL], and [EXTREME], and a universal feature set for tone that adds the features [HIGH₂] and [LOW] to the above.

One of the most important criteria in establishing a universally valid set of features in any area of phonology is comprehensiveness. If the set does not provide enough distinctions to cover every opposition found in natural language, then it is inadequate. On the grounds of comprehensiveness, therefore, feature sets that account for only three or four levels of tone, such as those proposed by Halle and Stevens (1971), Gruber (1964), and Yip (1980), are inadequate for describing Copala Trique, even if they are very useful for describing simpler tone systems. I therefore give them no further consideration here; see Hollenbach (to appear) for a discussion of these three systems.

There are, however, a number of feature sets proposed in the literature that handle five tone levels, each of which I consider here.
Clearly, each is comprehensive enough to describe Copala Trique. In order to evaluate such feature sets, therefore, we need to consider other criteria. I suggest that two are especially relevant. One of them is phonetic reality. Each proposed feature should have some articulatory or acoustic basis, even though, of course, many oppositions will need to be defined in relative, rather than absolute, terms. The second criterion is phonological function. The system should permit phonological (and perhaps morphological) processes to be stated in a simple and insightful way. Sometimes these two criteria are in conflict because different languages may impose differing organization on very similar phonetic material.

It is necessary to consider both of these criteria. If, for example, we consider only phonetic reality, we are likely to conclude that the proper set of tone features is a single scalar (multivalued) feature. Tone has a well defined acoustic correlate, fundamental frequency, which is a single, potentially multivalued, parameter. This phonetic fact can be captured simply by such a feature. At least one linguist, Stahlke (1977), has argued for this position. From the point of view of phonological function, however, binary features have proven so useful for expressing underlying oppositions and for writing rules for consonants and vowels that it seems desirable to employ them for tone as well. To my knowledge, all linguists except Stahlke who have proposed feature sets for tone have assumed that tone features should be
binary, and I consider only binary features in the remainder of this section.

Given the phonetically scalar nature of fundamental frequency, it is clear that the choice of a set of binary features to partition tone into three or more values cannot be made on a phonetic basis. There are various possible ways of juggling two features to handle systems with three or four levels of tone, and there are even more ways of juggling three features to handle systems with five levels. The only principled basis for choosing among the possible feature systems is phonological function.

It is clear that phonological processes differ significantly from language to language. In order to capture these different kinds of processes in an insightful way, a certain degree of latitude must be permitted in the way that features are selected and assigned. Most linguists who have provided feature sets for five tone levels, however, provide only a single choice of features, and a single way of assigning those features to the tone levels. As a result, none of the sets that has been proposed captures the significant relationships among the tone levels of Copala Trique. All of these linguists were undoubtedly motivated by the generally laudable goal of constraining universal phonological theory. It appears, however, that they have overconstrained it. I turn now to a consideration of each of these feature sets.

There are three kinds of sets that handle five levels of tone. Woo (1969) proposed the tonal features [HIGH] and [LOW] to handle three
levels of tone, and added a third feature, [MODIFY], which is nontonal, to allow her set to handle systems with four or five tone levels. Wang (1967), Sampson (1969), and Maddieson (1970, 1972) have each proposed a set with three different tonal features. The third kind of feature set is that of Clements (1981b), which uses a single opposition between high and low repeated as many times as needed to produce the correct number of tones. Because Clements' system is based on a different principle from the others, and because it permits a five-level system to be characterized in a variety of ways, I discuss it separately, after I have considered the other four authors.

Table 6 shows the feature matrices for tone systems with five levels according to the feature sets proposed by Woo, Wang, Sampson, and Maddieson.

Woo's feature set differs from the others in its use of the feature [MODIFY] to handle levels 2 and 4. This feature is not tonal; it consists of some waveform (i.e., voice quality) modification. In Copala Trique, however, there is no evidence whatever of any such modification for any of the five levels. It therefore seems preferable to restrict my attention to feature sets that use strictly tonal features. In Hollenbach (to appear), I argue in detail against the feature [MODIFY].

Wang's feature set differs from Sampson's and Maddieson's in that it is asymmetrical: it assigns the value [+HIGH] to the two highest levels, but has no opposite feature [LOW]. It also differs from all other sets in having two different features, [CENTRAL] and [MID], to
Table 6. Feature Sets for Five-Level Tone Systems

<table>
<thead>
<tr>
<th>Woo:</th>
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<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[LOW]</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[MODIFY]</td>
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<td>+</td>
<td>-</td>
<td>+</td>
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<td>[HIGH]</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[CENTRAL]</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>[NID]</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
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<td>[HIGH]</td>
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<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[LOW]</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[CENTRAL]</td>
<td>-</td>
<td>+</td>
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<td>+</td>
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<table>
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<td>[RAISED]</td>
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<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
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<tr>
<td>[LOWERED]</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[EXTREME]</td>
<td>+</td>
<td>-</td>
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<td>+</td>
</tr>
</tbody>
</table>
separate middle levels from those at the extremes, with [MID] defined more narrowly than [CENTRAL]. Sampson's and Maddieson's sets are essentially isomorphic with each other. Both are symmetrical and employ one feature to separate off the two highest levels, a second one to separate off the two lowest levels, and a third one to divide the three levels in the middle from those at the extremes. The main difference between the two is that Sampson uses [CENTRAL] for the third feature, and Maddieson uses [EXTREME], with the values reversed.

I turn now to Clements' system. Because it employs successive binary branchings between high (h) and low (l), it is capable, in theory, of handling any number of tone levels. In practice, however, Clements restricts his discussion to tone systems with no more than four levels. For a two-level system, there is, of course, only a single possible structure, which is shown in (15):

(15) \[ h \quad l \]

For a three-level system, there are two possible structures. Either the top branch or the bottom branch of the first split may undergo a second split, as seen in (16):

(16) a. \[ h \quad h \quad l \]
   b. \[ h \quad h \quad l \]

For a three-level system, there are two possible structures. Either the top branch or the bottom branch of the first split may undergo a second split, as seen in (16):
Clements claims that either of these structures is possible, depending on the language (1981b:58-60). For a system with four levels, there are five possible structures. Four of these structures require a third level of branching, and Clements claims that they constitute marked systems. The fifth possible structure, which Clements claims is the norm (pp. 55-58), requires only two levels of branching. This structure is:

\[(17)\]
\[
\begin{array}{c}
  h \\
  \downarrow \\
  l \\
  \downarrow \\
  h \\
  \downarrow \\
  l \\
  \end{array}
\]

Even though Clements does not discuss five-level tone systems, his method can easily be extended to cover them. It turns out that there are fourteen possible ways to characterize a five-level system using successive binary branchings. Six of these ways involve only three levels of branching; they are shown in (18):

\[(18)\]
\[
\begin{array}{c}
  a. \\
  h \\
  \downarrow \\
  l \\
  \downarrow \\
  h \\
  \downarrow \\
  l \\
  \end{array}
\]
\[
\begin{array}{c}
  b. \\
  h \\
  \downarrow \\
  l \\
  \downarrow \\
  h \\
  \downarrow \\
  l \\
  \end{array}
\]
The remaining eight ways require a fourth level of branching; they are shown in (19):

(19) a. 
```
  h
 /  \
h   1
 /  \
1   h
```
b. 
```
  h
 /  \
1   h
```
c. 
```
  h
 /  \
1   h
```
d. 
```
  h
 /  \
1   h
```
e. 
```
  h
 /  \
1   h
```
f. 
```
  h
 /  \
1   h
```
One of the advantages that Clements claimed for his method is that it constrains the number of ways in which a tone system with two, three, or four levels can be characterized. Even if we grant that Clements would be more likely to accept a characterization with three levels of branching as the norm than one with four levels, there are still six possible ways to characterize a five-level system using Clements' method. It therefore fails to constrain five-level systems in any significant way. Clements' method is also open to a number of other objections, some of which are discussed in Hollenbach (to appear).

Now that I have described each of these proposed feature sets briefly, I return to the tone system of Copala Trique in order to show that none of them captures the essential relationships among the tone levels of this language.

The most important division among the tone levels of Copala Trique comes between levels 2 and 3. This break is extremely important in the tone alternations found in the language, as will be seen in Chapters 7 and 9. It is also important in writing a rule to derive the predictable tone on certain vowels, as will be seen in Section 4.3 below. This division is asymmetrical in that three of the tone levels fall on one side, and two on the other. This basic division can probably best be handled by the feature [HIGH]. Note, however, that none of the feature
sets described, except for Clements', permits the value [+HIGH] to be assigned to the three highest levels. All four authors limit [+HIGH] to the two highest levels.

The second important fact about Copala Trique tone is that the two middle levels, 2 and 3, must be separated from the remaining three in order to account for the predictable tone found on certain vowels. An obvious feature choice to capture this relationship is [CENTRAL], which is found in Wang's and Sampson's feature sets (and implicitly in Maddieson's). Note, however, that Clements' method of characterizing complex tone systems by means of tree structures is incompatible with a feature like [CENTRAL] or [EXTREME]. This is not an oversight on Clements' part. He specifically claimed that alternations among peripheral tones were either unattested or highly marked, and he deliberately ruled them out (pp. 54 and 56).

It turns out, therefore, that none of the eighteen feature sets that have been proposed for five-level tone systems allows me to combine the two features [HIGH] and [CENTRAL] in the way that I find necessary. I conclude, therefore, that none of them is adequate as a universal characterization of tone systems. I return briefly to the question of an adequate universal set of features for tone after I complete my proposal for a set of features adequate to characterize Copala Trique tone.

The features [HIGH] and [CENTRAL] distinguish the four lowest tone levels of Copala Trique from each other. It remains, however, to distinguish level 5 from level 4, and to accomplish this, a third
feature is needed. Level 5 is a recent addition to the system that arose from a split of level 4 (Longacre 1957:81-82). This fact explains the asymmetrical nature of the tone system, with three levels assigned the value [+HIGH]. I would like to reflect the special, marked status of level 5 in the feature set, and I have therefore decided to use the feature [EXTREME]: 5 is [+EXTREME], and 4 is [-EXTREME]. The feature [EXTREME] is underutilized, as, of course, some feature(s) must be in any set that describes five levels. Any tone that is [-HIGH] and/or [+CENTRAL] is redundantly [-EXTREME]. The feature matrix for the tone levels of Copala Trique is given in Table 7. In addition to the three tone features, I also use two other features, [segmental] and [GLOTTAL], as major class features to distinguish tones from laryngeals and from material on the segmental tier. All laryngeal tier material is [-segmental], and all tones are [-GLOTTAL].

The relationships that are attested among the tone levels of Copala Trique show that more latitude is needed in choosing tone features and in assigning features to different levels than most linguists have been willing to grant. I suggest that, in addition to the three features I have proposed for Copala Trique, phonological theory provide two other tone features, [LOW] and [HIGH₂] (a feature which subdivides a group of tones already divided by a basic feature like [HIGH]). No language can employ more than three of these features. Further information about this proposed universal set of tone features is given in Hollenbach (to appear).
Table 7. Feature Matrix for Copala Trique Tones

<table>
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<tr>
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<th>1</th>
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<tbody>
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<td>[segmental]</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<td>[GOTTAL]</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>[HIGH]</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
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</tr>
<tr>
<td>[EXTREME]</td>
<td>( -</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>


4.3 Tone Association

The relation between tone and the segmental tier in Copala Trique is very different from that typically found in a tone language. Instead of showing a one-to-one mapping between tones and syllable nuclei, the tones bunch up on the word-final syllable, which serves as the primary tone-bearing unit of the language. In this section, I first describe the structure of underlying tonal representations, and next the way in which the underlying representation is associated with the segments. I refer to this as primary tone association. In order to complete the derivation, however, two further stages are required, each involving a rule that creates a new tone, followed by the association of that tone with the segmental tier. I refer to these stages as secondary and tertiary tone association.

The underlying tonal representation for simple words, i.e., those that do not contain lexically linked tones, is quite simple. There are eight contrastive tone patterns: the five individual tone levels, plus three sequences of two levels each, 13, 31, and 32. There are seventeen other theoretically possible sequences of two tones that do not occur; all of them can be ruled out by the following three output conditions:

(20) a. No sequence contains a tone that is [+HIGH, -CENTRAL], i.e., no sequence contains levels 4 or 5.
b. No sequence begins with a tone that is \([-\text{HIGH}, +\text{CENTRAL}]\), i.e., no sequence begins with level 2.

c. No sequence has the same value for \([\text{HIGH}]\) on both parts.

In a simple word, therefore, the underlying representation for tone consists of one or two tone levels, each characterized by a set of two or three features. If there is only one tone, it may be any of the five levels, but if there are two, the sequences are constrained by the above conditions. The following words show typical tonal representations:

\[(21) \quad \begin{align*}
a. \quad \begin{array}{c}
3 \\
[-\text{HIGH}] \\
[+\text{CENT}] \\
\end{array}
\quad \text{'plow'} \\
\begin{array}{c}
\text{ne} \\
\end{array}
\\
b. \quad \begin{array}{c}
3 \\
[+\text{HIGH}] \\
[+\text{CENT}] \\
\end{array}
\begin{array}{c}
2 \\
[-\text{HIGH}] \\
[+\text{CENT}] \\
\end{array}
\quad \text{'small seeds'} \\
\begin{array}{c}
\text{kā} \\
\end{array}
\\
c. \quad \begin{array}{c}
3 \\
[+\text{HIGH}] \\
[+\text{CENT}] \\
\end{array}
\begin{array}{c}
1 \\
[-\text{HIGH}] \\
[-\text{CENT}] \\
\end{array}
\quad \text{'caused to explode'} \\
\begin{array}{c}
\text{tukwanu} \\
\end{array}
\end{align*}\]
Condition (20c) is particularly significant in the light of the tone contour universals proposed by Yip (1980:195-202). Yip claims that register (her basic high-low split) remains constant within a syllable, though tone (her secondary high-low split) may change value. This proposal limits the number of tone sequences within a syllable to two upglides and two downglides. Even though it is clearly desirable to constrain the number of possible sequences, because no language with four or five levels has been attested with anywhere near the theoretically possible number of glides, Yip's system does not work for Copala Trique. In this language, all tone sequences cross the basic division between [+HIGH] and [-HIGH]; this seems to indicate that the principle used to constrain tone sequences in Copala Trique is precisely the opposite of the one suggested by Yip. Furthermore, there are good reasons, based on alternation evidence (see Chapter 7) for giving the sequences the underlying representations that I have assigned to them, rather than positing some abstract analysis that conforms to Yip's proposed universals. Each sequence alternates with one of its component levels, and so the alternation can be stated as an epenthesis or a deletion.

In complex words, the tonal representation consists of two parts. The second part is identical to the range of tonal representations found in simple words, i.e., one or two unassociated tones. The first part consists of a tone pattern that is lexically linked to some nonfinal vowel. The lexically linked tone patterns are more restricted than the unlinked patterns; they comprise only levels 2, 3, 5, and, in
one word, the sequence 31. The following complex words show typical
tonal representations:

(22) a. \[
\begin{array}{c}
-\text{HIGH} \\
+\text{CENT} \\
+\text{EXTR}
\end{array} \quad \begin{array}{c}
+\text{HIGH} \\
-\text{CENT}
\end{array} \]
\quad 'will cover'

kara

b. \[
\begin{array}{c}
+\text{HIGH} \\
+\text{CENT} \\
-\text{CENT}
\end{array} \quad \begin{array}{c}
-\text{HIGH}
\end{array} \quad h
\quad 'turns'

anika

c. \[
\begin{array}{c}
+\text{HIGH} \\
+\text{CENT} \\
+\text{EXTR}
\end{array} \quad \begin{array}{c}
+\text{HIGH} \\
-\text{CENT} \\
+\text{CENT}
\end{array} \quad h
\quad 'sighed'

karače

d. \[
\begin{array}{c}
+\text{HIGH} \\
+\text{CENT} \\
-\text{CENT} \\
-\text{EXTR}
\end{array} \quad \begin{array}{c}
-\text{HIGH} \\
+\text{CENT} \\
+\text{HIGH}
\end{array} \quad h \\
\quad 'barn owl'

šume

There do not appear to be any systematic restrictions between
lexically linked tone patterns and the following unassociated tone pat-
terns. Because the lexically linked 31 sequence occurs on only a single
word, it is found only with unassociated level 4. The remaining three lexically linked tones show only sporadic gaps in their cooccurrence with unassociated tone patterns; an example of each combination recorded to date is given in Table 8.

The way in which the tones found in underlying representations are associated with segments is essentially a simple process. Because the extra tones found in complex words are already lexically linked, they do not need to be associated, and therefore a single set of processes will suffice for both simple and complex words.

Because all of the unassociated tones in underlying representations must be associated with the final syllable of words, the simple convention originally proposed for autosegmental phonology, in which tones and vowels are matched up one-to-one, going from left to right (Goldsmith 1976:38, 1979:207), makes incorrect predictions about Copala Trique. Consider, for example, the association that this convention predicts for the word given in (21c), which is shown in (23), versus the correct association, shown in (24):

(23) \[ \frac{3}{1} \]

\[ \begin{array}{c}
+\text{HIGH} \\
+\text{CENT}
\end{array} \quad \begin{array}{c}
-\text{HIGH} \\
-\text{CENT}
\end{array} \]

'tukwanu'

'caused to explode'
Table 8. Attested Sequences of Tone Patterns

<table>
<thead>
<tr>
<th>Linked</th>
<th>2</th>
<th>3</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlinked ↓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(ka^2\text{du}^1)</td>
<td>(\text{s}a^3\text{na}^1)</td>
<td>(\text{sna}^5\text{ka}^1)</td>
</tr>
<tr>
<td>2</td>
<td>(\text{ka}^2\text{ri}^2)</td>
<td>(\text{ro}^3\text{to}^2)</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>(\text{ri}^2\text{ge}^3)</td>
<td>(\text{ta}^3\text{ge}^3)</td>
<td>(\text{ri}^5\text{ce}^3)</td>
</tr>
<tr>
<td>4</td>
<td>(\text{re}^2\text{ce}^4)</td>
<td>(\text{su}^3\text{sc}^4)</td>
<td>(\text{ti}^5\text{se}^4)</td>
</tr>
<tr>
<td>5</td>
<td>(\text{ka}^2\text{ra}^5)</td>
<td>(\text{ya}^3\text{wi}^5)</td>
<td>--</td>
</tr>
<tr>
<td>13</td>
<td>(\text{na}^2\text{ra}^3\text{a}^1)</td>
<td>(\text{ka}^3\text{nu}^1)</td>
<td>(\text{ya}^5\text{nu}^1)</td>
</tr>
<tr>
<td>31</td>
<td>(\text{tukwa}^2\text{nu}^3)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>32</td>
<td>(\text{sno}^2\text{o}^3\text{e}^2)</td>
<td>(\text{na}^3\text{ka}^3)</td>
<td>(\text{sno}^5\text{o}^3\text{e}^2)</td>
</tr>
</tbody>
</table>
Note that a mirror image convention, i.e., one that goes from right to left, would also predict an incorrect association, as seen in (25):

\[ (25) \quad \frac{3}{1} \quad \text{'caused to explode'} \]

\[
\begin{array}{c}
+\text{HIGH} \\
+\text{CENT}
\end{array}
\quad \begin{array}{c}
-\text{HIGH} \\
-\text{CENT}
\end{array}
\]

tukwanu

There is, however, another proposal in the literature, first developed by Haraguchi (1977:9-10, 319-48) and also adopted by Clements and Ford (1979:181-82). In this proposal, which was originally developed to handle a pitch-accent language like Japanese, but which applies also to a tone language with skewed distribution like Copala Trique, there is an initial tone association rule for each language. This rule associates a single tone with a single tone-bearing unit; its precise form varies from language to language, within certain limits imposed by universal grammar. In Copala Trique, the correct association can be carried out by employing the following rule:

\[ (26) \quad \text{Initial Tone Association} \]

Associate the first free tone in the underlying representation with the vowel of the final syllable.
The result of Initial Tone Association is shown by a dashed line in the following examples (I use tone numbers alone as abbreviations for feature bundles in order to save space):

(27) a. 3 'plow'
    ne

b. 3 1 'caused to explode'
    tukwanu

c. 5 3 2 h 'sighed'
    karacé

Following the application of Initial Tone Association, the second unassociated tone, if there is one, can be correctly associated with the final vowel by the wellformedness principles, specifically, the third one, which is:

(28) No Crossing
    Association lines must not cross (Goldsmith 1976:36, 1979:207).

Because the first tone is already associated with the final syllable of the word, the second tone must also be associated with the final syllable; if it were associated with any earlier syllable, the lines would cross. The following examples show lexical linking and initial
association by solid lines, and the association of the second tone by the No Crossing convention by a dashed line:

(29) a. \[ \frac{3 \ 1}{tuk\text{wanu}} \] 'caused to explode'

b. \[ \frac{5 \ 3 \ 2 \ h}{kara\text{ce}} \] 'sighed'

There is a difference of opinion among the proponents of autosegmental phonology concerning the association of two or more tones with a single syllable nucleus. According to Goldsmith's original formulation of the wellformedness principles, all tones must be associated with at least one vowel (1976:36, 1979:207). According to a number of other authors, however, among them Williams (1976:468, 479-83), Clements and Ford (1979:186, 208), McCarthy (1981:382-83), and Halle and Vergnaud (1982:66-69), it is not necessary for all tones in an underlying representation to be associated. If there are more tones than there are available syllable nuclei, extra tones will remain unassociated, and therefore unpronounced, unless some language-particular rule provides a way to associate them. (This position was developed in order to handle the floating tone phenomenon so common in West African tone languages.) For Copala Trique, however, Goldsmith's original proposal makes the correct prediction, and I have chosen to adopt it, rather than to formulate a second language-particular rule.
After primary association has been carried out, many words still contain vowels that are not yet associated with any tone. The tone found on such vowels is nondistinctive and can be predicted from the first distinctive tone that is associated with a vowel to the right. It is therefore the case that no information about the tone of these vowels should be included in underlying representations.

The usual way of handling such a situation within autosegmental theory is to posit multiple association lines between one tone and two or more vowels. Such multiple associations are shown by dashed lines in example (30):

\[
\begin{array}{ccc}
\dfrac{3}{1} & & \\
& tuk\text{wahu} & \\
\end{array}
\]

In this word, such an approach produces the correct result because the nondistinctive tone found on the first two syllables of the word is identical to the first contrastive tone. In many other words, however, this approach produces an incorrect form, as seen in the following examples:

\[
\begin{array}{ccc}
\dfrac{3}{1} & & \\
& k\text{a}n\text{u} & \\
\end{array}
\]

\[
\begin{array}{ccc}
\dfrac{5}{1} & & \\
& k\text{ara} & \\
\end{array}
\]

\[
\begin{array}{ccc}
\dfrac{5}{1} & & \\
& k\text{ara} & \\
\end{array}
\]

(31) a. * 1 'will explode'

(31) b. * 5 'covered'
The correct tone level for the nonfinal syllable of (31a) is 2, and the correct level for (31b) is 3, because the tone found on nonfinal syllables is not an exact copy of the first contrastive tone to the right, but rather a bleached copy. These tones take their value for the basic feature [HIGH] from the following tone, but they always have the values [+CENTRAL, -EXTREME]. In other words, nonfinal syllables have level 2 before levels 1 or 2, and they have level 3 before levels 3, 4, or 5. This dependency is shown in the following examples, in which predictable tones are written on nonfinal vowels:

(32) a. \(\text{ka'nu}^1\)  'will explode'
b. \(\text{ka}^2\text{ka}^2\)  'will burn'
c. \(\text{ka}^2\text{ra}^1\)  'will fill'

(33) a. \(\text{ka}^3\text{ra}^3\)  'filled'
b. \(\text{ko}^3\text{to}^4\)  'shirts' (Spanish cotón)
c. \(\text{ka}^3\text{ce}^5\)  'walked'
d. \(\text{ka}^3\text{nu}^3\)  'exploded'
e. \(\text{ka}^3\text{ka}^3\)  'burned'

The best device available to capture this kind of dependency appears to be an epenthesis rule that inserts a tone on the laryngeal tier. This rule makes crucial use of the features [HIGH] and [CENTRAL]; it has the following form:
In order to associate the newly inserted tone with nonfinal vowels, it is necessary to employ the procedure which Clements and Ford (1979:185) call Convention 2; this procedure is:

(35) Convention 2

If there exists a subdomain containing one free tone and one or more tone-bearing units, associate the tone with each of these units.

The following derivations show how tone is supplied on each syllable of a simple word:

(36) Underlying Form  3 1  'caused to explode'

Initial Association  3 1

No Crossing  3 1
The tone epenthesis rule also applies in complex words whenever there is a syllable that precedes the one that contains a lexically linked tone, as seen in the following derivation:

(37) Underlying Form

\[ 1 \quad 3 \quad \text{'will fill'} \]
\[ \text{kara} \]

Initial Association

\[ 1 \quad 3 \]
\[ \text{kara} \]

No Crossing

\[ 1 \quad 3 \]
\[ \text{kara} \]

Tone Epenthesis

\[ 2 \quad 1 \quad 3 \]
\[ \text{kara} \]

Convention 2

\[ 2 \quad 1 \quad 3 \]
\[ \text{kara} \]
In four-syllable words, Tone Epenthesis applies twice, as seen in the following derivation:

(39) Underlying Form  \[5 \ 1 \ 3 \ h\]  'makes a fuss over'
\[\text{araya}^?\text{a}\]

Initial Association  \[5 \ 1 \ 3 \ h\]  \[\text{araya}^?\text{a}\]

No Crossing  \[5 \ 1 \ 3 \ h\]  \[\text{araya}^?\text{a}\]

Tone Epenthesis  \[3 \ 5 \ 2 \ 1 \ 3 \ h\]  \[\text{araya}^?\text{a}\]
Because stress is sensitive to both lexical linking of tone and to the placement of contrastive tone on final syllables, it seems best to order the stress assignment rules immediately after primary association. If stress rules were ordered after secondary association, the distinctive association lines for underlying tones would no longer be available to serve as the environment for the rule because they would be obscured by the association lines for epenthesized tones. The rules for stress placement are:

(40) Primary Stress Placement

\[
\begin{array}{c}
[-\text{seg}] \\
[-\text{GLOT}] \\
(+\text{GLOT})
\end{array} \neq
\]

\begin{equation}
[\text{+syll}] \rightarrow [+\text{str}_1] / _-
\end{equation}

(41) Secondary Stress Placement

\[
\begin{array}{c}
[-\text{seg}] \\
-\text{GLOT} \\
+\text{HIGH}
\end{array}
\]

\begin{equation}
[\text{+syll}] \rightarrow [+\text{str}_2] / _- [\text{-syll}]_0 [+\text{syll}]
\end{equation}

Because these rules apply to segments, yet require laryngeal tier information as the environment, they are cross-tier rules. In rule (40), the environment defines the vowel that receives primary stress as the one with which the final tone is associated. The environment will always be
met, and so this rule will apply in the derivation of every word. In rule (41), the environment defines a vowel that receives secondary stress as the nonfinal vowel with which a [+HIGH] tone is associated. This rule will apply in the derivation of only a minority of words. The following sample derivation incorporates these stress rules:

| (42) | Underlying Form | 5 1 3 h | 'makes a fuss over' |
|      |                 |       | araya?a |
| Initial Association | 5 1 3 h |       | araya?a |
| No Crossing        | 5 1 3 h |       | araya?á |
| Primary Stress     | 5 1 3 h |       | araya"?á |
| Secondary Stress   | 5 1 3 h |       | a'raya"?á |
| Tone Epenthesis    | 3 5 2 1 3 h |       | a'raya"?á |
| Convention 2       | 3 5 2 1 3 h |       | a'raya"?á |
In order to derive the correct surface forms, a number of other tone rules need to be applied to the results of primary and secondary association. Some of these, such as the rules that create slight downglides on underlying level tones, are not formulated here because they require reference to scalar phonetic features. It is necessary, however, to describe the process of tertiary association, which creates glides from the underlying level tones 4 and 5. When these tones are not followed by any laryngeal, or when they are checked by ʔ or ʰ, they are realized as the upglides [34] and [35], respectively, as seen in the following examples:

(43) a. koto₄ [ko₃[to:₃4] 'shirt' (Spanish cotón)
    b. kara₅ [ka₃[rə:₅5] 'covered'
    c. ni₄ʔ ["ni₃⁴ʔ] 'we inclusive'
    d. ana₅ʰ [a₃[na₃⁵ʰ] 'hoes'

When, however, tone 4 is followed by the ballistic laryngeal ʰ, it is actualized as a [43] downglide, rather than as an upglide, as seen in (44):

(44) kano₄ʰ [ka₃[nː⁴³] 'grabbed'

(Tone 5 does not precede ʰ.) This downglide is presumably one of the dynamic effects of ʰ; see the discussion of this laryngeal in Chapter 5, Section 5.1.
In order to create these glides, I employ two further epenthesis rules, which create a new tone 3; these rules are:

(45) **Upglide Insertion**

\[ \emptyset \rightarrow \left[ \begin{array}{l}
+\text{HIGH} \\
+\text{CENT}
\end{array} \right] / \rightarrow \left[ \begin{array}{l}
+\text{HIGH} \\
+\text{GLOT}
\end{array} \right] \]

(46) **Downglide Insertion**

\[ \emptyset \rightarrow \left[ \begin{array}{l}
+\text{HIGH} \\
+\text{CENT}
\end{array} \right] / \rightarrow \left[ \begin{array}{l}
+\text{HSP}
\end{array} \right] \]

The tone 3 created by Downglide Insertion is invariably associated with the vowel of the word-final syllable by means of the No Crossing convention. This is because the newly created tone 3 follows the underlying tone 4, which is associated with the final vowel by Initial Tone Association. The following derivation shows rule (46) followed by No Crossing:

(47) **Underlying Form**

<table>
<thead>
<tr>
<th>4</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>kano</td>
<td></td>
</tr>
</tbody>
</table>

**Initial Association**

<table>
<thead>
<tr>
<th>4</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>kano</td>
<td></td>
</tr>
</tbody>
</table>

**No Crossing**

Does not apply
Primary Stress

4

| kana

Secondary Stress does not apply

Tone Epenthesis

3 4

| kana

Convention 2

3 4

| | kana

Downglide Insertion

3 4 2

| | kana

No Crossing

3 4 2

| |/ kana

The tone 3 created by Upglide Insertion, on the other hand, precedes the underlying 4 or 5 that is associated with the final vowel by Initial Tone Association. If the word has only one syllable, this tone 3 must, of course, be associated with the final vowel. If, however, the word has two or more syllables, the newly created tone 3 is between the tone created by Tone Epenthesis and associated with the penultimate vowel by Convention 2 and the underlying 4 or 5 that is associated with the final vowel by Initial Tone Association. The newly created tone 3 could be associated with either of these vowels without violating the
No Crossing convention. There is nothing in the literature to resolve this indeterminacy by any general principle of autosegmental phonology, as far as I can tell. In fact, Clements and Ford (1979:186) state specifically that there is no principle to cover such a case because they consider that such a tone would normally remain unassociated. Goldsmith (1976:36, 1979:207) says that it must be associated, but does not say how. It therefore seems to be necessary to posit a second language-particular rule, which states that a tone which has no free vowel with which it can be associated is associated to the right. This rule is:

(48) Association to Right

If a tone lies between two tones, each of which is associated with a different vowel, associate the free tone to the right.

The following derivations show the application of Upglide Insertion followed by No Crossing or Association to Right:

(49) Underlying Form

\[\frac{\text{kaki}}{5}\]

\[\text{'earring'}\]

Initial Association

\[\frac{\text{kaki}}{1}\]

No Crossing does not apply
Primary Stress  

\[
\begin{align*}
\text{5} & \\
\text{ka"ki} & \\
\end{align*}
\]

Secondary Stress  

does not apply

Tone Epenthesis  

\[
\begin{align*}
\text{3} & \\
\text{5} & \\
\text{ka"ki} & \\
\end{align*}
\]

Convention 2  

\[
\begin{align*}
\text{3} & \\
\text{5} & \\
\text{ka"ki} & \\
\end{align*}
\]

Upglide Insertion  

\[
\begin{align*}
\text{3} & \\
\text{3} & \\
\text{5} & \\
\text{ka"ki} & \\
\end{align*}
\]

No Crossing  

does not apply

Association to Right  

\[
\begin{align*}
\text{3} & \\
\text{3} & \\
\text{5} & \\
\text{ka"ki} & \\
\end{align*}
\]

(50) Underlying Form  

\[
\begin{align*}
\text{4} & \\
\text{‘palm basket’} & \\
\text{yo} & \\
\end{align*}
\]

Initial Association  

\[
\begin{align*}
\text{4} & \\
\text{yo} & \\
\end{align*}
\]

No Crossing  

does not apply
Primary Stress \[4\] 
/ "yo"

Secondary Stress does not apply

Tone Epenthesis does not apply

Convention 2 does not apply

Upglide Insertion \[3 4\] 
/ "yo"

No Crossing \[3 4\] 
/ "yo"

Association to Right does not apply

Upglide Insertion and Downglide Insertion are not ordered with respect to each other.

All of the rules for the three stages of tone association and for stress placement given in this section are regular and exceptionless phonological rules of Copala Trique. As might be expected, they all take place after word-internal morphology, which is carried out in the lexicon, effects certain changes in the tonal representation of stems (see Chapter 7). There are, however, certain word-external morphological processes in Copala Trique that are clearly postlexical (see Chapters 8 and 9). These processes take place after primary and
secondary association, but before tertiary association. Some regular rules of Copala Trique therefore precede some rules that have morphological conditions. Such an ordering violates the principles of lexical phonology (see Kiparsky 1982), but is in accord with the model proposed by S. Anderson (1975, 1982).

4.4 Tone and the Segmental Tier

One of the criteria for autosegmentality, as discussed in Chapter 2, Section 2.2, is autonomy: the material that is placed on a separate tier should show significant interaction with material on its own tier and a minimum of interaction with material on other tiers. The central thrust of this study is, of course, to show various kinds of interaction among tones and between tones and nuclear laryngeals. In this section I present evidence for the autosegmentality of tone by showing that there are no significant distributional restrictions between any of the tone levels or sequences and any feature on the segmental tier. Tables 9-11 show all of the tone patterns with each class of segments. Table 9 gives an example of each oral vowel, and of one of the nasalized vowels, with each tone pattern. Tables 10 and 11 give examples of consonant classes with each tone pattern: Table 10 shows different manners of articulation, and Table 11 shows different places of articulation.
Table 9. Cooccurrence of Tones and Vowels

<table>
<thead>
<tr>
<th>i</th>
<th>u</th>
<th>o</th>
<th>a</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>wi₁ʰ</td>
<td>yu¹</td>
<td>ke₄</td>
<td>ko¹</td>
</tr>
<tr>
<td>'two'</td>
<td>'sour'</td>
<td>'many'</td>
<td>'stinking'</td>
<td>'violent'</td>
</tr>
<tr>
<td>2</td>
<td>iči₂ʰ</td>
<td>sku₂</td>
<td>ne₂</td>
<td>yo²</td>
</tr>
<tr>
<td>'seven'</td>
<td>'illegitimate'</td>
<td>'slanting'</td>
<td>'wet'</td>
<td>'and', 'with'</td>
</tr>
<tr>
<td>3</td>
<td>či³</td>
<td>ayu³</td>
<td>ne³</td>
<td>yo³</td>
</tr>
<tr>
<td>'man'</td>
<td>'spills'</td>
<td>'plow'</td>
<td>'that'</td>
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Table 10. Cooccurrence of Tones and Consonants: Manners of Articulation

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<td>'went up'</td>
<td>'vine'</td>
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NOTES FOR CHAPTER 4

1. Five-level tone systems have been reported for at least nine languages beside Copala Trique; they are: Chicahuaxtla Trique (Longacre 1952), various dialects of Miao and Yao (Chang 1953, 1972, Kwan 1971), Ticuna (L. Anderson 1959), Usila Chinantec (Skinner 1962), Ivory Coast Dan (Béarth and Zemp 1967), Ashuku and Kporo (Shimizu 1980), Puyi (Sarawit 1973), and Ngamambo Bamileke (Asongwed and Hyman 1977). I am not personally acquainted with all of these sources; see the discussion in S. Anderson (1978:145-46), Maddieson (1978:338), and Yip (1980:202-203). Even though it is possible that some of these systems could be reduced to four levels by means of an abstract analysis, it seems highly unlikely that all of them could be simplified in this way. The reluctance on the part of some linguists, such as Yip (1980:44, 202-204), to accept five-level systems at the underlying level may have something to do with the fact that four levels are far easier to analyze in terms of binary features than five levels are.

2. I adopt the convention of using capital letters for laryngeal tier features and lowercase letters for segmental tier features; this distinguishes the tone feature [HIGH] from the articulatory feature [high].
3. In the original analysis, I used the numbering convention that was developed by Pike (1945) to describe the intonation levels found in English. This convention has also been used to describe many Otomanguean tone systems. In this convention, the number 1 represents the highest tone in the system, rather than the lowest. In the present study, I have reversed this convention and use 1 for the lowest tone in order to conform to the convention that seems to be more widely used. In order to facilitate comparison between the two analyses, I reverse the numbers when I cite the original analysis.

4. For a dissenting point of view, see Mugele (1982:126-36), who claims that, for Lalana Chinantec (an Otomanguean language distantly related to Copala Trique), there is a tone harmony rule that can be stated more elegantly by having contour tone features than by decomposing contours into sequences of levels. It may be possible, however, using a system like Yip's (1980:195-97), in which register and tone form two separate autosegmental tiers, to write a rule that shifts an entire contour to a different register, while maintaining the autosegmental approach.

5. In September, 1983, the Linguistics Department of the University of Arizona obtained a Kay Digital Sona-Graph 7800 and a Kay Sona-Graph Printer 7900, under National Science Foundation Grant BNS-8309112. I would like to express my appreciation to the National
6. Huautla Mazatec appears to be a genuine counterexample to Yip's claim about gliding tones. This language has been described with at least three upglides (12, 13, and 23) and four downglides (21, 31, 32, and 42) in Pike (1948:95-165). (I have reversed the numbering to conform to the convention used in the present study, in which 1 represents low tone.)
CHAPTER 5

THE LARYNGEAL TIER: LARYNGEALS

In this chapter I discuss the three nuclear laryngeals that I posit in Copala Trique: \( \sim, \text{h,} \) and \( \sim. \) Unlike the onset laryngeals \( \sim \) and \( \text{h,} \) which I claim should be treated as ordinary consonants on the segmental tier, the three nuclear laryngeals are treated on the laryngeal tier, along with tone, in the analysis that I adopt in this study. A detailed justification of this position has been presented in Chapter 2, Section 2.2.

The nuclear laryngeals \( \sim \) and \( \text{h,} \) present no essential difficulties of analysis: \( \sim \) is a glottal stop, and \( \text{h,} \) is a nonsyllabic voiceless vowel. Both sometimes weaken so that \( \sim \) is often actualized as a creaky (laryngealized) fade on the vowel with which it is associated, and \( \text{h,} \) is often actualized as a breathy (murmured) fade into complete voicelessness. The third nuclear laryngeal, \( \sim, \) however, is an abstract segment that I posit as the underlying representation for a distinction that is, on the surface, realized mainly as a difference in vowel length. The first section of this chapter is devoted largely to a justification for this highly unorthodox analysis. The next section deals with laryngeal features, and the third section covers the way in which laryngeals are associated with the segmental tier. The final two sections cover the
relation between laryngeals and tone, and the relation between laryngeals and the segmental tier; in each section both distributional restrictions and coarticulation effects are considered.

5.1 Laryngeal Contrasts

The three nuclear laryngeals of Copala Trique, ʔ, ʰ, and ŋ, contrast with each other, and with the absence of any laryngeal, in the word-final position on the laryngeal tier, as seen in the following examples:

(1) a. ići²ʔ 'ten'
b. ići²ʰ 'seven'

(2) a. uta³ʔ 'puts down on top'
b. uta³ʰ 'sticks'

(3) a. ne³ʔ 'rope'
b. ne³ 'plow'

(4) a. ya¹³ʰ 'now'
b. ya¹³ʰ 'true'
c. ya¹³ 'Spanish moss'

Of these four possibilities, ʰ is the most frequent, ʔ is the least frequent, and ŋ and no laryngeal occupy an intermediate position.

The laryngeal ʔ is realized either by glottal closure or by a period of creaky voicing, and ʰ is realized by a period of complete
voicelessness. The laryngeal ], however, is realized mainly by the fact that a vowel associated with ] is much shorter than a vowel that is not associated with any laryngeal, as seen in the following examples:

(5) a. \text{to}^{32}\!] \quad [\text{"to}^{32}] \quad 'metate'
   b. \text{to}^{32} \quad [\text{"to:}^{32}] \quad 'milk'

(6) a. \text{ya}^{13}\!] \quad [\text{"ya}^{13}] \quad 'true'
   b. \text{ya}^{13} \quad [\text{"ya:}^{13}] \quad 'Spanish moss'

(7) a. \text{ane}^{32}\!] \quad [\text{a"n:e."}^{32}] \quad 'takes a bath'
   b. \text{ane}^{32} \quad [\text{a"ne:}^{32}] \quad 'glows (coals)'

The usual approach to vowel length is to consider "short" vowels to constitute the simple, unmarked case, and "long" vowels to be either geminate clusters or vowels that are specified [+long]. In either case, the contrast would be handled on the segmental tier. A recent variation of the gemination analysis is a metrical analysis, in which "long" vowels are single vowels that fill two distinct positions in the syllable; see, for example, Leben (1980) and Ingria (1980:467-70).

In what follows, I argue that none of these analyses fits the facts of Copala Trique. In this language, the "long" vowels are the unmarked case, and the surface "length" distinction involves more than simple duration. "Long" vowels are simple vowels that have undergone a phonetic lengthening rule in word-final position; this rule operates when no laryngeal is associated with this vowel. See rule (22) in
Chapter 3, Section 3.1, for a description of this process. "Short" vowels, on the other hand, are vowels that are associated with the abstract laryngeal \( \_ \), which imposes certain ballistic features on the vowel with which it is associated; "short" vowels thus constitute the marked member of the opposition.\(^1\) The laryngeal \( \_ \) is abstract because it has no phonetic content at the position I assign it to in underlying structure. It nevertheless provides a more coherent account of a number of phonetic and structural facts about Copala Trique than any of the traditional approaches to vowel length does.

I begin by presenting four kinds of phonetic facts that fit in well with the proposed abstract laryngeal analysis, but which would be hard to account for if the phonetic length difference were to be assigned to an underlying length difference.

The first kind of evidence concerns the way in which the contrast between \( V \) and \( V' \) is heightened in words that receive sentence stress. When words do not receive sentence stress, the average durations of \( V \) and \( V' \) are 26 and 12 centiseconds, respectively. The "long" vowels are therefore more than twice as long as their "short" counterparts. Under sentence stress, however, the average durations of \( V \) and \( V' \) are 31 and 9 centiseconds, respectively. The "long" vowels are therefore more than three times as long as their "short" counterparts in this position. Even more significant than the increase in relative duration, however, is that fact that the "short" vowels actually decrease in absolute duration under sentence stress. Figure 10 shows
broad-band spectrograms of the words for 'milk' and 'metate'; in this particular pair of utterances, the "long" vowel is about four times as long as the "short" one in stressed position.²

These facts are consistent with the proposed analysis. The abstract laryngeal has a set of dynamic phonetic effects on the vowel with which it is associated that include shortening it (in addition to blocking the application of the vowel lengthening rule), and these effects are heightened in stressed syllables. In a traditional gemination or length analysis, we would expect the absolute duration of both "short" and "long" vowels to be somewhat greater in words that receive sentence stress than in words that do not, but such is not the case.

Figure 10 also shows an amplitude display of the words for 'milk' and 'metate' to illustrate the contrasting intensity patterns characteristic of "long" and "short" vowels. Simple shows a steep rise in intensity following the release of the t, followed by a slow decay, while shows only the steep rise, immediately after which the segment terminates. also shows a slightly higher intensity peak than . Again, these facts are consistent with the proposed analysis. A vowel associated with a ballistic laryngeal can be expected to show an intensity pattern different from that found in a simple vowel. In a traditional gemination or length analysis, on the other hand, the sharp difference in intensity curve remains unaccounted for.

A precise phonetic characterization of must await further research. The best hypothesis I can offer at present is that the
Figure 10. Spectrograms Illustrating \( \overline{y} \) and \( \overline{y}' \)

Displays of \( {\underline{to}}^{32} \) 'milk' (on left) and \( {\underline{to}}^{32!} \) 'metate'.
articulatory mechanism responsible for this characteristic intensity pattern is subglottal and involves action of the respiratory muscles. Mugele (1982:14) claimed that the ballistic syllables found in Lalana Chinantec were "produced by an active expiratory gesture that raises subglottal pressure." If this phonetic description proves to be true for Copala Trique also, then \( \downarrow \) is technically not a laryngeal, because it is produced below the larynx. I nevertheless claim that, structurally, it patterns as a laryngeal; such an analysis simplifies the statement of various morphological rules, as described below and in Chapters 7-9.

A third kind of phonetic evidence is found in the fact that tone 4 has two variants, one that occurs with \( V \) (and with \( V' \)), and one that occurs with \( V' \). With \( V \), tone 4 is a [34] upglide; and with \( V' \), tone 4 is a [43] downglide, as described by rules (45) and (46) in Chapter 4, Section 4.3. This is seen in the following examples:

(8) \[ y_{o}^{4} \quad ["yo\,^{34}] \quad 'palm basket' \]

(9) \[ run_{a}^{4'} \quad [ru^{3\,n:a\,^{43}}] \quad 'avocado' \]

These facts are also consistent with the proposed analysis because the downglide found with \( \downarrow \) can be considered another of its dynamic phonetic effects. A gemination or length analysis, however, fails to account for the downglide. If the contrast between \( V \) and \( V' \) were simply doubling or duration, we might expect tone 4 to be level or reduced to a slight
upglide with "short" vowels, but we would not expect a change in the direction of the glide.

The fourth kind of phonetic evidence is that sonorants are lengthened preceding \( \ddash \), but not preceding \( \ddash \), as described by rule (51) in Chapter 3, Section 3.2. This is seen in examples (10) and (11):

(10) \( na^{32} \) \( ["n:a^{32}] \) 'water'

(11) \( na^{31} \) \( ["n:a^{31}] \) 'cornfield'

This lengthening is particularly noticeable in syllables that receive sentence stress. No lengthening takes place, however, with a preceding obstruent, as seen in (12) and (13):

(12) \( to^{32} \) \( ["t:o^{32}] \) 'metate'

(13) \( to^{32} \) \( ["t:o^{32}] \) 'milk'

Sonorant lengthening is also compatible with the abstract laryngeal analysis in that the lengthening can be considered another of the dynamic effects of \( \ddash \). A traditional gemination or length analysis, on the other hand, provides no rationale for this fact. The lengthening rule cannot be considered to be strictly a case of compensatory lengthening that makes all syllables approximately equal in duration, because it does not apply in the case of obstruents.

I turn now from a consideration of strictly phonetic detail to an examination of structural factors that favor the abstract laryngeal
analysis over a gemination or length analysis. The first structural factor concerns the number of oral vowels that occur with \( \overline{v} \) and \( \overline{v} ' \).

There are five vowels, \( a, e, i, o, \) and \( u, \) and all five occur with \( \overline{v} \). Only three of these, however, \( a, e, \) and \( o, \) occur with \( \overline{v} ' \), and in this environment, \( e \) and \( o \) have a more open tongue position, approximately \([\text{t}]\) and \([\text{o}]\), respectively, as described by rule (24) in Chapter 3, Section 3.1. Example set (14) shows the range of vowels when no laryngeal is associated with them, and example set (15) shows the reduced set of vowels associated with \( \overline{v} ' \):

(14) a. \( \overline{na}^{31} \) \(["na:\,31"]\) 'cornfield'
b. \( \overline{ne}^{3} \) \(["ne:\,3"]\) 'plow'
c. \( \overline{ni}^{31} \) \(["ni:\,31"]\) 'at night'
d. \( \overline{yo}^{32} \) \(["yo:\,32"]\) 'sugarcane'
e. \( \overline{nu}^{3} \) \(["nu:\,3"]\) 'becomes'

(15) a. \( \overline{na}^{32'} \) \(["na:\,32"]\) 'water'
b. \( \overline{uno}^{31} \) \([u^{3}n:\,o^{3}3"]\) 'hears'
c. \( \overline{ane}^{32'} \) \([a^{3}n:\,e^{32}3"]\) 'takes a bath'

As in the case of the phonetic factors described above, the dynamic nature of \( \overline{v} ' \) again provides a plausible account of this restriction. The \( \overline{v} ' \) combination simply does not last long enough to permit five vowel qualities to be clearly contrasted, or to permit a tense and maximally differentiated set of three tongue positions to be reached. A gemination analysis, on the other hand, is unable to account for the absence
of single \( \ddagger \) and \( \ddagger \); and a length analysis, though possible, in that languages with more long vowels than short vowels are attested, provides no rationale for the gaps.

A second structural factor is the fact that there is no "length" contrast before \( \ddagger \) and \( \ddagger \). If, however, the "length" contrast is merely a surface manifestation of an underlying contrast that involves the presence or absence of a laryngeal, then this distributional fact is precisely what we would expect: \( \ddagger \) does not cooccur with either \( \ddagger \) or \( \ddagger \) because they are all in paradigmatic contrast in the same structural position.

Furthermore, the abstract laryngeal analysis provides a coherent account of the phonetic facts about vowels that are associated with \( \ddagger \) and \( \ddagger \), which a gemination or length analysis cannot do. The vowels that are associated with \( \ddagger \) and \( \ddagger \), like those that are associated with \( \ddagger \), are not phonetically long. On the other hand, they do not exhibit any of the special characteristics of \( \ddagger \), i.e., of the "short" vowels. They are not notably short, nor do they have the special intensity pattern associated with \( \ddagger \). Also, the vowels that are associated with \( \ddagger \) and \( \ddagger \) show all five vowel qualities, not merely three, as seen in (16) and (17):

(16) a. \( \text{ya}^3\ddagger \) 'maguey fiber'
b. \( \text{ne}^3\ddagger \) 'rope'
c. \( \text{ni}^4\ddagger \) 'we inclusive'
d. \[no^{3}\] 'she'
e. \[nu^{1}\] 'completely'

(17) a. \[ya^{32h}\] 'flower'
b. \[ne^{32h}\] 'sleepiness'
c. \[ni^{32h}\] 'ugly'
d. \[tayo^{3h}\] 'Juxtlahuaca' (town)
e. \[nu^{3h}\] 'skin'

In addition, sonorants that precede \[\nu\] and \[\nu^{h}\] are not lengthened, as seen in (18) and (19):

(18) \[ya^{3}\] ['ya^{3}'] 'maguey fiber'

(19) \[nu^{3h}\] ['nu^{3h}'] 'skin'

Furthermore, tone 4 is an upglide ([34]), not a downglide ([43]), in syllables associated with 2, as seen in (20):

(20) \[ni^{4}\] ['ni^{34}\'] 'we inclusive'

(Tone 4 does not precede \(\cdot\).

In the abstract laryngeal analysis proposed in this study, 2 occurs in the same position as 2 and \(\cdot\) and therefore cannot cooccur with either of them. The vowels that are associated with 2 and \(\cdot\) must therefore be the simple ones. They are not long because 2 and \(\cdot\), like 2, block the application of the phonetic lengthening rule, which applies only when vowels are unassociated with any laryngeal. Nor do they have
any of the unusual characteristics of "short" vowels in open syllables because all of those characteristics are caused by \~.

In a gemination or length analysis, on the other hand, the vowels that are associated with \? and \~h would have to be assigned to the simple or short series because they are not long. As a result, the various differences between simple or short vowels in open syllables and simple or short vowels associated with \? and \~h would constitute an arbitrary list of facts to be described. It would also be necessary to state the lack of contrast between simple and geminate, or short and long, vowels associated with \? and \~h as an arbitrary phonotactic constraint.

The third—and final—kind of structural evidence that I consider is found in morphological and morphophonemic alternations. There are two areas that lend support to the abstract laryngeal analysis.

The first area involves alternations in which \~h is added or deleted at the end of the laryngeal tier representation. In each case, the alternation is between \~V and \~V^h, never between \~V' and \~V^h. For example, potential aspect is marked by a lowering of the stem tone (see Chapter 7, Section 7.3); this lowering sometimes involves the addition or deletion of \~h, as seen in (21) and (22):

(21) a. \underline{kina}^\text{5} \quad \text{'washed'}
b. \underline{kina}^{1\text{h}} \quad \text{'will wash'}
A similar alternation is seen in a tone sandhi rule in which tone 3 is raised to 5, and nuclear h is deleted, before certain pronouns, as seen in (23):

(23) a. ʔya₃ʰ  'makes'
   b. ʔya₅ zo¹  'you make'

This process is described in greater detail in Chapter 8, Section 8.2.

In the analysis proposed in this study, in which the "long" vowels are underlying simple vowels, these alternations are easy to state because they involve only the addition or deletion of h, as seen in examples (21)-(23). Length is introduced in ʔ by the independently necessary phonetic rule that lengthens vowels that are unassociated with any laryngeal (rule (22) in Chapter 3, Section 3.1).

In a gemination or length analysis, however, the situation would be considerably more complicated. The alternating forms would contain two differences: the presence or absence of h and a difference in the vowel. The forms that would alternate in a gemination analysis are shown in (21')-(23'), and the forms that would alternate in a length analysis are shown in (21'')-(23''):

(21') a. kinā₅  'washed'
    b. kin₁h  'will wash'

(22) a. kirā₅ʰ  'bought'
    b. kir₂  'will buy'
The rule that adds ʰ, exemplified in (21), would have to be accompanied by another rule that automatically deletes or shortens a vowel that is associated with a laryngeal. Also, the two rules that delete ʰ, exemplified in (22) and (23), would have to incorporate the concomitant gemination or lengthening of the associated vowel into the statement of the rules. Under either a gemination or a length analysis, therefore, the need to handle the vowel changes would make the description of the alternations more complex.

The second area of morphology that supports the abstract laryngeal analysis is found in enclitic pronouns. The first person singular clitic has the underlying form -ʰ, and the inclusive clitic has the underlying form -ʔ. When these pronouns are added to a stem that
already has one of the three nuclear laryngeals, the stem laryngeal is deleted, as seen in (24):

<table>
<thead>
<tr>
<th>(24)</th>
<th>gloss</th>
<th>stem alone</th>
<th>stem + -h</th>
<th>stem + -ʔ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>'will walk'</td>
<td>kačē^2_2</td>
<td>kačē^2h_2</td>
<td>kačē^2ʔ_2</td>
</tr>
<tr>
<td>b.</td>
<td>'will bury'</td>
<td>kači^1ʔ_1</td>
<td>kači^1h_1</td>
<td>kači^1ʔ_1</td>
</tr>
<tr>
<td>c.</td>
<td>'will wash'</td>
<td>kinā^1h_1</td>
<td>kinā^1h_1</td>
<td>kinā^1ʔ_1</td>
</tr>
<tr>
<td>d.</td>
<td>'will sow'</td>
<td>kuno^2ʔ_0</td>
<td>kuno^2h_0</td>
<td>kuno^2ʔ_0</td>
</tr>
</tbody>
</table>

These pronouns are described in detail in Chapter 9, Section 9.3.1. In the analysis proposed in this study, the forms in row (a) are generated by simply attaching -ʔ or -ʔ, and the forms in rows (b)-(d) are generated by cliticization plus the application of a rule that deletes a laryngeal preceding another one.

In a gemination or length analysis, however, as shown in (24') and (24''), respectively, the situation would be more complex:

<table>
<thead>
<tr>
<th>(24')</th>
<th>gloss</th>
<th>stem alone</th>
<th>stem + -h</th>
<th>stem + -ʔ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>'will walk'</td>
<td>kače^2_2</td>
<td>kače^2h_2</td>
<td>kače^2ʔ_2</td>
</tr>
<tr>
<td>b.</td>
<td>'will bury'</td>
<td>kači^1ʔ_1</td>
<td>kači^1h_1</td>
<td>kači^1ʔ_1</td>
</tr>
<tr>
<td>c.</td>
<td>'will wash'</td>
<td>kinā^1h_1</td>
<td>kinā^1h_1</td>
<td>kinā^1ʔ_1</td>
</tr>
<tr>
<td>d.</td>
<td>'will sow'</td>
<td>kuno^2ʔ_0</td>
<td>kuno^2h_0</td>
<td>kuno^2ʔ_0</td>
</tr>
</tbody>
</table>
(24'') gloss stem alone stem + -h stem + -ʔ

a. 'will walk'  kače₂⁡  kače²h  kače²ʔ
b. 'will bury'  kačί₁ʔ  kačί₁h  kačί₁ʔ
c. 'will wash'  kinά₁h  kinά₁h  kinά₁ʔ
d. 'will sow'  kuno₂  kuno²h  kuno²ʔ

Under either of these analyses, it would be necessary to employ the rule mentioned above that automatically deletes or shortens a vowel that is associated with a laryngeal, in addition to the rule that deletes a laryngeal preceding another laryngeal. The forms in row (a) of (24′) and (24'') would be generated by cliticization and vowel reduction or shortening, the forms in rows (b) and (c) would be generated by cliticization and laryngeal deletion, and the forms in row (d) would be generated by cliticization alone. A gemination or length analysis, therefore, makes it more difficult to describe the way that clitics are attached.

I have now presented a number of reasons why the surface "length" contrast found in Copala Trique should not be treated as such at the underlying level. I have claimed that "short" vowels constitute the marked case and that their "shortness" should be considered a manifestation of the abstract laryngeal ʕ. I turn now to a brief consideration of the relation between Copala Trique ʕ and the ballistic syllable type that has been proposed for other Otomanguean languages.
Two families within Otomanguean, Chinantecan and Amuzgoan, have been reported to have a contrast between ballistic and controlled syllables. See, for example, Merrifield (1963), Bauernschmidt (1965), Rensch and Rensch (1966), and Mugele (1982). A useful comparison of the two families is found in Rensch (1978). While the phonetic manifestations differ from language to language, there are three characteristics of ballistic syllables in Chinantec and Amuzgo that are shared by Copala Trique. First, ballistic syllables show a different intensity pattern from their controlled counterparts. Second, ballistic syllables are shorter than their controlled counterparts. And third, ballistic syllables condition variants of tone patterns in which the tones typically begin higher and show a pronounced downglide at the end.

In spite of the clear phonetic similarity between Copala Trique and the ballistic syllables of the other two families, there is no historical relation between the two. Rensch (1978:91-92) claims that the ballistic syllables of Chinantec and Amuzgo are reflexes of Proto-Otomanguean postvocalic *h, which was actualized either as an h interrupting the preceding vowel or as a murmured quality to that vowel. In Trique, however, the historical development was very different. Rensch (1976:84) claims that Proto-Otomanguean postvocalic *h developed into Proto-Mixtecan postvocalic ʔ, which then split within Trique into postvocalic ʔ and h. According to Longacre (1957:82), this split took place under rather complex conditions involving both tones and segments. I have also examined the cognate sets in Rensch (1976) in some detail to
determine whether or not Copala Trique words with a can be traced back to Proto-Otomanguean forms with postvocalic *\#h, or with any other consistent laryngeal feature, and I have found no evidence that they can.

It appears to be the case, therefore, that a developed within Trique by a split of simple *V into V and V', conditioned by some feature of tone and/or stress. Even though further research is needed to determine the precise historical development, some evidence bearing on the question is found in cognate forms from San Andrés Chicahuaxtla Trique and in Spanish loanwords.

The contrast between V and V' does not occur in Chicahuaxtla Trique, which has simple V corresponding to both V and V' in Copala Trique. Chicahuaxtla words sometimes show distinctive tone patterns, however, when they correspond to V', rather than to V. For example, Chicahuaxtla words characteristically bear one of the three lowest tone levels on nonfinal syllables, but there is one unusual tone pattern in which the penultimate syllable has level 4, accompanied by secondary stress, and the final syllable has level 3 (Longacre 1952:74, 78). This tone pattern is cognate with Copala Trique V' with tone 4. The following examples show this correspondence (Chicahuaxtla forms are from Longacre 1957:188, 183): 4

(25) a. Chicahuaxtla: \(ru^4ne^3\) 'avocado'
b. Copala: \(runa^4\) [\(ru^3"n:a^43\)] 'avocado'
Spanish words are borrowed into Copala Trique with either \( V \) or \( V' \), depending on the placement of the stress in the Spanish source word. A Spanish word with final stress is borrowed with \( V \), and one with penultimate stress is borrowed with \( V' \); both have tone 4 and primary stress on the final syllable. Examples (27) and (28) show the prosodic patterns found in loanwords:

(27) \( koto^4 \) \( [ko^3\text{to}^34] \) 'shirt' (Spanish \( \text{coton} \))

(28) \( kwayo^4' \) \( [kwa^3\text{yo}^343] \) 'horse' (Spanish \( \text{caballo} \))

It seems likely that the drop in pitch and intensity on the final vowel of a Spanish word with penultimate stress is the factor that triggered the perception of such words as having the ballistic laryngeal \( \_ \). It is of interest, however, that the Spanish penultimate stress was overridden by the regular final stress pattern of Copala Trique.

5.2 Laryngeal Features

The feature set proposed by Chomsky and Halle (1968:298-329) is not particularly helpful for handling laryngeal tier material. It provides no major class features to separate either tone or laryngeals from other sounds, nor any characterization for \( \_ \).

(26) a. Chicahuaxtla: \( ga^4\text{ne}^3 \) 'to ripen'

b. Copala: \( kane^4' \) \( [ka^3\text{ne}^43] \) 'ripened'
For ŋ and ŋ, the approach they have followed is to treat them as glides and classify them as [+sonorant], just like ŋ and ŋ. It seems to be the case, however, that the opposition between obstruents and sonorants is simply irrelevant in the case of laryngeals. The cavity features provided by Chomsky and Halle (1968:176–77) are also unhelpful for describing ŋ and ŋ because these features focus on the oral cavity. In spite of these weaknesses, I have followed Chomsky and Halle's system for onset laryngeals, which are on the same tier as oral glides (see Table 4 in Chapter 3, Section 3.2). For nuclear laryngeals, however, I have chosen a different system, which I describe below.

Chomsky and Halle mention two other features that are relevant for describing laryngeals: [GLOTTAL CLOSURE] and [HEIGHTENED SUBGLOTTAL PRESSURE] (pp. 321, 326). The [GLOTTAL CLOSURE] feature seems to have been developed primarily to handle glottal closure or constriction as a secondary articulation with obstruents, but they also assign a plain ŋ a positive value for this feature. The [HEIGHTENED SUBGLOTTAL PRESSURE] feature, on the other hand, seems to have been developed primarily to handle aspiration, but they also assign a plain ŋ a positive value for this feature. In Copala Trique, however, ŋ never represents aspiration of an obstruent, and it is not characterized by increased subglottal pressure, but rather by an open glottis. The laryngeal that is characterized by increased subglottal pressure is ŋ.

A different approach to laryngeal features was proposed by Halle and Stevens (1971). They proposed two pairs of opposing features, based
on vocal cord shape and positioning. Each pair of features defines three values along a parameter. One pair of features describes vocal cord tension; the two features are [STIFF] and [SLACK]. The second pair describes the positioning of the vocal cords; the two features are [SPREAD] and [CONSTRUCTED]. Halle and Stevens originally hoped to account for a variety of different laryngeal phenomena with these four features, including voicing and tone, as well as the laryngeal glides, but this has since been shown to be too ambitious. In the area of tone, Halle and Stevens' features fail because they handle only three levels. Also, the predictions that this feature system makes about the relation of consonant types to tone are not always borne out. See the discussion in S. Anderson (1978:161-67) for a detailed critique. In spite of these problems, however, the Halle and Stevens feature system is more appropriate for characterizing the Copala Trique laryngeals ʔ and h than any of the features developed by Chomsky and Halle.

The feature system that I have chosen to handle the three laryngeals of Copala Trique is a composite. First, it employs two major class features that define laryngeals, [segmental] and [GLOTTAL]. All vowels and consonants on the segmental tier are [+segmental], and all tones and nuclear laryngeals are [-segmental]. Within the laryngeal tier, all tones are [-GLOTTAL], and all laryngeals are [+GLOTTAL]. Second, it employs the Halle and Stevens parameter of vocal cord positioning: ʔ is [-SPREAD, +CONSTRUCTED], and h is [+SPREAD, -CONSTRUCTED]. The third laryngeal, ʕ, is [-SPREAD, -CONSTRUCTED], i.e., it has a
neutral positioning of the vocal cords. The final feature is Chomsky and Halle's [HEIGHTENED SUBGLOTTAL PRESSURE] ([HSP]): _ is [+HSP], and _ and _ are [-HSP].

Because there are only three laryngeals, the preceding set of features exceeds the minimum necessary to distinguish them. In addition to the major class features, only two other features are needed. Any two of these three features will distinguish the three laryngeals and will allow the value for the third feature to be predicted. Table 12 shows the three possible distinctive feature matrices for the three laryngeals of Copala Trique. I have somewhat arbitrarily chosen to use the first of these matrices, in which the distinctive features are [SPREAD] and [HSP]. The value for [CONSTR], which is redundant, can be predicted by the following rules:

\[(29) \begin{bmatrix} +GLOT \\ -SPR \\ -HSP \end{bmatrix} \rightarrow [+CONSTR] \]

\[(30) \begin{bmatrix} +GLOT \\ +SPR \\ +HSP \end{bmatrix} \rightarrow [-CONSTR] \]

For Copala Trique there does not seem to be any need to employ the features [STIFF] and [SLACK]. Even though Halle and Stevens (1971: 209) classify ordinary voiceless _ and _ as [+STIFF], these nuclear
Table 12. Feature Matrices for Copala Trique Laryngeals

<table>
<thead>
<tr>
<th>Matrix one:</th>
<th>ʔ</th>
<th>h</th>
<th>ɬ</th>
</tr>
</thead>
<tbody>
<tr>
<td>[segmental]</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>[GLOTTAL]</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[SPREAD]</td>
<td>−</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>[HSP]</td>
<td>−</td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td>([CONSTRICTED])</td>
<td>+</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Matrix two:</th>
<th>ʔ</th>
<th>h</th>
<th>ɬ</th>
</tr>
</thead>
<tbody>
<tr>
<td>[segmental]</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>[GLOTTAL]</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[CONSTRICTED]</td>
<td>+</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>[HSP]</td>
<td>−</td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td>([SPREAD]</td>
<td>−</td>
<td>+</td>
<td>−</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Matrix three:</th>
<th>ʔ</th>
<th>h</th>
<th>ɬ</th>
</tr>
</thead>
<tbody>
<tr>
<td>[segmental]</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>[GLOTTAL]</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>[SPREAD]</td>
<td>−</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>[CONSTRICTED]</td>
<td>+</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>([HSP]</td>
<td>−</td>
<td>−</td>
<td>+</td>
</tr>
</tbody>
</table>
laryngeals are produced with a very lax articulation in Copala Trique and should probably be characterized as [+SLACK] instead, which is the value Halle and Stevens assign to voiced glottal stop ꜣ and murmured Ꜳ, and also to creaky and murmured vowels (1971:203, 208-209).

5.3 Laryngeal Association

The underlying representation for nuclear laryngeals is very simple because only one nuclear laryngeal may occur in any word, and it is invariably the final element on the laryngeal tier. The schema for the laryngeal tier representation of a word, which was originally presented in Chapter 2, Section 2.3, is:

\[(31) \quad \left( \begin{array}{c} T(T) \\ V \\ N \end{array} \right) (T)(L) \]

The way in which the nuclear laryngeal is associated with the segmental tier is extremely simple and falls out naturally as a result of tone association, which is described in Chapter 4, Section 4.3. Copala Trique has a rule of Initial Tone Association, in which the first unassociated underlying tone is associated with the final vowel of the word. Then the second tone, if there is one, must also be associated with that vowel by the universal convention that association lines must not cross. Because this convention applies to any laryngeal tier element to the right of the first unassociated underlying tone, it also accounts for the association of nuclear laryngeals with the final vowel of the word.
The following partial derivations show the association process for words with a nuclear laryngeal and one or two unassociated tones:

(32) Underlying Form \[ \begin{array}{c} \text{Underlying Form} \\ \text{Initial Association} \\ \text{No Crossing} \end{array} \]

\[ \begin{array}{c} 3 \? \\ 1 \\ 1/ \end{array} \]

'metal'

\[\text{aga}\]

\[\text{aga}\]

\[\text{aga}\]

(33) Underlying Form \[ \begin{array}{c} \text{Underlying Form} \\ \text{Initial Association} \\ \text{No Crossing} \end{array} \]

\[ \begin{array}{c} 1 \ 3 \ h \\ 1 \end{array} \]

'grey'

\[\text{da}\]

\[\text{da}\]

\[\text{da}\]

5.4 Laryngeals and Tone

As noted in Chapter 4, the full range of eight tone patterns is found only on word-final syllables that are not associated with a nuclear laryngeal, and these patterns show the greatest degree of phonetic differentiation in such syllables. In this section, the distributional
restrictions between tone and nuclear laryngeals are discussed, and also
the ways in which nuclear laryngeals affect the realization of the
tones. (Tone does not affect the laryngeals in any perceptible way.)

Each of the three laryngeals occurs with only a restricted set
of tone patterns. The laryngeal ʔ does not occur with the two down-
glides, 31 and 32. Also, tone levels 4 and 5 are rare with ʔ; in under-
lying forms, each occurs with only one or two stems. Tone 4 is, how-
ever, commonly found with ʔ in surface forms that have undergone tone
sandhi (see Chapter 8, Section 8.2), or that have the inclusive clitic
pronoun attached to them (see Chapter 9, Section 9.3.1). The laryngeal
h does not occur with tone level 4, and it is extremely rare with the 31
downglide. (I have recorded only a single stem with a 31h laryngeal
tier representation.) The laryngeal 1 does not occur with either tone
level 5 or with the 31 downglide. These restrictions are summarized on
Table 13, which gives an example of each combination that occurs.

This pattern of sporadic gaps in the distribution of tone pat-
terns with nuclear laryngeals provides some additional evidence for the
analysis of the surface "length" contrast as the presence or absence of
the ballistic laryngeal 1 at the underlying level. If the underlying
contrast were basically one of gemination or length, we might expect a
very different distribution of tone patterns with "long" and "short"
vowels. For example, it would be plausible to expect all tone sequences
to be restricted to "long" vowels, but this is clearly not the case.
Table 13. Cooccurrence of Nuclear Laryngeals and Tone

<table>
<thead>
<tr>
<th>none</th>
<th>?</th>
<th>h</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>kanu₁</td>
<td>kiri₁?</td>
<td>kinah</td>
</tr>
<tr>
<td></td>
<td>'will explode'</td>
<td>'will obtain'</td>
<td>'will wash'</td>
</tr>
<tr>
<td>2</td>
<td>kaka²</td>
<td>içi²?</td>
<td>kunah</td>
</tr>
<tr>
<td></td>
<td>'will burn'</td>
<td>'ten'</td>
<td>'will run'</td>
</tr>
<tr>
<td>3</td>
<td>kara³</td>
<td>kanoko³?</td>
<td>nawi³h</td>
</tr>
<tr>
<td></td>
<td>'filled'</td>
<td>'followed'</td>
<td>'ended'</td>
</tr>
<tr>
<td>4</td>
<td>yo⁴</td>
<td>ni⁴?</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>'palm basket'</td>
<td>'we inclusive'*</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>cinä⁵</td>
<td>ru⁵?</td>
<td>kunah</td>
</tr>
<tr>
<td></td>
<td>'washed'</td>
<td>'only'*</td>
<td>'ran'</td>
</tr>
<tr>
<td>13</td>
<td>kara¹³</td>
<td>kanoko¹³?</td>
<td>nawi¹³h</td>
</tr>
<tr>
<td></td>
<td>'will fill'</td>
<td>'will follow'</td>
<td>'will end'</td>
</tr>
<tr>
<td>31</td>
<td>kanu³¹</td>
<td>x</td>
<td>maya³¹h</td>
</tr>
<tr>
<td></td>
<td>'exploded'</td>
<td></td>
<td>'yellow'*</td>
</tr>
<tr>
<td>32</td>
<td>kaka³²</td>
<td>x</td>
<td>kuçu³²h</td>
</tr>
<tr>
<td></td>
<td>'burned'</td>
<td></td>
<td>'laid down'</td>
</tr>
</tbody>
</table>

X = does not occur

\* = occurs only in one or two stems
The 13 upglide occurs with both "short" and "long" vowels, as well as with ʔ and h.

Nuclear laryngeals affect the realization of the tones in various ways; I discuss some of them below.

Two rules create surface glides out of underlying level tones. These rules are Upglide Insertion and Downglide Insertion, which have already been presented in Chapter 4, Section 4.3, as part of the description of the tone association process. These rules account for the realization of tone 4 as [43] before ʔ and as [34] elsewhere, and for the realization of tone 5 as [35]. Even though these two rules insert a tone, they do not involve any neutralization of underlying oppositions because it is always possible to recover the underlying representation from the surface form. For convenience, I repeat these two rules here:

(34) Upglide Insertion

$$\emptyset \rightarrow \frac{3}{+\text{HIGH}} / \frac{4, 5}{+\text{HIGH}} \left(\frac{2, h}{-\text{CENT}} / \left[+\text{GLOT}\right]\right)$$

(35) Downglide Insertion

$$\emptyset \rightarrow \frac{3}{+\text{HIGH}} / \frac{4, 5}{+\text{HIGH}} \left(\frac{1}{-\text{CENT}} / \left[+\text{GLOT}\right]\right)$$

These two rules must be ordered fairly late in the derivation because their input includes both stems with underlying tones 4 and 5 and also
stems that have had their underlying tone pattern changed to $4$ or $5$ by the operation of a postlexical tone sandhi rule (see Chapter 8, Section 8.2, for a description of these rules). Downglide insertion describes one of the dynamic effects of the ballistic laryngeal $\uparrow$. This laryngeal appears to be incompatible with a sustained pitch level above the middle of a speaker’s range: tone $5$ does not precede $\downarrow$ at all, and tone $4$ is realized as a downglide with $\downarrow$, rather than as an upglide. I do not at present have any explanation to offer for these facts.

There are also rules that change unpermitted or rare tone-laryngeal sequences that arise from the attachment of clitic pronouns to more acceptable sequences; these are presented in Chapter 9, Section 9.3.1.

Three other interactions between tone and laryngeals are worthy of mention. Because they involve low-level phonetic detail, however, and would require scalar, rather than binary, features, I do not attempt to write rules to describe them.

One of these is a very general process. Because the presence of a laryngeal associated with a word-final vowel prevents that vowel from being lengthened, vowels associated with a laryngeal are fairly short. It is therefore the case that tone patterns often show less movement before laryngeals than they do in final position.

The other two processes involve the frequency level of tone $3$ preceding $\uparrow$ and $\downarrow$. Before $\uparrow$, tone $3$ shows a greater degree of variation than it does elsewhere. Sometimes it rises slightly, and sometimes it
falls slightly. I offer the following tentative explanation for this variation. It is well-known that 2 has a raising effect on the preceding tone (see, for example, Hombert 1978a:92-95), and this accounts for the tendency of 3 to be higher before 2. This tendency is, however, counterbalanced by two factors. The first is a general downdrift found throughout an utterance, and the second is the fact that neither of the falling sequences, 31 and 32, occurs before 2. This leaves considerable phonetic space available for the pitch to drop without losing any of the contrasts.

Before 3, tone 3 is somewhat higher than it is in word-final position. Given the fact that 3 usually tends to depress the level of a preceding tone (see, for example, Hombert 1978a:92-95), this is somewhat surprising. As in the case of 32, one relevant factor is the phonetic space available. There is no 4h sequence, and so there is room for 3h to be raised without losing a distinction. Also, vowels contain such a brief voiced portion when they are associated with 3 that there is a strong possibility of losing the significant distinction between 3h and 32h. The nondistinctive raising of 3h helps to preserve this contrast. I considered the possibility of assigning the raised 3 that precedes 3 to tone 4, but there is good alternation evidence for considering it to be 3; this evidence is presented in Chapters 7 and 8.
5.5 Laryngeals and the Segmental Tier

This section describes both the distributional restrictions between nuclear laryngeals and material on the segmental tier, and the ways in which the segments in these two components affect each other.

Like the eight tone patterns, the laryngeals ʔ and h show no significant distributional restrictions whatever with material on the segmental tier. The laryngeal ɬ, on the other hand, shows one such restriction: it is not associated with high vowels. Table 14 gives an example of the three laryngeals with each oral vowel and with some nasalized vowel. Table 15 gives an example of the three laryngeals with a consonant from each manner of articulation, and Table 16 gives an example of them with a consonant at each place of articulation.

The failure of ɬ to be associated with high vowels appears to be one of the dynamic effects of ɬ. As noted in Section 5.4, ɬ appears to be incompatible with a sustained high pitch. Perhaps it is also incompatible with a high tongue position, i.e., with a low value for formant one. Even mid vowels have more open allophones when they are associated with ɬ, as described in Chapter 3, Section 3.1.

Laryngeals and the vowels with which they are associated affect each other in various ways. I discuss first ʔ and h and then move to ɬ.

As might be expected, the transition between an oral vowel and the laryngeals ʔ and h is gradual, rather than abrupt. ɬ is characterized by a transition period of creaky voicing between the fully voiced vowel and the ʔ, and often a period of true glottal closure is
Table 14. Cooccurrence of Nuclear Laryngeals and Vowels

<table>
<thead>
<tr>
<th>Laryngeal</th>
<th>i</th>
<th>u</th>
<th>e</th>
<th>o</th>
<th>a</th>
<th>i'</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>zi³</td>
<td>lu³</td>
<td>ne³</td>
<td>to³</td>
<td>ya¹³</td>
<td>yā³</td>
</tr>
<tr>
<td></td>
<td>'man'</td>
<td>'cat'</td>
<td>'plow'</td>
<td>'milk'</td>
<td>'Spanish moss'</td>
<td>'salt'</td>
</tr>
<tr>
<td>?</td>
<td>gi¹²</td>
<td>nu¹²</td>
<td>ne³</td>
<td>yo³</td>
<td>ka³</td>
<td>ugi³</td>
</tr>
<tr>
<td></td>
<td>'sweet'</td>
<td>'completely'</td>
<td>'rope'</td>
<td>'that'</td>
<td>'pitchpine'</td>
<td>'rips'</td>
</tr>
</tbody>
</table>
| h         | wi¹|h | ču³|h | ne³|h | ako⁵|h | ya³|h | yā³|h
|           | 'two' | 'fruit' | 'sleepiness' | 'whittles' | 'ashes' | 'paper' |
| !         | x | x | ane³ | to³ | ya¹³ | tō³ |
|           | 'bathes' | 'metate' | 'true' | 'blood' |

X = does not occur in language
Table 15. Cooccurrence of Nuclear Laryngeals and Consonants: Manners of Articulation

<table>
<thead>
<tr>
<th>laryngeal</th>
<th>tense stop</th>
<th>lax stop</th>
<th>affricate</th>
<th>tense sibilant</th>
<th>lax sibilant</th>
</tr>
</thead>
<tbody>
<tr>
<td>no laryngeal</td>
<td>kā₃¹</td>
<td>šugū₃¹</td>
<td>či₃</td>
<td>šu₃¹</td>
<td>zū₃²</td>
</tr>
<tr>
<td></td>
<td>'squash'</td>
<td>'shines'</td>
<td>'man'</td>
<td>'check of'</td>
<td>'work'</td>
</tr>
<tr>
<td>?</td>
<td>ka₃²</td>
<td>aga₃²</td>
<td>ča₃²</td>
<td>ša²</td>
<td>za¹</td>
</tr>
<tr>
<td></td>
<td>'pitchpine'</td>
<td>'metal'</td>
<td>'song'</td>
<td>'lover of'</td>
<td>'good'</td>
</tr>
<tr>
<td>h</td>
<td>ki₃₂h</td>
<td>do¹₃h</td>
<td>iči²h</td>
<td>ši¹h</td>
<td>zi⁵h</td>
</tr>
<tr>
<td></td>
<td>'mountain'</td>
<td>'some'</td>
<td>'seven'</td>
<td>'big'</td>
<td>'reaches'</td>
</tr>
<tr>
<td>!</td>
<td>ako⁴!</td>
<td>sa³da⁴!</td>
<td>ače⁴!</td>
<td>ti⁵xe⁴!</td>
<td>ze³²!</td>
</tr>
</tbody>
</table>
|            | 'sobs' | 'silk' | 'passes' | 'stumbles' | 'it' | (continued on following page)
<table>
<thead>
<tr>
<th></th>
<th>nasal</th>
<th>lateral</th>
<th>glide</th>
<th>laryngeal</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>ne³</td>
<td>lu³</td>
<td>yo³2</td>
<td>koʔo³</td>
</tr>
<tr>
<td></td>
<td>'plow' 'cat' 'sugarcane' 'bowl'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ʔ</td>
<td>ne³ʔ</td>
<td>kili³ʔ</td>
<td>we³ʔ</td>
<td>kuʔu³ʔ</td>
</tr>
<tr>
<td></td>
<td>'rope' 'prickly pear' 'house' 'warped (loom)'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>nu³h</td>
<td>lu³h</td>
<td>ya³h</td>
<td>neʔe³h</td>
</tr>
<tr>
<td></td>
<td>'skin' 'sore' 'ashes' 'baby'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>runa⁴!</td>
<td>paʔa⁴!</td>
<td>ya¹3!</td>
<td>weʔe⁴!</td>
</tr>
<tr>
<td></td>
<td>'avocado' 'shovel' 'true' 'pretty'</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 16. Cooccurrence of Nuclear Laryngeals and Consonants: Places of Articulation

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>labial</th>
<th>dental</th>
<th>alveopalatal</th>
<th>retroflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>m\textsuperscript{15}</td>
<td>t\textsuperscript{a3}</td>
<td>ċ\textsuperscript{i3}</td>
<td>Š\textsuperscript{u31}</td>
<td></td>
</tr>
<tr>
<td>'yellow'</td>
<td>'plain'</td>
<td>'man'</td>
<td>'cheek of'</td>
<td></td>
</tr>
<tr>
<td>a\textsuperscript{m3}</td>
<td>ġ\textsuperscript{i1}</td>
<td>Ž\textsuperscript{e3}</td>
<td>Č\textsuperscript{e2}</td>
<td></td>
</tr>
<tr>
<td>'rains'</td>
<td>'sweet'</td>
<td>'outside'</td>
<td>'short'</td>
<td></td>
</tr>
<tr>
<td>b\textsuperscript{a5h}</td>
<td>y\textsuperscript{a5h}</td>
<td>š\textsuperscript{i1h}</td>
<td>Š\textsuperscript{u3h}</td>
<td></td>
</tr>
<tr>
<td>'compadre of'</td>
<td>'clothing'</td>
<td>'big'</td>
<td>'clay pot'</td>
<td></td>
</tr>
<tr>
<td>l\textsuperscript{a3p}</td>
<td>n\textsuperscript{a32}</td>
<td>k\textsuperscript{u4}</td>
<td>a\textsuperscript{a4}</td>
<td></td>
</tr>
<tr>
<td>'pencil'</td>
<td>'banana'</td>
<td>'wooden peg'</td>
<td>'writes'</td>
<td></td>
</tr>
</tbody>
</table>

(continued on following page)
<table>
<thead>
<tr>
<th>Laryngeal Type</th>
<th>Palatal</th>
<th>Velar</th>
<th>Labiovelar</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>yā²³²</td>
<td>kā³</td>
<td>yawi³</td>
<td>koⁿo³</td>
</tr>
<tr>
<td></td>
<td>'salt'</td>
<td>'squash'</td>
<td>'moon'</td>
<td>'bowl'</td>
</tr>
<tr>
<td>ʔ</td>
<td>ya³ʔ</td>
<td>ka³ʔ</td>
<td>we³ʔ</td>
<td>kuʔu³ʔ</td>
</tr>
<tr>
<td></td>
<td>'maguey fiber'</td>
<td>'pitchpine'</td>
<td>'house'</td>
<td>'warped (loom)'</td>
</tr>
<tr>
<td>h</td>
<td>ya³ʰ</td>
<td>k̓i³²ʰ</td>
<td>wa⁵ʰ</td>
<td>neⁿe³ʰ</td>
</tr>
<tr>
<td></td>
<td>'ashes'</td>
<td>'mountain'</td>
<td>'grinds'</td>
<td>'baby'</td>
</tr>
<tr>
<td>!</td>
<td>ya¹³¹</td>
<td>ako⁴¹</td>
<td>na³² we¹³¹</td>
<td>weⁿe⁴¹</td>
</tr>
<tr>
<td></td>
<td>'true'</td>
<td>'sobs'</td>
<td>'hat'</td>
<td>'pretty'</td>
</tr>
</tbody>
</table>
lacking entirely, leaving the creaky voicing as the sole actualization of \( ? \). This is seen in (36):

(36) a. \( \overline{w} \varepsilon^{37} \) \( [\cdot w e \varepsilon^{37}] \text{ or } [\cdot w e \varepsilon^{3}] \) 'house'

b. \( \overline{z} \varepsilon^{17} \) \( [\cdot z a \varepsilon^{17}] \text{ or } [\cdot z a \varepsilon^{1}] \) 'good'

\( \varepsilon^{h} \), on the other hand, even though it has a transition period of murmured voicing, usually contains a period of complete voicelessness.

This period of voicelessness can probably best be characterized phonetically as a voiceless vowel that has the tongue position of the preceding voiced vowel; but if the voiced vowel is high, \( \varepsilon \) sometimes has friction in the oral cavity. Example set (37) shows various phonetic actualizations of \( \varepsilon \):

(37) a. \( \overline{y} \varepsilon^{32} \) \( [\cdot y a \varepsilon^{32}] \) 'flower'

b. \( \overline{w} \varepsilon^{32} \) \( [\cdot w e \varepsilon^{32}] \) 'baby'

c. \( \overline{y} \varepsilon^{32} \) \( [\cdot y a \varepsilon^{32}] \text{ or } [\cdot y a \varepsilon^{3}] \) 'ugly'

d. \( \overline{y} \varepsilon^{32} \) \( [\cdot y u \varepsilon^{3}] \text{ or } [\cdot y u \varepsilon^{3}] \) 'sore'

The interactions between \( \varepsilon \) and the segmental tier are more far-reaching than those between \( ? \) or \( h \) and the segmental tier. This is because \( \varepsilon \) is an abstract segment with no precisely definable phonetic properties at the position to which I assign it in underlying structure. It serves as the environment for a number of rules, the effects of which serve to signal its presence, and then it is deleted from the representation.
The most important effects of \( \ddot{a} \) are found on the vowel with which it is associated. First of all, \( \ddot{a} \), like other laryngeals, prevents this vowel from being lengthened by the rule of Vowel Lengthening described in Chapter 3, Section 3.1, which operates only in the absence of any nuclear laryngeal. In addition, however, it shortens the vowel and produces an unusual amplitude envelope on it, which consists of a steep rise in intensity, immediately after which the vowel terminates. This shortness and unusual amplitude envelope are consistent characteristics of \( \ddot{a} \) and are therefore probably the cues that a listener is most likely to use to identify the presence of \( \ddot{a} \). There are various other effects that \( \ddot{a} \) produces, but in each case they occur only when some other environmental condition is met, and so they are not always present to serve as cues to the presence of \( \ddot{a} \). One of these effects is the laxing of mid vowels, in which \( \ddot{e} \) and \( \ddot{o} \) become [ɛ] and [ɔ], respectively, when they are associated with \( \ddot{a} \); this is described by rule (24) in Chapter 3, Section 3.1. Another effect is the lengthening of sonorants that immediately precede \( \ddot{a} \), which is described by rule (51) in Chapter 3, Section 3.2.
NOTES FOR CHAPTER 5

1. For a useful summary of the phonetic characteristics associated with ballistic accent, see Rensch (1978).

2. These spectrograms were prepared on the Kay Digital Sona-Graph 7800 and the Kay Sona-Graph Printer 7900 in the phonetics laboratory of the Linguistics Department of the University of Arizona. Duration was measured by using timed paper provided by Kay Elemetrics Corporation; measurement error is probably less than 1 centisecond.

3. An interesting psycholinguistic confirmation of the claim that the "long" vowels are basic is found in the way native speakers of Copala Trique respond to vowel symbols when they are learning to read. Single vowel symbols are invariably read as "long" vowels, usually with tone 3.

4. I have inverted the tone numbers used in the Chicahuaxtla forms from a system in which 1 represents the highest tone to one in which it represents the lowest tone, in order to make these forms easier to compare with the Copala cognates.
CHAPTER 6

AN OVERVIEW OF THE SYNTAX

In order to present a brief picture of how Copala Trique sentences are structured, I employ two crucial concepts developed by Steele (in preparation): domain and domain-defining element. A domain of analysis is a stretch of material with internal structuring, roughly parallel to the notion of constituent in traditional generative grammar, except that the material within a domain does not necessarily have to occur in one contiguous span. Sentence and noun phrase are examples of domains in English. A domain-defining element is a set of closed-class elements that serves to establish the presence of a domain, for example, function words, affixes, or intonation contours. Domain-defining elements also establish conditions on the material within the domain; these conditions must be met in order for the string to be wellformed. Except for the notion sentence, which Steele accepts as a primitive, domains are established in language-particular terms. Furthermore, all domains are defined in language-particular terms, and all domain-defining elements are likewise language-particular.

In what follows, I use these notions to establish the domains of analysis and grammatical categories that are relevant for Copala Trique, and to define them as precisely as possible. Because this study is
primarily about phonology and morphology, not about syntax, the treatment ignores dozens of interesting questions that could profitably be explored; I include only enough information to help the reader understand the function of the laryngeal tier morphology presented in Chapters 7-9 within the context of a full grammar of the language. I begin with the sentence and work down to the word.

6.1 Sentence

The domain sentence is defined for Copala Trique by an obligatory set of sentence-final particles that express a judgment about the sentence, i.e., they ground the predicate-argument structure to the real world in some way. The notions that these particles carry include both sentence mood (declarative, interrogative, imperative) and speaker attitude (neutral, emphatic, irritated, sarcastic, pleading, etc.) The most common and least marked particle in the language is a\textsuperscript{2} 'neutral declarative'. All sentence-final particles require the material that precedes them to constitute either a complete clause, a combination of clauses, or, under appropriate pragmatic or discourse conditions, a single noun phrase, prepositional phrase, or adverbial. Some particles impose further conditions: for example, ru\textsuperscript{2}gwa\textsuperscript{2h} 'pleading imperative' requires the verb to be in potential aspect and the subject to be either second person or first person plural inclusive; and ga\textsuperscript{2} 'neutral WH interrogative' requires an interrogative word or phrase in clause-initial position. The following sentences illustrate sentence-final particles:
(1) \textit{kinā}^{5} \textit{ša}^{1}^{3} \textit{na}^{1} \textit{yaci}^{5h} \textit{a}^{32}

washed woman clothes decl

'The woman washed clothes.'

(2) \textit{kinā}^{5} \textit{ša}^{1}^{3} \textit{na}^{1} \textit{yaci}^{5h} \textit{adō}^{2h}

washed woman clothes emphatic-declarative

'The woman really did wash clothes.'

(3) \textit{kinā}^{5} \textit{ša}^{1}^{3} \textit{na}^{1} \textit{yaci}^{5h} \textit{ażi}^{3}

washed woman clothes sarcastic-declarative

'Sure, the woman washed clothes!' (meaning that she didn't)

(4) \textit{kinā}^{5} \textit{ša}^{1}^{3} \textit{na}^{1} \textit{yaci}^{5h} \textit{na}^{4?}

washed woman clothes neutral-yes/no-interrogative

'Did the woman wash clothes?'

(5) \textit{kinā}^{1h} \textit{zo}^{1?} \textit{yaci}^{5h} \textit{ru}^{3} \textit{gwā}^{32h}

will-wash 2sg clothes pleading-imperative

'Please wash clothes!'

(6) \textit{me}^{3?} \textit{ze}^{32?} \textit{kinā}^{5} \textit{ša}^{1}^{3} \textit{na}^{1} \textit{ga}^{2}

which 3sgi washed woman neutral-WH-interrogative

'What did the woman wash?'

6.2 Clause

The domain clause is defined for Copala Trique by the presence of a verb, which determines the number of arguments in it. All verbs
are subcategorized to take from zero to three arguments; many verbs enter into more than one subcategorization frame. If a verb has a single argument, it is the subject; if it has two, they are subject and direct object; and only if it has three is there an indirect object. The unmarked order for a clause has the verb in initial position, followed by the subject, the direct object, and the indirect object. The number of arguments in a clause and their linear order together serve as a formal criterion to define the three grammatical relations subject, direct object, and indirect object. Each of the three is associated with a variety of semantic roles in the sense of Fillmore (1968) or Jackendoff (1972:25-46); a discussion of these roles is beyond the scope of this brief sketch. Arguments are realized by prepositional phrases, noun phrases, and embedded clauses (which I do not treat in this sketch); prepositional phrases are infrequent in subject position. The following sentences contain clauses with zero to three arguments:

(7) \[\text{ti\textsuperscript{n}u\textsubscript{32} a\textsubscript{32}}\]
gets-dark decl

'It is getting dark.'

(8) \[\text{un\textsuperscript{5h} suwe\textsuperscript{3} a\textsubscript{32}}\]
runs dog decl

'The dog is running.'
(9) \[\text{kene}^3 \text{e}^3 \text{! sa}^3 \text{na}^1 \text{! } \text{suwe}^3 \text{ } \text{a}^3 \text{2}\]
\[\text{saw } \text{woman } \text{dog } \text{decl}\]
'The woman saw the dog.'

(10) \[\text{naru}^3 \text{we}^3 \text{2} \text{! sa}^3 \text{na}^1 \text{! sa}^3 \text{?}^3 \text{2h} \text{ ri}^3 \text{2} \text{ } \text{?ni}^3 \text{ } \text{a}^3 \text{2}\]
\[\text{repaid } \text{woman } \text{money } \text{face-of } \text{boy } \text{decl}\]
'The woman repaid the money to the boy.'

All verbs also permit the optional occurrence of various other nominal or adverbial elements, such as benefactive, referent, time, and location; I refer to these as adjuncts. In unmarked order, adjuncts follow the last argument. Adjuncts are realized by the same kind of elements as arguments, and also by various kinds of adverbials. The following sentences contain adjuncts:

(11) \[\text{ti}^2 \text{?nu}^2 \text{ } \text{kora}^4 \text{! } \text{a}^3 \text{2}\]
\[\text{will-get-dark later-today } \text{decl}\]
'It will get dark later.'

(12) \[\text{u?u}^5 \text{h } \text{suwe}^3 \text{ } \text{tak}^3 \text{ } \text{a}^3 \text{2}\]
\[\text{runs } \text{dog } \text{hillside } \text{decl}\]
'The dog is running on the hillside.'

(13) \[\text{kin}^5 \text{ } \text{sa}^3 \text{na}^1 \text{! } \text{yagi}^5 \text{h } \text{?e}^2 \text{e}^4 \text{! } \text{?ni}^3 \text{ } \text{a}^3 \text{2}\]
\[\text{washed } \text{woman } \text{clothes } \text{base-of } \text{boy } \text{decl}\]
'The woman washed clothes for the boy.'
'The woman told stories (=chatted) about the boy.'

All arguments for which a verb is subcategorized must occur in the sentence. For older speakers, however, the third person singular inanimate pronoun is zero in direct object position. The absence of an overt direct object in a sentence whose verb is subcategorized to take one will therefore be construed as some contextually or pragmatically determined inanimate entity. Example (15) shows a sentence with such a missing object:

(15)  
\[
\begin{array}{c}
\text{kinä}^5 \ ŋä'na^1! \ ki^5 \ a^{32}
\end{array}
\]

washed woman yesterday decl

'The woman washed it yesterday.'

Under appropriate discourse or pragmatic conditions, a main clause may have one argument or adjunct fronted to preverbal position to indicate focus, as seen in (16)-(18):

(16)  
\[
\begin{array}{c}
\text{ŋä'na}^1! \ text{kinä}^5 \ yagi^{5h} \ ki^5 \ a^{32}
\end{array}
\]

woman washed clothes yesterday decl

'THE WOMAN washed clothes yesterday.'

(17)  
\[
\begin{array}{c}
yagi^{5h} \ text{kinä}^5 \ ŋä'na^1! \ ki^5 \ a^{32}
\end{array}
\]

clothes washed woman yesterday decl

'The woman washed CLOTHES yesterday.'
The most important elements of which clauses are composed are the verb phrase, the prepositional phrase, and the noun phrase. I describe each of these domains in turn.

6.3 Verb Phrase

The domain verb phrase, as I define it for Copala Trique, is not to be equated with Chomsky's use of this term. For Chomsky, the verb phrase includes not only the verb, but also the direct object noun phrase and various prepositional phrases; see, for example, Chomsky (1965:68-71, 102). In Copala Trique, the verb phrase includes only the verb itself and certain close-knit modifiers.

The Copala Trique verb phrase has as its domain-defining element its head, which is always a verb. There are two kinds of verbs: verb words and verbal idioms. The verb word can be formally defined as a lexical category as the class of elements that takes aspect inflection. There are three aspects: continuative, expressed by the stem alone, completive, expressed by a prefix roughly of the form kV- plus the stem; and potential, expressed by the completive form plus a lowering of the stem tone. Example sets (19)-(20) show two sample verb words inflected for the three aspects:

(18) \[ ki^3 \text{ kiná}^5 \text{ ša}'na^1 \text{ yací}^5h \text{ a}^3 \text{ a}2 \]

yesterday washed woman clothes decl

'The woman washed clothes YESTERDAY.'
(19) a. \( \text{una}^{5h} \) 'runs', 'is running'
b. \( \text{kuna}^{5h} \) 'ran'
c. \( \text{kunā}^{2h} \) 'will run'

(20) a. \( \text{ri}^{3°} \) 'obtains', 'is obtaining'
b. \( \text{kiri}^{3°} \) 'obtained'
c. \( \text{kiri}^{1°} \) 'will obtain'

The tone changes that mark potential aspect are treated in detail in Chapter 7, Section 7.3. As can be seen from the glosses in the above examples, the three aspects contain both tense (deictic temporal reference) and aspect (nondeictic temporal reference) components. I nevertheless refer to them as aspect throughout this study.

A verb phrase consists minimally of an inflected verb word, but it may also include various optional elements. Preceding the head there is a position for negative particles. In that there are only three such particles, their presence serves as a further indication of the presence of a verb phrase, and so contributes to the definition of this domain. Following the head there is a manner position, which may be filled by elements from various lexical categories, such as adjectives and adverbs, and also by various closed-class items, such as numbers and intensifiers. Manner may also be filled by adverb and adjective phrases, which consist of a member of one of these open classes followed by an intensifier. Following manner there is a repetitive position, filled by \( \text{ū}^{4} \) 'again', 'also' and by a few other elements. Therefore, the presence
of repetitive, like the presence of negative, helps to define the
domain. The following examples show verb phrases:

(21) \textit{unā}^{5h}
runs
'runs', 'is running'

(22) \textit{ne}^{3!} \textit{unā}^{5h}
\textit{not runs}
'does not run', 'is not running'

(23) \textit{unā}^{5h} \textit{za}^{1º}
\textit{runs good}
'runs well', 'is running well'

(24) \textit{unā}^{5h} \textit{nana}^{32h}
\textit{runs slowly}
'runs slowly', 'is running slowly'

(25) \textit{unā}^{5h} \textit{wi}^{1h}
\textit{runs two}
'is running for the second time'

(26) \textit{unā}^{5h} \textit{ndo}^{20}^{32!}
\textit{runs much}
'runs a lot', 'runs hard', 'is running hard'
For obscure reasons, the class of verb words contains only about 300 members. Furthermore, it is essentially closed; there are no synchronically productive ways of deriving a verb either from another verb or from some other lexical category, nor are verbs directly borrowed from Spanish or any other language. The need for new verbal notions is met by the creation of idioms. The most common kind contains a verb word immediately followed by a modifier, which may be a member of virtually any lexical category; occasionally it is even a function word. Some verbal idioms are:

(27) \( \text{unâ}^{3h} \text{ndo}^{32} \text{u}^{4} \)
    runs much again
    'runs a lot again', 'runs hard again', 'is running hard again'

(28) \( \text{ce}^{5} \text{kwavo}^{41} \)
    walk horse
    'to crawl'

(29) \( \text{ya}^{3h} \text{zû}^{32} \)
    do work
    'to work'

(30) \( \text{a}^{3h} \text{mi}^{32} \text{unu}^{37} \)
    speak fight
    'to argue'
(31) \( \text{ara}^3 \text{ za}^1 \)
put-in good
'to put away (inside of something)'

(32) \( \text{a}\text{mi}^{32} \text{ ndo}\text{o}^{32!} \)
speak much
'to be angry'

All verbal idioms must be listed in the lexicon because their existence and/or their meanings are unpredictable, and also because they sometimes have a subcategorization frame that is different from the simple verb. See Hollenbach (1984) for further discussion of these idioms.

This kind of verbal idiom probably developed historically by the reinterpretation of a verb followed by a manner modifier as alexically complex verb. The modifiers in verbal idioms are, however, not manner synchronically. This can be shown by the fact that verbal idioms can themselves take manner, as seen in (33):

(33) \( \text{če}^5 \text{ kwayo}^{4!} \text{ za}^1 \)
walks horse good
'crawls well', 'is crawling well'

Verbal idioms of this type sometimes fuse to single words. This is an historical process that takes place one idiom at a time, under conditions that are difficult to define precisely, but undoubtedly have much to do with frequency. The result of the fusion process is the creation
of a new verb with an aspect inflection that is irregular in a certain way (see Chapter 7, Sections 7.3 and 7.6).

A second kind of verbal idiom is potentially discontinuous. It usually consists of a verb plus a body-part noun, which must be the final element of the verb phrase. Thus, if manner and/or repetitive occur, they interrupt the idiom. Most such idioms contain $ra^4\text{'},$ which formerly meant 'heart of', and which now serves to transform a verb that refers to a physical concept into an idiom that refers to an emotional concept. Two of these idioms are:

(34) \[ a^3 m^3 \quad ra^4 \]

heat-up inside
'to become angry'

(35) \[ nukwi^3 \quad ra^4 \]

arrive-home inside
'to be proud', 'to be smug', 'to be hypocritical'

I have argued elsewhere (Hollenbach 1982a) that such idioms developed via a syntactic reanalysis. The word $ra^4,$ now the final element of the verb phrase, was originally a possessed noun that, together with its possessor, served as the subject. When $ra^4$ became part of the verb phrase, its possessor became the new subject. The following sentences show $ra^4$ idioms:
(36) kaʔma³ ndoʔo³2 ra⁴ šni³ a³2
heated-up much inside boy decl
'The boy became very angry.' (literally, 'The boy heated up inside a lot.); formerly, 'The boy's heart heated up a lot."

(37) nukwi¹7 a⁴ ra⁴ ša’nal⁷ a³yu³h a³2
will-arrive-home again inside woman tomorrow decl
'The woman will be smug again tomorrow.' (literally, 'The woman will arrive home inside again tomorrow.'; formerly, 'The woman's heart will arrive home again tomorrow."

6.4 Prepositional Phrase

The domain prepositional phrase is defined by the presence of a preposition. The class preposition contains about fifteen members, most of which are special uses of certain body-part nouns. The prepositional phrase has a very simple structure: it consists simply of a preposition followed by a noun phrase that serves as its complement. The following examples show prepositional phrases:

(38) ria³2 šni³
face-of boy
'to the boy', 'in front of the boy'
Prepositional phrases occur both as arguments and as adjuncts. The following examples show prepositional phrases as subject, direct object, indirect object, benefactive, and location:

(40)  ꙡ semaphore 3

stinks to boy decl
'The boy stinks.'

(41)  kene semaphore 3! pe dro semaphore 4! maa semaphore 3! gwa semaphore 4! a semaphore 32

saw Peter to John decl
'Peter saw John.'

(42)  go semaphore 3! sa semaphore na semaphore 1! sa semaphore 32h semaphore maa semaphore 3! ni semaphore 3! a semaphore 32

gave woman money to boy decl
'The woman gave money to the boy.'

(43)  kir semaphore 5h ni semaphore 3! sku semaphore 5h semaphore semaphore e semaphore 4! semaphore sa semaphore na semaphore 1! a semaphore 32

bought boy cow base-of woman decl
'The boy bought the cow for the woman.'

(44)  ca semaphore 4! ni semaphore 3! ne semaphore 31! ra semaphore 4! we semaphore 3! a semaphore 32

ate boy meat in house decl
'The boy ate meat in the house.'
As in English, prepositions serve two different functions. They indicate both grammatical relations, such as the identification of particular arguments or adjuncts, and lexical notions, such as spatial, temporal, or logical relations. For example, the preposition `ma'3! 'to' in (40)-(42) is purely a grammatical marker that indicates an animate, but nonagentive, participant in the action, while `se5e4! 'base of' in (43) and `re4! 'in' in (44) have both functions.

6.5 Noun Phrase

The domain noun phrase is somewhat more difficult to define than any of the domains treated earlier because there is no single formal feature that defines either a noun phrase or its head. Unlike verb and preposition, noun is an open class, and so it cannot be formally defined by listing its membership. And, unlike verb, there is no inflectional morphology that defines the class; Copala Trique nouns do not mark number, gender, or case. Noun phrases are, however, classified as definite or indefinite. Even though the definiteness parameter is highly abstract, because it is expressed by a number of elements from different structural positions that operate together to assign its value, I suggest that it serves as the domain-defining element for noun phrase. I proceed now to describe the structure of noun phrases, giving special attention to the elements that mark definiteness.

There are two major noun phrase types: basic noun phrases and possessive noun phrases. They differ in the kind of noun that occurs as
their head and in the number and kind of postnuclear elements that they take.

Basic noun phrases take as their head an unpossessed noun; this category comprises all noun stems that are not inherently possessed. The head may be expanded by two optional positions on each side. Preceding the nucleus there are positions for quantifier and article, and following it there are qualifier and demonstrative positions. Of these four positions, the only one that is filled by an open class is the qualifier, which is filled by adjectives, adjective phrases (an adjective followed by an intensifier), and relative clauses. The remaining three positions are filled by closed classes, all of which contribute information about definiteness and so help to define the domain of basic noun phrase.

The quantifier position is initial in the noun phrase, and it is filled by a fairly large, but essentially closed, set of items: numbers, number phrases of various types, and other quantifiers. A few quantifiers, such as do¹³ʰ 'some' and do²¹ 'one', 'a', clearly signal indefiniteness. The article class has only two members: ro¹ʰ 'dual definite' and ni³ʰ 'plural definite'; the occurrence of either clearly marks the noun phrase as definite. The class of demonstrative likewise has only two members, either of which clearly marks the noun phrase as definite: ni₅ʰ 'this' and yo³ 'that'. The relationship between definiteness and these three positions is, however, far from simple. Each class of items expresses information about categories other than
definiteness: quantifier and article contribute information about number, and demonstrative contributes information about the deictic category of spatial proximity. An item can occur only if all of the information it expresses is appropriate. It is therefore possible for certain noun phrases to contain no element from any of these classes, in which case it is ambiguous between a singular definite reading and a plural indefinite one. The following examples of basic noun phrases show the interplay among these classes in expressing the definiteness parameter:

(45) \( w1 \, ָן1 \, ֶנ13 \)
    
    two boy
    'two boys'

(46) \( ni3h \, ָן1 \, ֶנ13 \)
    
    pl-def boy
    'the boys'

(47) \( wa2nu1h \, ni3h \, ֶנ13 \)
    
    three pl-def boy
    'the three boys'

(48) \( ָן13 \, yo3\)
    
    boy that
    'that boy'
In what appears to be an attempt to eliminate the ambiguity of examples like (50), some speakers have developed a singular definite article, which consists of a form of yo\textsuperscript{3} 'that' with reduced stress, cliticized to the preceding noun or qualifier, as seen in (51):

(51) \textsf{\textugo{500} z\textugo{700} y\textugo{200}}
    boy good-the
    'the good boy'

For the speakers who have this form, example (50) has only the plural indefinite reading.

Possessive noun phrases take a possessed noun as their head. The category possessed noun comprises two distinct groups: a set of about 100 noun stems that are inherently possessed, and noun stems that are optionally possessed plus an inflectional element that indicates their possessed status. This inflectional element does not identify the possessor; it merely serves to indicate that a possessor will be expressed within the noun phrase that contains it. Both kinds of
possessed nouns are definite. In this they are unlike unpossessed
nouns, which are unspecified as to definiteness.

The head of a possessive noun phrase may be expanded on the left
by optional quantifiers and articles, just as the basic noun phrase may
be. Possessive noun phrases differ from basic noun phrases, however,
in what occurs to the right of the head. In the possessive noun phrase,
the head is followed by a single, obligatory constituent, the possessor,
which consists of a full noun phrase (of either type). Neither a quali-
fier nor a demonstrative can occur in a possessive noun phrase. The
following examples show possessive noun phrases:

(52)  raʔaʔ3! ŋiʔ5
hand-of boy
'the boy's hand'

(53)  ro1h tinu5 ŋiʔ5
du-def brother-of boy
'the boy's two brothers'

(54)  ikiʔ2h niʔ3h taʔni5 ŋaʔna1!
seven du-def child-of woman
'the woman's seven children'

(55)  tiʔnu5 ŋiʔ5
corn-of boy
'the boy's corn' (cf. ?nu5 'shelled corn')
An indefinite quantifier overrides the inherent definiteness of the possessed noun head; such a phrase is best translated by a partitive construction. This is seen in (58):

(58) \( n_i^{3h} \) \( d_0^{12h} \) \( t_i^n u^5 \) \( s_ni^3 \)

'some corn-of boy'

'in order to express a qualifier and/or a demonstrative with a noun that serves as the head of a possessive noun phrase, it is necessary to use an appositional structure in which a basic noun phrase occurs together with the possessive noun phrase, as seen in (59):

(59) \( t_i^n u^5 \) \( s_ni^3 \) \( f_nu^5 \) \( z_a^{17} \) \( v_o^{37} \)

corn-of boy corn good that

'that good corn of the boy' (literally, 'the boy's corn, that good corn')
Certain phrases show a genuine ambiguity between a prepositional phrase reading and a possessive noun phrase reading, as seen in examples (60) and (61):

(60)  ria³²  šni³
    face-of boy
    'to the boy', 'in front of the boy', or 'the boy's face'

(61)  rike³¹  šni³
    abdomen-of boy
    'in the boy', 'under the boy', or 'the boy's abdomen'

The problem hinges on the category membership of words like ria³² and rike³¹. Even though it is clear that, historically, they started out as possessed nouns, I claim that, synchronically, they belong to both categories, noun and preposition, and that the two constructions are distinct. A possessive noun phrase permits optional prenuclear quantifiers and articles, as seen in examples (53) and (54) above, and a prepositional phrase does not. Furthermore, when an argument or adjunct is fronted for focus, a preposition can be left behind, but the head of a possessive noun phrase cannot be. Example set (62) shows both ways of focusing a prepositional phrase:

(62) a.  Še'³² e⁴ šni³ kinä⁵ ša'³ na³¹ vaci⁵ h a³²
    base-of boy washed woman clothes decl
    'The woman washed clothes FOR THE BOY.'
b. \( \text{šni}\text{3} \text{kina}\text{5} \text{ša}\text{3}\text{na}\text{1}! \text{yagi}\text{5h} \text{še}\text{e}\text{4!} \text{a}\text{32} \)

boy washed woman clothes base-of decl

'The woman washed clothes for THE BOY.'

Example set (63) shows the single way of focusing a possessive noun phrase:

(63) a. \( \text{ti}\text{3}\text{nu}\text{5} \text{ša}\text{3}\text{na}\text{1}! \text{kuno}\text{32!} \text{šni}\text{3} \text{a}\text{32} \)

corn-of woman sowed boy decl

'The boy sowed THE WOMAN'S CORN.'

b. \( *\text{ša}\text{3}\text{na}\text{1}! \text{kuno}\text{32!} \text{šni}\text{3} \text{ti}\text{3}\text{nu}\text{5} \text{a}\text{32} \)

woman sowed boy corn-of decl

'The boy sowed THE WOMAN's corn.'

There is one minor noun phrase type that is relevant to the discussion of clitics in Chapter 9: the coordinate noun phrase. In that various other syntactic means are usually exploited to express two or more items filling a single argument or adjunct position, this construction is fairly rare. It consists simply of two noun phrases linked by \( \text{ga}\text{3!} \) 'and', as seen in (64):

(64) \( \text{kene}\text{r}\text{e}\text{3!} \text{gwa}\text{4} \text{ga}\text{2!} \text{pa}\text{3}\text{blo}\text{4!} \text{šuwa}\text{31} \text{a}\text{32} \)

saw John and Paul cougar decl

'John and Paul saw the cougar.'

The word \( \text{ga}\text{2!} \) also serves as a preposition meaning 'with'.
6.6 Pronouns

Personal pronouns are a subclass of unpossessed nouns in Copala Trique. As such, they occur as the heads of basic noun phrases. The parameters by which they can be classified include a number of traditional ones, such as person, number, gender, and degree of intimacy; but one traditional one—case—is absent, and there are two nontraditional ones: position within noun phrase and definiteness. I discuss each of these parameters in turn.

There are four persons: first, inclusive, second, and third. Inclusive occurs only in nonsingular forms; it refers to the addressee (second person) and the speaker (first person), and optionally to others (third person) as well. There are three numbers: singular, dual, and plural. Some pronouns have separate forms for singular and nonsingular, and others add the definite articles \textit{ro} \textsuperscript{1h} 'dual definite' and \textit{ni} \textsuperscript{3h} 'plural definite' to the singular form to create duals and plurals. Sometimes both mechanisms are used together. Gender is relevant only in third person; the categories that are distinguished are: masculine human, feminine human, animal, inanimate, and locative. Degree of intimacy is relevant only in second person singular; there are two categories: unmarked and intimate.

There are no formal distinctions within the pronoun system to indicate grammatical function of any sort, except that, as mentioned in Section 6.2, some speakers use zero for a third person singular inanimate direct object. The grammatical function of a pronoun is signaled
by a combination of factors that includes linear order, prepositions, and possessed nouns. Copala Trique has a language-particular constraint to the effect that noun phrases with pronoun heads cannot serve as direct object; they must be expressed instead as prepositional phrases with $\text{mā}^{31}$ 'to'. Otherwise, noun phrases with pronoun heads have the same distribution as those with noun heads. The following example shows a sentence with a pronominal direct object:

$\text{(65)} \quad \text{kene}^{31} \text{ } \text{saw} \text{ } \text{woman} \text{ } \text{to} \text{ } \text{3sgm} \text{ } \text{decl}$

'The woman saw him.'

The following examples show sentences with pronouns as subject, complement of a preposition, and possessor of a noun:

$\text{(66)} \quad \text{unā}^{5h} \text{ } \text{runs} \text{ } \text{3sgm} \text{ } \text{decl}$

'He is running.'

$\text{(67)} \quad \text{kinā}^{5} \text{ } \text{washed} \text{ } \text{woman} \text{ } \text{clothes} \text{ } \text{base-of} \text{ } \text{3sgm} \text{ } \text{decl}$

'The woman washed clothes for him.'

$\text{(68)} \quad \text{unā}^{5h} \text{ } \text{runs} \text{ } \text{brother-of} \text{ } \text{3sgm} \text{ } \text{decl}$

'His brother is running.'
Perhaps the most interesting property of Copala Trique pronouns is the existence, in third person, of one set of pronouns that occur only at the end of their noun phrase and another set that occurs only when a qualifier and/or a demonstrative follow within the same noun phrase. The phrase-final set has gender distinctions for masculine, feminine, animal, and inanimate; and the non-phrase-final set has gender distinctions for masculine, feminine, inanimate, and locative. One of the main functions of non-phrase-final pronouns is to introduce relative clauses. Examples (65)-(68) above show phrase-final pronouns. The following sentences show non-phrase-final pronouns:

(69) \( \text{un}^5 \text{h} \ \text{zi}^5 \ \text{za}^{17} \text{a}^{32} \)

runs 3sgm good decl

'The good man is running.'

(70) \( \text{ta}^{3}\text{we}^3 \ \text{sa}^{3}\text{na}^{11} \ \text{še}^{3}\text{e}^{4} \ \text{zi}^5 \ \text{kawi}^{37} \text{a}^{32} \)

cried woman base-of 3sgm died decl

'The woman cried about the man who died.'

(71) \( \text{un}^5 \text{h} \ \text{tinu}^5 \ \text{zi}^5 \ \text{ni}^5\text{a}^{32} \)

runs brother-of 3sgm this decl

'This man's brother is running.'

Both kinds of pronouns take optional quantifiers and articles preceding them, as seen in (72) and (73):
The above facts show that pronouns serve as the heads of basic noun phrases, and that they are therefore a special subclass of unpossessed nouns.

The one parameter that remains to be considered is definiteness. All of the pronouns mentioned in the discussion of the other parameters are definite, as might be expected. There is, however, one indefinite pronoun in the system, \textit{ni}: which is phrase-final and third person, but unspecified as to either number or gender. It is used when the speaker either does not know, or does not wish to disclose, the identity of a referent. For many speakers, this pronoun is used only as the subject of a clause, as seen in (74):

\begin{equation}
(74) \quad \text{\textit{ka}32h \textit{ni}3 a32}
\end{equation}

'\textit{They went away.}' or 'Someone went away.'

The pronoun \textit{ni} does not occur with quantifiers or articles.
The complete set of Copala Trique personal pronouns is shown in Table 17.
Table 17. Copala Trique Personal Pronouns

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>dual</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>definite</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>first</td>
<td>zo (^{1h})</td>
<td>ru (^{5h})</td>
<td>nu (^{5h})</td>
</tr>
<tr>
<td></td>
<td>ru (^{1h}) nu (^{5h})</td>
<td>(ni (^{3h})) nu (^{5h})</td>
<td></td>
</tr>
<tr>
<td>inclusive</td>
<td>--</td>
<td>ru (^{1h})</td>
<td>ni (^{4h})</td>
</tr>
<tr>
<td></td>
<td>ru (^{1h}) ni (^{4h})</td>
<td>(ni (^{3h})) ni (^{4h})</td>
<td></td>
</tr>
<tr>
<td>second</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unmarked</td>
<td>zo (^{1h})</td>
<td>ru (^{1h}) zo (^{1h})</td>
<td>(ni (^{3h})) zo (^{3h})</td>
</tr>
<tr>
<td>intimate</td>
<td>di (^{1h})</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>third</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>phrase-final</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>masculine</td>
<td>zo (^{3h})</td>
<td>ru (^{1h}) zo (^{3h})</td>
<td>ni (^{3h}) zo (^{3h})</td>
</tr>
<tr>
<td>feminine</td>
<td>no (^{3h})</td>
<td>ru (^{1h}) no (^{3h})</td>
<td>ni (^{3h}) no (^{3h})</td>
</tr>
<tr>
<td>animal</td>
<td>zo (^{3h})</td>
<td>ru (^{1h}) zo (^{3h})</td>
<td>ni (^{3h}) zo (^{3h})</td>
</tr>
<tr>
<td>inanimate</td>
<td>yo (^{3h})</td>
<td>ru (^{1h}) yo (^{3h})</td>
<td>ni (^{3h}) yo (^{3h})</td>
</tr>
<tr>
<td>non-phrase-final</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>masculine</td>
<td>zi (^{5h})</td>
<td>ru (^{1h}) zi (^{5h})</td>
<td>ni (^{3h}) zi (^{5h})</td>
</tr>
<tr>
<td>feminine</td>
<td>ni (^{3h})</td>
<td>ru (^{1h}) ni (^{5h})</td>
<td>ni (^{3h}) ni (^{5h})</td>
</tr>
<tr>
<td>inanimate</td>
<td>ze (^{3h})</td>
<td>ru (^{1h}) ze (^{3h})</td>
<td>ni (^{3h}) ze (^{3h})</td>
</tr>
<tr>
<td>locative</td>
<td>re (^{3h})</td>
<td>ru (^{1h}) re (^{3h})</td>
<td>ni (^{3h}) re (^{3h})</td>
</tr>
<tr>
<td>indefinite</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>third, phrase-final</td>
<td></td>
<td></td>
<td>ni (^{3h})</td>
</tr>
</tbody>
</table>
NOTES FOR CHAPTER 6

1. An informal, but fairly complete, sketch of Copala Trique syntax is given in Hollenbach (in preparation). A treatment of the clause and sentence levels in the Chicahuaxtla dialect of Trique has been published by Longacre (1966).

2. In these examples I gloss pronouns and certain other function words by a set of standard abbreviations. The symbols 1, incl, 2, and 3 represent first, inclusive, second, and third persons; sg, du, and pl represent singular, dual, and plural number; m, f, a, i, and l represent masculine, feminine, animal, inanimate, and locative genders; def represents definite; decl represents neutral declarative; and pos represents possessed.

3. There is one exception to this statement: in stative sentences, the continuative aspect form of wa32 'to be' is optionally deleted with some adjectival complements, and obligatorily deleted with some others. Because only this one verb form, which has a very weak semantic content, is ever deleted, meaning is preserved; and a simpler grammar results if I consider the verb to be present in underlying structure. See Zwicky and Pullum (1983) for an analysis of the deletion of specific function words in English as a morphological rule.
4. The distinction between tense and aspect is treated in Fillmore (1975:35-37, 44-49) and in Comrie (1976, especially pages 1-3).

5. In that I believe definiteness to be an obligatory category of Copala Trique, I consider these noun phrases to be truly ambiguous, not merely indeterminate. Note that the categories plural indefinite and singular definite are disjoint.

6. Breton, an Indo-European language, has a similar constraint; see S. Anderson (1982:578).
CHAPTER 7

WORD-INTERNAL MORPHOLOGY

In Chapters 7-9 of this study, various aspects of morphology are treated. Chapters 8 and 9 address morphological changes that take place across word boundaries, whereas the present chapter addresses the more typical kind of morphology, namely, changes that take place in the form of a word to realize some change in its semantic or distributional properties.

Copala Trique has short words, and, in one sense, a fairly simple and limited system of morphology, which consists only of a handful of prefixes and three sets of tone-laryngeal changes. There are four verbal prefixes: na- 'repetitive', tV- 'causative', s°- 'detransitive', and kV- 'noncontinuative aspect'. There is also a set of nominal prefixes that mark a noun stem as possessed; these include ti-, sE-, and s-. I do not discuss these prefixes further because they involve only the segmental tier. In this chapter, I describe only the three sets of tone-laryngeal changes, which involve only the laryngeal tier, using the phonological analysis developed in Chapters 4 and 5.

Before describing them, however, it is necessary to handle certain preliminary matters. First of all, it is essential to distinguish the morphological function of tone from its lexical function, described
in Chapter 4, Section 4.1. As shown there, Copala Trique has five contrasting levels of tone. One or more of these tones must be included as part of the underlying representation that forms part of the lexical entry for each word because a difference in tone is potentially sufficient to distinguish among totally unrelated words, just as a difference in consonant or vowel is. The following examples show words that differ only by tone:

(1) a. \(\ddot{y}a^1\) 'one (in compounds like twenty-one)'
b. \(\ddot{y}a^2\) 'unmarried'
c. \(\ddot{y}a^4\) 'corn cob'
d. \(\ddot{y}a^5\) 'is sitting'
e. \(\ddot{y}a^{31}\) 'scar'
f. \(\ddot{y}a^{32}\) 'salt'

(2) a. \(\ddot{y}a^3_{a}\) 'chile'
b. \(\ddot{y}a^5_{a}\) 'gourd canteen'

I refer to tone that functions in this way as lexical tone.

In addition to lexical tone, however, there are also cases in which the replacement of one tone pattern by another one does not change a word into either a completely unrelated word or a nonsense word. Instead, it affects the properties of the word in some way. For example, in Copala Trique, a lowering of the tone in verbs signals potential aspect, and a similar lowering of the tone in nouns converts them into adjectives, as seen in the following examples:
In these cases, tone alternation acts like an affix, and I refer to such phenomena as morphological tone. Note that such tonal morphology may be inflectional, as in the case of potential aspect, or derivational, as in the case of denominal adjectives. Note also that this process of tonal replacement is not different in principle from the vowel ablaut found in English strong verbs.

Other preliminary matters that I discuss before describing these replacements in detail are their relation to the classic view of the morpheme as a minimal form-meaning composite and their relevance to certain theories of morphology recently developed within generative grammar; these topics are covered in Sections 7.1 and 7.2 below. Sections 7.3–7.5 treat each of the three replacements in detail, including the changes they effect in the properties of the words that undergo them, and the specific individual rules that make them up. I close the chapter with a brief treatment of compounding in Section 7.6.

7.1 Some Problems of Morphological Analysis

In the classic model of word structure, words are composed of a sequence of morphemes, each of which consists of one or more segments and contributes one component to the properties of the word. This model

(3) a. \underline{kanu}³¹ 'exploded'
b. \underline{kanu}¹ 'will explode'

(4) a. \underline{yà}³ʰ 'paper'
b. \underline{yà}¹³ʰ 'papery'
is superficially attractive, but it suffers from the serious drawback that it simply does not fit the facts for the vast majority of the world's languages. It works reasonably well for agglutinative languages, of which the best known case is probably Turkish, though even in this language it is necessary to provide vowel harmony rules to account for the fact that the same morpheme has different phonological characteristics in different environments. For many other languages, however, the concept is unworkable because of the lack of a one-to-one mapping between units of meaning and units of form. A classic example of such a language is Latin. For a detailed argument against structuralist morphology, I refer the reader to Matthews (1972) and to Aronoff (1976: 6-17).

I believe that the problems involved in defining the morpheme stem from the fact that this concept lies at the interface between two major components of a grammar, syntax and phonology, each of which has very different characteristics. The meaning part of a morpheme lies in the syntax (and/or the lexicon), and the form part lies in the phonology. The reason that the above concept of the morpheme is unworkable is partly because it tries to do too much at once; this will become apparent in Section 7.2, where I discuss the levels of abstraction needed to handle the tone-laryngeal changes found in Copala Trique.

The same problem affects the entire field of morphology. It lies at an interface, and linguists who develop theories of morphology sometimes give more priority to one of the two components than to the
other. If the meaning side of morphology is taken as basic, then the field consists of an analysis of the distributional possibilities of words or stems and affixes. The appropriate tools are those of syntax, such as nodes and constituent structures. The chief proponent of this view at present is Selkirk (1982); it is significant that her book is called _The Syntax of Words_.

If the form side of morphology is taken as basic, however, then the field consists of a description of the processes that words or stems undergo to create new words, which have different properties from the original words or stems. In the case of classic morphemes, the process consists in the addition of affixes, but in other cases, the process does not involve affixation, but rather some change in the stem itself, such as reduplication or replacement. The appropriate tools for describing such processes are rules similar to those that form such an important part of the phonological component. Perhaps the strongest advocate of this view is S. Anderson (1982), who has developed the approach of Matthews (1972) into the extended word-and-paradigm model. In this model, nonstem morphemes do not enter into constituent relations, nor are they lexical entries; they are rather morphosyntactic features on stems that are realized by rules.

In my view, Selkirk's approach has much to recommend it for the meaning side of morphology, though it fails to address the problems found on the form side. For example, nowhere in her book does she treat, even in the most cursory manner, the nitty-gritty problems of
allomorphy. She seems to simply assume that all morphemes are reason-
ably well-behaved affixes, and that each has an underlying phonological
form as part of its lexical entry (pp. 59, 63-64). As will be seen in
Sections 7.2-7.5, however, Copala Trique laryngeal tier changes have no
underlying phonological shape. For the form side of morphology, there­
fore, Anderson's approach seems to be preferable. His rules using a
transformational format are capable of handling replacements quite eas­
illy. I do not, however, agree with Anderson's approach to the distribu­
tion side of morphology. It is not clear to me that all nonstem
categories should be considered to be merely features on stems, as op­
posed to lexical entries in their own right. As will be seen in Chapter
9, clitic pronouns that have the surface form of affixes on the preced­
ing word are separate lexical entries in underlying forms. There may
well be some advantages to treating at least some indisputably word­
internal elements in the same way.

Perhaps the answer lies in a mixed model, in which the distribu­
tion side of morphology manipulates "things" that are full lexical en­
tries, but these entries are realized (spelled out) by formatives that
involve rules. Such a model combines the strengths of both views, and I
attempt to apply it to the three formatives in question.

Because my goal is to describe Copala Trique and to explore some
of the consequences of its structure for linguistic theory, I do not at­
tempt to formulate a comprehensive theory of morphology in this study.
The facts that I present about Copala Trique do, however, have a bearing
on a number of significant questions in the field. For example, they do not lend support to theories that posit a rigid separation between derivation and inflection, or between irregular and regular inflection.

7.2 Category, Formative, and Rule

As is the case in many languages, Copala Trique words do not show a one-to-one mapping between elements of meaning and elements of form, and therefore the classic view of the morpheme as a form-meaning composite is not appropriate. In what follows, I show the various ways in which the mapping is skewed, and propose that three kinds of theoretical constructs are needed to handle the data: morphosyntactic categories, formatives, and rules that describe specific morphological processes.

Consider the category of tense-aspect (hereafter simply aspect) in Copala Trique. This is the only inflectional category for Copala Trique verbs, and its presence serves as a domain-defining element to establish the category verb for this language (see Chapter 6, Section 6.3). There are precisely three aspect categories: continuative, completive, and potential. The classic view of the morpheme predicts that this category should be realized by a set of three affixes that are attached at a given position within the word. This is not, however, the case. Consider the following sample paradigms:
(5) a. ri³⁷ 'obtains'
b. kiri³⁷ 'obtained'
c. kiri¹⁷ 'will obtain'

(6) a. unā⁵h 'runs'
b. kunā⁵h 'ran'
c. kunā²h 'will run'

(7) a. nu³² 'is in'
b. kunu³² 'was in'
c. ku²nu³² 'will be in'

(8) a. ŝa⁴¹ 'eats', 'ate'
b. ŝa²¹ 'will eat'

The continuative aspect form is the shortest of the three; it consists of the stem alone. In examples (5)-(7), the continuative and comple-
tive forms differ in that the latter contains a prefix, which has the variant forms ki-, k-, and ku-. In example (8), however, the continu-
ative and completeive forms are homophonous. The potential form con-
tains two modifications of the stem: the same prefix that occurs in the completeive, and a laryngeal tier change that, in these examples, consists of the replacement of one tone by a lower one, as in examples (5), (6), and (8), or the addition of a low tone to the word, as in example (7). It is probably best to view the potential as consisting of the completeive form plus a laryngeal tier change.
Even though this inflectional system is, in a sense, quite simple, with only two main elements, the prefix and the laryngeal tier change, it fails to fit the traditional concept of the morpheme in three different ways. First, one of the three aspects, continuative, is realized by the absence of any formal material added to the stem. Even though the lack of an overt element is certainly meaningful in this context, there are sound theoretical reasons for wanting to avoid zero morphemes. Second, the prefix, when it occurs, does not mark a single category, but rather either of the two noncontinuative categories, completive or potential. It is only when the prefix and the laryngeal tier change are considered together that its "meaning" can be given. Furthermore, the prefix sometimes does not occur. Even though the fiction of a zero allomorph could be employed here to save the notion of morpheme, it does not seem advisable to do so. Third, even though the laryngeal tier change invariably realizes potential aspect, it must cooccur with the prefix (unless the verb, like $\text{ca}^4!$ 'to eat', simply does not take the prefix).

It is clear that Copala Trique has two units of form, the prefix and the laryngeal tier change, which interact in a complex way to realize the three aspect categories. I will refer to these units of form as formatives even though both are fairly abstract concepts that comprise a number of variant realizations. I will not refer to them as morphemes because neither can be assigned a precise meaning. It would also be incorrect to refer to the individual aspect categories as
morphemes because none of them is realized by precisely one formative. The complex relationship among category, formative, and individual changes can be represented as follows, using \{KV-\} as an abbreviation for the prefix, $F_1$ as an abbreviation for the laryngeal tier change formative, and a double colon to indicate the realization relation:

\[(9) \quad \text{a. Continuative} :: \emptyset\]
\[\text{b. Completive} :: \left[\begin{array}{l} \emptyset \\ \emptyset \end{array}\right] \quad \text{Verb A} \]
\[\text{c. Potential} :: \text{Completive} + F_1\]
\[\left\{\begin{array}{l} \emptyset \rightarrow ki- \\ \emptyset \rightarrow k- \\ \emptyset \rightarrow ku- \\ \ldots \end{array}\right\}\]
\[\text{d. \{KV-\} :: \left\{\begin{array}{l} \emptyset \rightarrow ki- \\ \emptyset \rightarrow k- \\ \emptyset \rightarrow ku- \\ \ldots \end{array}\right\}\]
\[\text{e. } F_1 :: \left\{\begin{array}{l} 5 \rightarrow 2 \\ 4 \rightarrow 2 \\ \ldots \end{array}\right\}\]

The representations of the realizations of \{KV-\} and $F_1$ are schematic and incomplete. The choice of prefix form and of laryngeal tier change is conditioned by a complex set of factors that involve morphological
and idiosyncratic properties of verb stems, as well as their phonological shape.

All three of these levels, morphosyntactic categories, formatives, and individual morphological rules, are needed in a grammar of Copala Trique. If any one is eliminated, then a serious loss of generalization results. I proceed now to argue for this claim.

First I argue that the morphosyntactic category level is needed and cannot be omitted in favor of simply listing the formatives. The evidence for this claim consists of certain facts about negative sentences that show the reality of the distinction between continuative and completive aspects, even for verbs that do not take the \{kV-\} prefix.

Copala Trique has an exchange rule in which the completive and potential aspect forms of a verb interchange immediately following the negative particles ne\textsuperscript{3}\textsuperscript{!} 'continuative and completive negative' and ze\textsuperscript{2}\textsuperscript{!} 'potential negative'. No matter what the form of the potential is for a given verb, we get it where, on semantic grounds, we might expect the completive form, and we get the completive where we expect the potential. This is clearly a language-particular phenomenon, and a highly marked one. It is not clear to me at present how, or where, this should be handled in a grammar of Copala Trique, but some kind of exchange rule will allow the idiosyncrasies of aspect to be stated only once for a given verb stem. As an example of this interchange in a verb that takes the \{kV-\} prefix, compare the positive sentences in (10) with their
negative counterparts in (11); note that the continuative aspect form
is unchanged in negative sentences:

(10) a. \textit{ri\textsuperscript{3\textdegree}} \textit{\textit{\textit{ci}}\textsuperscript{3} \textit{sku\textsuperscript{5h} a\textsuperscript{32}}}

obtains man cow decl
'The man obtains a cow.'

b. \textit{kiri\textsuperscript{3\textdegree}} \textit{\textit{\textit{ci}}\textsuperscript{3} \textit{sku\textsuperscript{5h} a\textsuperscript{32}}}

obtained man cow decl
'The man obtained a cow.'

c. \textit{kiri\textsuperscript{1\textdegree}} \textit{\textit{\textit{ci}}\textsuperscript{3} \textit{sku\textsuperscript{5h} a\textsuperscript{32}}}

will-obtain man cow decl
'The man will obtain a cow.'

(11) a. \textit{ne\textsuperscript{3\textdegree} ri\textsuperscript{3\textdegree}} \textit{\textit{\textit{ci}}\textsuperscript{3} \textit{sku\textsuperscript{5h} a\textsuperscript{32}}}

not obtains man cow decl
'The man doesn't obtain a cow.'

b. \textit{ne\textsuperscript{3\textdegree} kiri\textsuperscript{1\textdegree}} \textit{\textit{\textit{ci}}\textsuperscript{3} \textit{sku\textsuperscript{5h} a\textsuperscript{32}}}

not will-obtain man cow decl
'The man didn't obtain a cow.'

c. \textit{ze\textsuperscript{2\textdegree} kiri\textsuperscript{3\textdegree}} \textit{\textit{\textit{ci}}\textsuperscript{3} \textit{sku\textsuperscript{5h} a\textsuperscript{32}}}

not obtained man cow decl
'The man won't obtain a cow.'
In verbs that do not take the \{kv-\} prefix, the interchange still takes place, as seen in example sets (12) and (13):

(12) a. \(\tilde{c}a^{4!} \, \tilde{\nu}n^{3!} \, ne^{3!} \, a^{32}\)
    eats boy meat decl
    'The boy eats meat.'

b. \(\tilde{c}a^{4!} \, \tilde{\nu}n^{3!} \, ne^{3!} \, a^{32}\)
    ate boy meat decl
    'The boy ate meat.'

c. \(\tilde{c}a^{2!} \, \tilde{\nu}n^{3!} \, ne^{3!} \, a^{32}\)
    will-eat boy meat decl
    'The boy will eat meat.'

(13) a. \(ne^{3!} \, \tilde{c}a^{4!} \, \tilde{\nu}n^{3!} \, ne^{3!} \, a^{32}\)
    not eats boy meat decl
    'The boy doesn't eat meat.'

b. \(ne^{3!} \, \tilde{c}a^{2!} \, \tilde{\nu}n^{3!} \, ne^{3!} \, a^{32}\)
    not will-eat boy meat decl
    'The boy didn't eat meat.'

c. \(ze^{2!} \, \tilde{c}a^{4!} \, \tilde{\nu}n^{3!} \, ne^{3!} \, a^{32}\)
    not ate boy meat decl
    'The boy won't eat meat.'
The fact that the completive undergoes the exchange rule, while the homophonous continuative fails to do so, indicates that native speakers are aware of the covert aspect distinction. If the aspect category completive were not part of the grammar of Copala Trique, but only the formatives \{kV-\} and $F_1$ were, it would be difficult to write a grammar that would produce both (13a) and (13b). The exchange rule is clearly sensitive to the categories, not to the formatives alone. For further details about the exchange rule, the reader is referred to Hollenbach (1976).

I turn now to the level of formative. I do not believe that it can be eliminated as a relevant level of abstraction by referring solely to morphosyntactic categories and to individual rules that realize the formatives. To support my argument, I leave aside $F_1$, which realizes only potential aspect, and discuss a second formative, $F_2$, which, like $F_1$, comprises a patterned set of laryngeal tier changes conditioned by both idiosyncratic and phonological factors. $F_2$ comprises many of the same individual rules as $F_1$, but it has at least eleven different meanings or uses, i.e., eleven different ways in which it affects the properties of the words it applies to. One of the main uses of $F_2$ is to create denominal adjectives, as seen in the following examples:

(14) a. $\underline{\text{yo}2\text{o}}5$ 'earth'
    b. $\underline{\text{yo}2\text{o}}1\text{h}$ 'muddy'
A second use of $F_2$ is to create the possessed form of many nouns that are not inherently possessed. These nouns take a preposed particle $\text{zer}_3$ plus $F_2$ to indicate that the noun phrase that follows the noun serves as its possessor (see Chapter 6, Section 6.5), as seen in the following examples:

(16) a. $\text{kaci}_3$ 'honey'
    b. $\text{zer}_3 \text{kaci}_3 \text{kose}_4$ 'José's honey'

(17) a. $\text{çu}_5$ 'box'
    b. $\text{zer}_3 \text{çu}_1 \text{śni}_3$ 'the boy's box'

The remaining nine uses of $F_2$ are described in Section 7.4.2.

If $F_2$ is eliminated from the grammar as an abstract unit, then there would be a serious loss of generalization. It would be necessary to repeat the same set of rules eleven times, one for each morphosyntactic category that $F_2$ serves to realize. It would also be necessary to list the same idiosyncratic information about certain lexical entries several times, once for each of the eleven uses with which it occurs. If, however, $F_2$ is employed in the grammar as an abstract unit between the level of morphosyntactic category and individual rules, then a single set of rules is sufficient, and idiosyncratic information
associated with its realization needs to be listed only once for a lexical entry.

I turn now to the third level, the rules that produce the actual "allomorphs" of the formatives. This level is also essential because there is simply no way to assign an underlying form to F₁ or F₂, short of a completely unmotivated abstract analysis. These two formatives comprise a set of rules that add, delete, or replace tones, and sometimes also h; all have the effect of lowering the tone of the stem. The particular rule that applies is conditioned partly by the laryngeal tier representation of the stem, partly by morphological information (e.g., whether or not the stem contains the causative prefix), and partly by idiosyncratic information about particular lexical items. Even though they have the form of phonological rules, they are not general phonological processes of the language. They are morphological rules that realize particular formatives, and they take place within the lexicon. These rules require both a phonological environment and a morphological one. In the analysis I adopt in this study, the underlying representations that serve as the input to the regular phonological rules described in Chapters 3-5 include both forms that have been modified by these morphological rules and unmodified stems.

I conclude, therefore, that for Copala Trique morphology, three levels of abstraction are needed: morphosyntactic categories, formatives, and individual morphological rules that produce changes in the form of stems. The first two of these levels are things, and the third
is a process. The concept of the morpheme does not work in this language because formative is needed as an intermediate level between the meaning (morphosyntactic category) level and the ultimate formal realizations of the meanings.

7.3 Formative One: Potential Aspect

In this section I provide a detailed description of the individual processes that together make up $F_1$, the formative that realizes potential aspect.

Copala Trique verb stems have a canonical shape in which the first tone of the stem, lexically linked or not, is [+HIGH]. In simple words, this means that the tone pattern of the stem must be level 3, 4, or 5, or sequence 31 or 32. In complex words, the lexically linked tone must be 3 or 5 (or possibly 31, but I have not recorded any verbs with this sequence). The essence of $F_1$ is that it performs one of the following three operations on the [+HIGH] tone: it replaces it by a [-HIGH] tone, it deletes it, or it inserts a [-HIGH] tone to its left. I begin the description by treating simple stems.

Stems with the tone patterns 31 and 32 are very regular, while those with 3, 4, and 5 show more irregularity. Stems in the latter group sometimes insert or delete h, and they divide into two arbitrary groups, each of which undergoes a different replacement. I treat the regular patterns first.
In order to realize $F_1$, verb stems with tone sequences $31$ and $32$ delete the tone 3, leaving tone 1 or 2 alone, as seen in the following examples:

(18) a. $\text{kun}$\textsuperscript{31} 'exploded'
    b. $\text{kun}$\textsuperscript{1} 'will explode'

(19) a. $\text{kaka}$\textsuperscript{32} 'burned'
    b. $\text{kaka}$\textsuperscript{2} 'will burn'

(20) a. $\text{kuču}$\textsuperscript{32h} 'laid down'
    b. $\text{kuču}$\textsuperscript{2h} 'will lay down'

(21) a. $\text{kuno}$\textsuperscript{32!} 'sowed'
    b. $\text{kuno}$\textsuperscript{2!} 'will sow'

This process can be stated by the following morphological rule; I employ the notational convention of a double vertical bar (||) to indicate the morphological environment, i.e., the formative, to distinguish it from the phonological environment that is also needed in the rules:

(22) Deletion of Tone 3

$$
\begin{array}{c}
3
\end{array}
\begin{array}{c}
[+\text{HIGH}]
\end{array}
\rightarrow \emptyset \begin{array}{c}
1, 2
\end{array}
\begin{array}{c}
[+\text{CENT}]
\end{array}
\begin{array}{c}
[-\text{HIGH}]
\end{array} || F_1
$$

I adopt a convention that all tones that appear in rules are underlyingly unassociated unless the rule shows a lexical linking. If I did
not adopt this convention, rule (22) would wrongly delete a lexically
linked tone 3 before an unassociated [-HIGH] tone, instead of replacing
it by tone 2 (cf. rule (57) below).

Verb stems that have a simple tone 3 fall into two classes.
Most of them add tone 1 before the 3 to realize F_1, but a limited number
of stems with 3? replace 3 by 1 instead. Examples (23)-(26) show the
usual change, and example (27) shows the replacement:

(23) a. kara^3  'filled'
b. kara_13  'will fill'

(24) a. noko^3?  'followed'
b. noko_13?  'will follow'

(25) a. ki?ya^3h  'made'
b. ki?ya_13h  'will make'

(26) a. kuno^3!  'heard'
b. kuno_13!  'will hear'

(27) a. kiri^3?  'obtained'
b. kiri_1?  'will obtain'

These processes can be stated by the following morphological rules:
(28) Epenthesis of Tone 1

\[ \emptyset \rightarrow \left[ \begin{array}{c} -\text{HIGH} \\ -\text{CENT} \end{array} \right] / \left[ \begin{array}{c} +\text{HIGH} \\ +\text{CENT} \end{array} \right] \left( \left[ \text{GLOT} \right] \right) \# \left| \left| F_1 \right. \right. \]

(29) Replacement of 3 by 1

\[ \left[ \begin{array}{c} +\text{HIGH} \\ +\text{CENT} \end{array} \right] \rightarrow \left[ \begin{array}{c} -\text{HIGH} \\ -\text{CENT} \end{array} \right] / \left[ \begin{array}{c} +\text{GLOT} \\ -\text{SPR} \\ -\text{HSP} \end{array} \right] \left| \left| F_1 \right. \right. \text{ (minor rule)} \]

I operate under the assumption that morphological rules are normally unordered. If rule (28) were ordered to follow rule (22), however, the optional laryngeal and the word boundary could be omitted from the environment for rule (28).

Verb stems with tone 4 all have the nuclear laryngeal 1; these stems fall into two classes, those that replace 4 by 1 and those that replace 4 by 2, as seen in the following examples:

(30) a. kano\(^4\!\) 'grabbed'
    b. kano\(^1\!\) 'will grab'

(31) a. kace\(^4\!\) 'passed'
    b. kace\(^2\!\) 'will pass'

The replacement by tone 1 is slightly more frequent than the replacement by tone 2, and I have chosen to consider it the regular case. The stems that undergo a replacement of tone 4 by tone 2 must therefore be marked
in the lexicon to undergo a minor rule that accomplishes this. These
two replacement rules are:

(32) Replacement of $4$ by $1$

\[
\begin{align*}
&\begin{array}{c}
4 \\
+{\text{HIGH}} \\
-\text{CENT} \\
-\text{EXTR}
\end{array} \rightarrow \begin{array}{c}
1 \\
-\text{HIGH} \\
+\text{CENT} \\
\| F_1
\end{array}
\end{align*}
\]

(33) Replacement of $4$ by $2$

\[
\begin{align*}
&\begin{array}{c}
4 \\
+{\text{HIGH}} \\
-\text{CENT} \\
-\text{EXTR}
\end{array} \rightarrow \begin{array}{c}
2 \\
-\text{HIGH} \\
+\text{CENT} \\
\| F_1 \text{ (minor rule)}
\end{array}
\end{align*}
\]

Note that rule (28) above provides evidence for the analysis of $3h$ as $3h$, rather than as $4h$, even though its fundamental frequency is considerably higher than other instances of tone $3$. Stems with $3h$ add tone $1$ before the $3$ to realize $F_1$, just as most other instances of tone $3$ do. They do not undergo either of the characteristic replacements for tone $4$ described by rules (32) and (33).

Verb stems with tone $5$ have either no laryngeal or $h$. Verb stems with $5h$, like those with $4h$, fall into two classes. Some of these verbs replace tone $5$ by tone $2$, but some also delete the $h$ as well, as seen in the following examples:

(34) a. $kuna^{5h}$ 'ran'
b. $kuna^{2h}$ 'will run'
I have chosen to consider the replacement of the tone alone the regular case, and therefore the stems that also lose \( h \) must be marked in the lexicon to undergo a minor rule that accomplishes this change. This rule must be stated in a transformational format because it has two segments in its structural description. The two rules that realize \( F_1 \) on verb stems with \( 5h \) are:

(36) Replacement of \( 5 \) by \( 2 \) Before \( h \)

\[
\begin{align*}
5 \\
\text{[+HIGH]} \\
\text{[-CENT]} \\
\text{[+EXTR]}
\end{align*}
\rightarrow
\begin{align*}
2 \\
\text{[-HIGH]} \\
\text{[+CENT]} \\
\text{[-EXTR]}
\end{align*}

/ \:
\begin{align*}
h \\
\text{[+GLOT]} \\
\text{[+SPR]}
\end{align*}

\| \ F_1

(37) Replacement of \( 5h \) by \( 2 \)

\[
\begin{align*}
5 \\
\text{[+HIGH]} \\
\text{[-CENT]} \\
\text{[+EXTR]}
\end{align*}
\rightarrow
\begin{align*}
h \\
\text{[+GLOT]} \\
\text{[+SPR]}
\rightarrow
\begin{align*}
2 \\
\text{[-HIGH]} \\
\text{[+CENT]}
\end{align*}
\end{align*}

\| \ F_1 \quad \text{(minor rule)}

Verb stems with tone \( 5 \) and no laryngeal characteristically replace tone \( 5 \) by tone \( 1 \) and add \( h \), as seen in example (38):

(38) a. \( \underline{\text{kinà}}^5 \) 'washed'

b. \( \underline{\text{kinà}}^1 \) 'will wash'
Two verbs, however, ęće ‘to walk’ and ąča ‘to sing’, replace tone 5 by tone 2 and do not add a laryngeal, as seen in example (39):

(39) a. ęće
  'walked'
b. ąča
  'will walk'

It is clear that the stems in 5 that become 1h are the regular case, and that the two stems that replace 5 by 2 must be marked in the lexicon to undergo a minor rule that accomplishes this. These two replacement rules are:

(40) Replacement of 5 by 1h

\[
\begin{align*}
\text{5} & \Rightarrow \text{1} \quad \text{h} \\
\{ \text{+HIGH} \} & \emptyset \quad \{ \text{+HIGH} \} \quad \{ \text{+GLOT} \} \\
\{ \text{-CENT} \} & \quad \{ \text{-CENT} \} \\
\{ \text{+EXTR} \} & \quad \{ \text{+EXTR} \} \\
1 & \quad 1 \\
2 & \quad 2
\end{align*}
\]

(41) Replacement of 5 by 2

\[
\begin{align*}
\text{5} & \Rightarrow \text{2} \\
\{ \text{+HIGH} \} & \{ \text{-HIGH} \} \\
\{ \text{-CENT} \} & \quad \{ \text{+CENT} \} \\
\{ \text{+EXTR} \} & \quad \{ \text{-EXTR} \} \\
1 & \quad \# \\
\end{align*}
\]

The word boundary in the environment of rule (40) could be omitted if the rules are ordered, with rule (36) applying before rule (40).

I have now presented a set of nine morphological rules that account for the laryngeal tier changes that realize F₁ in verbs that are
simple words both in their basic stem form and in their potential aspect form. Each such verb undergoes one of these rules. I turn now to verbs that are simple words in their basic stem form, but that become complex words in their potential aspect form.

In this class of verbs, the underlyingly unassociated tones are not affected by the application of $F_1$. Instead, a tone 2 is added at the left of the laryngeal tier representation of the word, and it is lexically linked to the vowel of the penultimate syllable. Verb stems that contain the causative prefix $\text{tv}-$ always fall into this class, unless they have tone 3, in which case they are regular and simply add 1 before the 3 by the application of rule (28).¹ There are, however, also a few noncausative stems that fall into this class. The following examples show causatives that become complex words in potential aspect:

(42) a. \text{tukw}\tilde{\text{a}}\text{ce}^{41} \quad \text{'caused to pass'}
   b. \text{tukwa}_{2}\text{ce}^{41} \quad \text{'will cause to pass'}

(43) a. \text{tukw}\tilde{\text{a}}\text{ce}^{5} \quad \text{'caused to walk'}
   b. \text{tukwa}_{2}\text{ce}^{5} \quad \text{'will cause to walk'}

(44) a. \text{tukwa}n\text{u}^{31} \quad \text{'caused to explode'}
   b. \text{tukwa}^{2}_{n}\text{u}^{31} \quad \text{'will cause to explode'}

(45) a. \text{tika}\tilde{\text{mi}}^{32} \quad \text{'knocked' (literally, 'caused to speak')}
   b. \text{tika}_{2}\text{mi}^{32} \quad \text{'will knock'}
The following example shows a causative that does not become a complex word in potential aspect:

(46) a. tikawi$^{3?}$ 'killed'
b. tikawi$^{13?}$ 'will kill'

The following examples show noncausatives that become complex words in potential aspect:

(47) a. re?e$^{4!}$ 'urinated'
b. re$^{2?}e^{4!}$ 'will urinate'

(48) a. kara$^{5}$ 'covered'
b. ka$^{2}rā^{5}$ 'will cover'

(49) a. kunu$^{32}$ 'put on'
b. ku$^{2}nu^{32}$ 'will put on'

It is clear that the above noncausative verb stems must be marked in the lexicon to undergo a minor rule that inserts tone 2 on the penultimate vowel. It is less clear to me, however, whether the causatives should also be individually marked, or whether this generalization should be expressed elsewhere in the grammar, but I tentatively adopt the position that they should be individually marked, and I posit a minor rule to insert tone 2. This rule has the following form:
Table 18 summarizes all the changes that realize $F_1$ in simple words by the operation of the ten rules described so far. The tone patterns and laryngeals found in the underlying stem forms appear on the axes, and the forms that result from the application of $F_1$ appear schematically in the cells. A space following a linked tone distinguishes it from the unassociated tone(s) to its right.

I turn now to a description of verb stems that are complex words in their basic stem form. These verbs fall into two groups: a larger group that changes only the lexically linked tone, and a smaller group that changes both the lexically linked tone and the unassociated tone pattern. I consider the group that changes only the lexically linked tone first.

All verb stems that contain a lexically linked tone have either tone 3 or tone 5 as the linked tone. These verbs characteristically replace this tone by a tone 2 in potential aspect, and leave the unassociated tone pattern unchanged, as seen in the following examples:

\[
\begin{align*}
(51) \quad & a. \quad ka^3r_1^2 & \quad \text{'rumbled'} \\
& b. \quad ka^2r_1^2 & \quad \text{'will rumble'}
\end{align*}
\]
Table 18. Changes That Realize $F_1$

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>!</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>13</td>
<td>13?</td>
<td>13h</td>
</tr>
<tr>
<td></td>
<td>1?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>NV</td>
<td>NV</td>
<td>X</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1h</td>
<td>NV</td>
<td>2h</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2  5</td>
<td></td>
<td>2  5h</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>X</td>
<td>NV</td>
</tr>
<tr>
<td></td>
<td>2  31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>X</td>
<td>2h</td>
</tr>
<tr>
<td></td>
<td>2  32</td>
<td></td>
<td>2  32h</td>
</tr>
</tbody>
</table>

NV = does not occur on verb stems  
X = does not occur in language
(52) a. \( \text{na}^{3}_{3}\text{ra}^{2}_{a}13 \) 'got married'
b. \( \text{na}^{2}_{2}\text{ra}^{2}_{a}13 \) 'will get married'

(53) a. \( \text{kara}^{5}_{5}\text{ya}^{2}_{a}13h \) 'made a fuss over'
b. \( \text{kara}^{2}_{2}\text{ya}^{2}_{a}13h \) 'will make a fuss over'

(54) a. \( \text{ri}^{5}_{5}\text{ce}^{3}_{e} \) 'burned incense'
b. \( \text{ri}^{2}_{2}\text{ce}^{3}_{e} \) 'will burn incense'

(55) a. \( \text{su}^{2}_{2}\text{se}^{4}_{e}1_{1} \) 'kicked'
b. \( \text{su}^{2}_{2}\text{se}^{4}_{e}1_{1} \) 'will kick'

(56) a. \( \text{kara}^{5}_{5}\text{ce}^{3}_{e}2h \) 'sighed'
b. \( \text{kara}^{2}_{2}\text{ce}^{3}_{e}2h \) 'will sigh'

These changes can be described by the following rule:

(57) High Tone Lowering

\[
 [+\text{HIGH}] \rightarrow \left[ \begin{array}{c} -\text{HIGH} \\ +\text{CENT} \end{array} \right] / \left| \begin{array}{c} F_1 \\ [+\text{syll}] \end{array} \right. 
\]

If the unassociated tone pattern of the word starts with a \([-\text{HIGH}]\) tone, as in examples (51)-(53), the lexically linked tone \( 2 \) produced by rule (57) cannot be distinguished phonetically from the tone \( 2 \) inserted by the regular phonological rule of Tone Epenthesis, described in Chapter 4, Section 4.3. When, however, the unassociated tone pattern of the
word starts with a [+HIGH] tone, as in examples (54)-(56), the lexically linked tone 2 produced by rule (57) is clearly realized on the surface. I posit representations with a linked tone 2 before an unassociated [-HIGH] tone, as in (51b)-(53b), only when there is alternation evidence for doing so.

The final group of words to be described consists of only four stems. All of these stems have a lexically linked tone 3 and an unassociated tone 2 in their basic stem form, and a lexically linked tone 2 plus an unassociated 32 tone pattern in potential aspect. These verbs are:

(58) a. ni\textsubscript{3}ka\textsubscript{2h} 'had'
b. ni\textsubscript{2}ka\textsubscript{32h} 'will have'

(59) a. ni\textsubscript{3}ya\textsubscript{2h} 'looked'
b. ni\textsubscript{2}ya\textsubscript{32h} 'will look'

(60) a. ni\textsubscript{3}ke\textsubscript{2} 'wrapped'
b. ni\textsubscript{2}ke\textsubscript{32} 'will wrap'

(61) a. na\textsubscript{3}ka\textsubscript{2h} 'raised'
b. na\textsubscript{2}ka\textsubscript{32h} 'will raise'

Each of these verbs must be marked in the lexicon to undergo a minor rule that accomplishes these changes. This rule could be formulated in various ways, one of which is the following:
(62) Epenthesis of \( \tilde{2} \) with Movement of \( \tilde{3} \)

a. \( \emptyset \rightarrow \left[ \begin{array}{c} \tilde{2} \\ \text{[HIGH]} \\ \text{[CENT]} \end{array} \right] / \# \left[ \begin{array}{c} \tilde{3} \\ \text{[HIGH]} \\ \text{[CENT]} \end{array} \right] \left[ \begin{array}{c} \tilde{2} \\ \text{[HIGH]} \\ \text{[CENT]} \end{array} \right] \parallel F_1 \\
\left[ \text{[+syll]} \right] \) (minor rule)

b. Erase the lexical linking between tone \( \tilde{3} \) and the segmental tier, and link the epenthesized tone \( \tilde{2} \) in its place.

If I had adopted an analysis in which onset laryngeals were on the laryngeal tier, rule (62) could not be written in its present form because of the word-medial \( \tilde{2} \) in example (59). Even if an optional laryngeal were included in the environment between tones \( \tilde{3} \) and \( \tilde{2} \), the rule would violate the convention that association lines do not cross. It would be necessary to add a metathesis rule to handle this form, or to adopt a completely different analysis.

I have now presented a set of twelve morphological rules that together describe all of the variant realizations of \( F_1 \). Each individual stem undergoes only one of these twelve rules. Six of these rules are minor rules because stems must be marked in the lexicon to undergo one of them. The other six are regular in that they apply whenever the structural description and the environment are met, provided one of the minor rules has not applied instead.

Even though I have presented these rules as generative, rather than as parsing rules, it is not clear to what degree they are
productive. As noted in Chapter 6, Section 6.3, there are only about 300 verb stems in Copala Trique. Because the set of stems is so limited, it is probable that most speakers have learned the potential aspect form for each verb stem in the lexicon, and that they do not generate it anew with each use. Unfortunately, however, it is virtually impossible to test the productivity of any of the rules, because there is no way to introduce new verbs into the lexicon, except via historical compounding, described in Section 7.6. Furthermore, Copala Trique speakers do not accept language games in which meaningless material is manipulated. If the potential aspect form is learned for each stem, then it forms part of the lexical entry for that stem, and the rules that describe the changes for potential aspect would be parsing rules. Because genuine differences in productivity do appear to exist among the rules, however, I have given them in a generative format.

Before leaving the discussion of $F_1$, I would like to explore briefly the diachronic source of such synchronic complexity. I tentatively reconstruct the history of potential aspect inflection as follows. At some earlier stage in the language, distinctive tone occurred on all syllables of a word, and potential aspect was formed by lowering the tone of the first syllable. Then there was a sound change in which tones moved to the right, as described by Longacre (1957:101). (Movement to the right is typical; cf. Hyman [1978:261-62].) This change affected the potential aspect forms, as well as the underlying stem tones. At the present time, the degree to which the tone has moved to
the right varies with different kinds of words. In some words, the low tone appears at the right of the word; in others, it appears at the beginning of the final syllable; and in still others, it appears only on nonfinal syllables. The following examples show these three degrees of movement:

(63) a. \underline{kano}[^4]\text{1} 'grabbed'
    b. \underline{kano}[^1]\text{1} 'will grab'

(64) a. \underline{kara}[^3]\text{3} 'filled'
    b. \underline{kara}[^1]\text{3} 'will fill'

(65) a. \underline{tukwačë}[^4]\text{2} 'caused to pass'
    b. \underline{tukwačë}[^2]\text{2} 'will cause to pass'

7.4 Formative Two

In this section, the second formative that effects insertion, deletion, and replacement operations on the laryngeal tier representation of stems is described. Like \( F_1 \), \( F_2 \) has the effect of lowering the tone of stems, and the two formatives share many of the same individual rules. They are nevertheless distinct in that not all of the rules are shared. Unlike \( F_1 \), which realizes a single morphosyntactic category, potential aspect, on a single lexical category, verb; \( F_2 \) occurs with stems of various lexical categories, and it realizes at least eleven different morphosyntactic categories, some of which are quite abstract. I begin this section with the description of the individual
morphological rules that $F_2$ comprises, after which I describe briefly each of the eleven categories it realizes.

7.4.1 Replacement Rules

One of the main differences between $F_2$ and $F_1$ is that $F_2$ shows less irregularity than $F_1$. There are only eight rules, and only two of these are minor rules. Stems that have no lexically linked tone are discussed first.

Stems with the tone sequences $31$ and $32$ delete the tone $3$ to realize $F_2$, leaving the $1$ or $2$ alone, as seen in the following examples:

(66) a. \underline{ziu}^{31} \quad 'pitcher'
    b. \underline{ze}^{32!} \underline{ziu}^{1} \quad 'pitcher of'

(67) a. \underline{ska}^{32} \quad 'basket'
    b. \underline{ze}^{32!} \underline{ska}^{2} \quad 'basket of'

(68) a. \underline{naʔ}^{32h} \quad 'quicklime'
    b. \underline{ze}^{32!} \underline{naʔ}^{2h} \quad 'quicklime of'

(69) a. \underline{nato}^{32!} \quad 'banana'
    b. \underline{ze}^{32!} \underline{nato}^{2!} \quad 'banana of'

The rule that describes these changes is identical to rule (22), and I therefore revise this rule by expanding the morphological environment to include $F_2$ as well as $F_1$; this revised rule is:
Deletion of Tone 3 (revised)

\[
\begin{align*}
3 \quad \text{[+HIGH]} \quad \text{[+CENT]} & \rightarrow \emptyset \quad 1, 2 \quad [-\text{HIGH}] \quad \text{||} \quad F_1, F_2
\end{align*}
\]

Stems with a simple tone 3 characteristically add tone 1 before the 3 to realize \( F_2 \), as seen in the following examples:

(71) a. \text{ra}[^3] \text{â} \rightarrow \text{'tomato'}
     b. \text{ze}[^3!] \text{ra}[^3] \rightarrow \text{'tomato of'}

(72) a. \text{aga}[^3]\rightarrow \text{'metal'}
     b. \text{ze}[^3!] \text{aga}[^3] \rightarrow \text{'metal of'}

(73) a. \text{ya}[^3h] \rightarrow \text{'paper'}
     b. \text{ya}[^13h] \rightarrow \text{'papery'}

(74) a. \text{rike}[^3!] \rightarrow \text{'abdomen of'}
     b. \text{rike}[^13!] \rightarrow \text{'downhill'}

There are, however, a number of words with 3? that replace the 3 by 2, and a single word with 3? that replaces the 3 by 1, as seen in the following examples:

(75) a. \text{kaci}[^3?] \rightarrow \text{'honey'}
     b. \text{ze}[^3!] \text{kaci}[^2?] \rightarrow \text{'honey of'}

(76) a. \text{noko}[^3?] \rightarrow \text{'follows (non-clause-initial)'}
     b. \text{noko}[^1?] \rightarrow \text{'follows (clause-initial)'}
The rule that describes the usual change is identical to rule (28), which therefore needs to have its morphological environment expanded to include $F_2$. The other changes, however, must be described by minor rules, one of which is identical to rule (29). These three rules are:

(77) Epenthesis of Tone 1 (revised)

\[
\emptyset \rightarrow \begin{bmatrix} \text{-HIGH} \\ \text{-CENT} \end{bmatrix} / \begin{bmatrix} \text{+HIGH} \\ \text{+CENT} \end{bmatrix} \ \\
\] \begin{bmatrix} \text{+GLOT} \end{bmatrix} \# \ \\
\] \begin{bmatrix} \text{+CENT} \end{bmatrix} \ \\
\] $|| \ F_1, F_2$

(78) Replacement of $\hat{2}$ by $\hat{2}$

\[
\begin{bmatrix} \text{+HIGH} \\ \text{+CENT} \end{bmatrix} \rightarrow \begin{bmatrix} \text{-HIGH} \\ \text{-CENT} \end{bmatrix} / \begin{bmatrix} \text{+GLOT} \\ \text{-SPR} \\ \text{-HSP} \end{bmatrix} \ \\
\] $|| \ F_2$ (minor rule)

(79) Replacement of $\hat{2}$ by $\hat{1}$ (revised)

\[
\begin{bmatrix} \text{+HIGH} \\ \text{+CENT} \end{bmatrix} \rightarrow \begin{bmatrix} \text{-HIGH} \\ \text{-CENT} \end{bmatrix} / \begin{bmatrix} \text{+GLOT} \\ \text{-SPR} \\ \text{-HSP} \end{bmatrix} \ \\
\] $|| \ F_1, F_2$ (minor rule)

One of the reasons for separating $F_1$ from $F_2$ is that rule (78) applies only in $F_2$, never in $F_1$. A second reason is that the verb stem noko\textsuperscript{37} 'to follow' undergoes rule (79) to realize $F_2$, as seen in example (76), but rule (77) to realize $F_1$, as seen in example (80):

(80) a. kanoko\textsuperscript{37} 'followed'

b. kanoko\textsuperscript{13} 'will follow'
Stems with tone \(\underline{4}\) replace the \(\underline{4}\) by \(\underline{1}\), as seen in the following examples:

\[(81)\]

\begin{align*}
a. \quad & \underline{dā}^4 & \quad \text{'animal of'} \\
b. \quad & \underline{zi}^5 \underline{dā}^1 & \quad \text{'the owner of the animal'} \\
\end{align*}

\[(82)\]

\begin{align*}
a. \quad & \underline{ško}^4! & \quad \text{'beyond (preposition)'} \\
b. \quad & \underline{ško}^1! & \quad \text{'beyond (adverb)', 'backwards'} \\
\end{align*}

The rule that describes this change is identical to rule (32), which should therefore be revised as follows:

\[(83)\] Replacement of \(\underline{4}\) by \(\underline{1}\) (revised)

\[
\begin{array}{c}
4 \\
\quad \frac{\text{[+HIGH]}}{-\text{CENT}} \quad \frac{\text{[+HIGH]}}{-\text{EXTR}} \\
\rightarrow & 1 \\
& \mid \mid \ F_1, \ F_2
\end{array}
\]

The fact that stems with no laryngeal and those with \(\underline{1}\) show the same replacement of \(\underline{4}\) by \(\underline{1}\) when they undergo \(F_2\) provides evidence for the analysis of tone \(\underline{4}\) as a single underlying level tone, even though it becomes an upglide \([34]\) when no laryngeal follows it, and a downglide \([43]\) preceding \(\underline{1}\). See the discussion in Chapter 4, Section 4.3, and in Chapter 5, Sections 5.1 and 5.4.

Stems with tone \(\underline{5}\) have either no laryngeal or \(h\). Stems with \(\underline{5h}\) replace tone \(\underline{5}\) by tone \(\underline{1}\), as seen in the following example:
This change can be described by the following rule:

\[
\begin{align*}
(85) \quad & \text{Replacement of } 5 \text{ by } 1 \text{ Before } h \\
& \left[ \begin{array}{c}
5 \\
+\text{HIGH} \\
-\text{CENT} \\
+\text{EXTR}
\end{array} \right] \rightarrow \left[ \begin{array}{c}
1 \\
-\text{HIGH} \\
-\text{EXTR} \\
+\text{SPR}
\end{array} \right] / \left[ \begin{array}{c}
+\text{GLOT} \\
+\text{SPR}
\end{array} \right] \rightarrow F_2
\end{align*}
\]

Note that rule (85) is different from both of the rules that effect replacements in \(5\)h stems to realize \(F_1\). Rule (85) changes 5 to 1 before \(h\), whereas rule (36) changes 5 to 2 before \(h\), and rule (37) changes 5 to 2 and deletes the \(h\). This is a third reason for separating \(F_2\) from \(F_1\).

Stems with tone 5 and no laryngeal replace tone 5 by tone 1 and add \(h\), as seen in the following example:

\[
(86) \begin{align*}
\text{a. } & \text{ kaki } ^5 \text{ 'earring'} \\
\text{b. } & \text{ ze } ^3\text{2! k} \text{ak} \text{1} \text{h 'earring of'}
\end{align*}
\]

The rule that describes this change is identical to rule (40), which should therefore be revised as follows:
I have recorded no examples of stems that are simple words in their underlying form, but that become complex words by the application of $F_2$. This constitutes a fourth difference between the two formatives. Table 19 summarizes the variant realizations of $F_2$ described so far.

I turn now to stems that have lexically linked tone, all of which are probably either compounds (see Section 7.6 below) or Spanish loanwords. These stems all have tone $\tilde{3}$ or tone $\tilde{5}$ as the linked tone. (The one word with $\tilde{3}1$ as the linked tone pattern, $\tilde{s}u^31\text{me}^4!$ 'barn owl', does not appear to undergo $F_2$.) In such words, $F_2$ is realized by replacing the linked tone by tone $\tilde{2}$, leaving the unassociated tone pattern unchanged, as seen in the following examples:

(88) a. $\underline{\text{mesa}^34!}$ 'table' (Spanish mesa)
    b. $\underline{\text{ze}^32! \text{me}^24!}$ 'table of'

(89) a. $\underline{\text{sa}^3\text{na}^1!}$ 'woman'
    b. $\underline{\text{sa}^2\text{na}^1!}$ 'female'

(90) a. $\underline{\text{sno}^5\text{na}^32!}$ 'man'
    b. $\underline{\text{sno}^2\text{na}^32!}$ 'male'
Table 19. Changes That Realize F₂

<table>
<thead>
<tr>
<th></th>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>!</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>13</td>
<td>13?</td>
<td>13h</td>
<td>13!</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>R</td>
<td>X</td>
<td>1!</td>
</tr>
<tr>
<td>5</td>
<td>1h</td>
<td>R</td>
<td>1h</td>
<td>X</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>X</td>
<td>R</td>
<td>X</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>X</td>
<td>2h</td>
<td>2!</td>
</tr>
</tbody>
</table>

R = rare; no example found with F₂
X = does not occur in language
The rule that describes this change is identical to rule (57), which should therefore be revised as follows:

(91) High Tone Lowering (revised)

\[ \begin{align*}
[+\text{HIGH}] & \rightarrow [~^{\bot}[+\text{CENT}] ~/ & \text{F}_1, \text{F}_2 \\
& & [+\text{syll}] 
\end{align*} \]

There are no words with lexically linked tones that change both the linked tone and the unassociated tone pattern to realize \( \text{F}_2 \); this is a fifth difference between \( \text{F}_1 \) and \( \text{F}_2 \).

To summarize, \( \text{F}_2 \) involves only eight rules, instead of the twelve that are involved in \( \text{F}_1 \). Six of the eight rules are shared with \( \text{F}_1 \), one of the remaining two is a minor rule, and the other one is a regular rule that is unique to \( \text{F}_2 \). See rule block two in the Appendix for a summary of the rules that make up \( \text{F}_1 \) and \( \text{F}_2 \).

7.4.2 Categories Realized by Formative Two

In this section, the eleven morphosyntactic categories that \( \text{F}_2 \) realizes are described briefly. Some of these are fairly straightforward and widely attested in natural languages, while others are somewhat abstract and appear to be highly language-particular.

The first two uses that are described are the most important ones, and they apply to a single lexical category, noun. With few
exceptions, nouns, like verbs, have stems in which the first tone of the laryngeal tier representation is [+HIGH].

The first use of \( F_2 \) is the creation of denominal adjectives. Unlike \( F_1 \), which appears to involve inflectional morphology,\(^4\) this is clearly a case of derivational morphology. As is typical in derivational processes, neither the existence of a derived form nor its meaning is predictable, and each denominal adjective must be listed in the lexicon. For such words, the rules that make up \( F_2 \) function as parsing rules. The following examples show nouns and their corresponding denominal adjectives:

(92) a. katu\(^{31}\) 'waist of'
b. katu\(^{1}\) 'narrow (board)', 'thin (pole)'

(93) a. v\(\tilde{a}\)\(^{3h}\) 'paper'
b. v\(\tilde{a}\)\(^{13h}\) 'papery'

(94) a. ku\(^{5}\) 'bone'
b. ku\(^{1h}\) 'cleared off'

The second important use of \( F_2 \) is to create the possessed form of certain nouns (see Chapter 6, Section 6.5). In this use, \( F_2 \) occurs together with the preposed particle ze\(^{32}\). Even though this use is clearly inflectional, it is formed by precisely the same set of processes that create denominal adjectives, a use that is clearly
derivational. This inflectional process must be at least partly productive because Spanish loanwords enter into it. Examples (95)-(98) show this use of $F_2$:

(95) a. $\text{kaki}^3$³ $\text{ka}$¢i² 'honey'
b. $\text{ze}^3$³² $\text{kaki}^3$³ 'honey of'

(96) a. $\text{aga}^3$³ 'metal'
b. $\text{ze}^3$³² $\text{aga}$³ 'metal of'

(97) a. $\text{kaki}^5$ 'earring'
b. $\text{ze}^3$³² $\text{kaki}$³'h 'earring of'

(98) a. $\text{me}^3$³ $\text{sa}$³ 'table' (Spanish mesa)
b. $\text{ze}^3$³² $\text{me}^2$³ $\text{sa}$³ 'table of'

Noun stems that are simple words and that have tone 4 and no laryngeal do not take $F_2$ together with $\text{ze}^3$³² to create the possessed form, but rather use $\text{ze}^3$³² alone, and noun stems in 4! take $F_2$ optionally. The following examples show the possessed form of stems with tone 4:

(99) a. $\text{koto}^4$ 'shirt' (Spanish cotón)
b. $\text{ze}^3$³² $\text{koto}^4$ 'shirt of'

(100) a. $\text{šinga}^4$ 'corral'
b. $\text{ze}^3$³² $\text{šinga}$³ 'corral of' or
c. $\text{ze}^3$³² $\text{šinga}$³ 'corral of'
There are in addition a number of irregular nouns that create their possessed form by means of various segmental tier replacements and prefixes; a few of these irregular forms are given in (101)-(103):

(101) a. yo\textsuperscript{32} 'sugarcane'
b. do\textsuperscript{32} 'sugarcane of'

(102) a. ?nu\textsuperscript{5} 'shelled corn'
b. ti?nu\textsuperscript{5} 'corn of'

(103) a. na\textsuperscript{31} 'cornfield'
b. ŋna\textsuperscript{31} 'cornfield of'

The remaining uses of $F_2$ comprise a diverse assortment of highly language-particular mechanisms in which $F_2$ is applied to nouns, pronouns, prepositions, and verbs. A set of minor uses with nouns is discussed first.

When a noun immediately follows the noun phrase negative nuwe\textsuperscript{31}, its tone is lowered by means of $F_2$, as seen in (104) and (105):

(104) a. ŋni\textsuperscript{3} 'boy'
b. nuwe\textsuperscript{31} ŋni\textsuperscript{13} 'not a boy'

(105) a. ŋa\textsuperscript{3}na\textsuperscript{1} 'woman'
b. nuwe\textsuperscript{31} ŋa\textsuperscript{2}na\textsuperscript{1} 'not a woman'

This replacement is reminiscent of the rule that interchanges completive and potential aspects following a negative particle, as described in
Section 7.2. It is not, however, the same phenomenon because the tone lowering following *nuwe* involves \( F_2 \), rather than \( F_1 \).

A few nouns that are inherently possessed or that have a possessed form that is not created by means of \( F_2 \) take \( F_2 \) in what I call owner phrases. These phrases consist of a non-phrase-final pronoun like \( zi^5 \)'third person singular masculine' followed by the noun that has undergone \( F_2 \), as seen in (106)-(108):

\[
\begin{align*}
(106) & \quad \text{a. } ta^?ni^5 & \text{'child of'} \\
& \quad \text{b. } zi^5 ta^?ni^1h & \text{'the parent', 'the one having the child'} \\
(107) & \quad \text{a. } da^4 & \text{'animal of'} \\
& \quad \text{b. } zi^5 da^1 & \text{'the owner of the animal'} \\
(108) & \quad \text{a. } yo^?o^5 & \text{'earth'} \\
& \quad \text{b. } to^?o^5 & \text{'land of'} \\
& \quad \text{c. } zi^5 to^?o^1h & \text{'the owner of the land'}
\end{align*}
\]

This is similar to the denominal adjective use, but shows enough semantic specialization to merit separate treatment. In the creation of a denominal adjective, the noun stem loses its specification for definiteness, but in owner phrases, it does not. The phrase \( zi^5 da^1 \), for example, does not mean simply 'the person who owns an animal', but rather 'the person who owns the animal', referring to some contextually or pragmatically determined domestic animal.
Nouns that are inherently possessed or that have a possessed form that is not created by means of F₂ take F₂ when their possessor is questioned. The interrogative phrase that questions the possessor, which is usually me³! zi⁵ 'who?', precedes the possessed noun in such constructions. Examples (109) and (110) illustrate such phrases:

(109) a. riā³² 'face of'
b. me³! zi⁵ riā² 'whose face?'

(110) a. da⁴ 'animal of'
b. me³! zi⁵ da¹ 'whose animal?'

In Copala Trique, a possessed noun is usually followed by its possessor. Both this use and the previous one involve constructions in which a possessed noun occurs in a context where it is not followed by its possessor. It seems likely that the occurrence of F₂ in these constructions is somehow related to this violation of an expectation.

The final use of F₂ with nouns is a highly unusual construction that has, to my knowledge, been reported only for Chicahuaxtla Trique: the possessor included possession phrase (Longacre 1964:90-91). In this construction, an inherently possessed noun that expresses some social relation (for example, a kinship term) takes F₂, and the possession phrase then refers to both the head and the possessor, not to the head only, as seen in examples (111) and (112):
Further research is needed on this construction. Note the way the article ro\textsuperscript{1h} in (112) refers only to the head noun in the (a) part, but to both the head noun and the possessor in the (b) part.

$F_2$ is also used in two different ways with pronouns. First, some speakers use $F_2$ on one of the non-phrase-final pronouns (see Chapter 6, Section 6.6) when they serve as the head of an interrogative phrase with me\textsuperscript{3f} 'which?'. In this construction, the pronoun is phrase-final. Example set (113) shows this use of $F_2$:
Non-phrase-final pronouns, like possessed nouns, do not normally occur at the end of the noun phrase, and it seems likely that the occurrence of $F_2$ here is related to this violation of expectation, just as I suggest above for constructions in which a possessed noun is phrase-final.

The second way that $F_2$ is used with pronouns again involves the non-phrase-final pronouns like $zi^5$ 'third person singular masculine'. Whenever $zi^5$ introduces a phrase in apposition with a first or second person pronoun, it undergoes $F_2$, as seen in (114):

(114) a. $zo^3 zi^5 ku^n 1h gwa^4$
   3sgm 3sgm is-called John
   'he, the one who is called John'
   b. $zol^1 zi^1h ku^n 1h gwa^4$
   2sg 3sgm is-called John
   'you, the one who is called John'

Sometimes the presence or absence of $F_2$ serves to disambiguate the antecedent of the second part of an appositional phrase, as seen in (115):

(115) a. $ta?ni^5 qil^1h zi^5 ku^n 1h gwa^4$
   child-of 1sg 3sgm is-called John
   'my son John'
b. ta'nì⁵ ụh₁₁h ụh₁₁h ku'nà₁h gwa⁴
  child-of 1sg 3sgm is-called John
  'my—John's—son' or 'the son of me, John'

F₂ is also used to create adverbs from prepositions, as seen in
the following examples:

(116) a. sko⁴₁' ki³₂h
    beyond mountain
    'beyond the mountain'

b. ẹ⁵ sko¹₁
  walks beyond
  'walks backwards'

(117) a. rike³¹ sku₅h
  under cow
  'under the cow'

b. ka'ā³₂h rike¹₃h
  went under
  'went downhill'

In that prepositions developed historically from possessed nouns, it is
likely that this process is related either to the creation of denominal
adjectives or to the use of F₂ for a possessed noun that is not followed
by a possessor.
There is one use of $F_2$ that is limited to verbs. About a dozen verbs, most of them position verbs, have two different continuative aspect forms, one with $F_2$ and the other without it. There is no meaning difference between the two forms that has to do with aspect; they rather mark the position of the verb in the sentence. If the verb is clause-initial, in either a main clause or a relative clause, the form with $F_2$ occurs; and if the verb is not clause-initial, the form without $F_2$ occurs. Example set (118) shows this use of $F_2$:

(118) a. \[\text{nu}^2 \text{ aga}^3 \text{ rike}^3 ! \text{ cu}^5 \text{ a}^3\]
   is-in metal abdomen-of box decl
   'The metal object is in the box.'

   b. \[\text{aga}^3 \text{ nu}^2 \text{ rike}^3 ! \text{ cu}^5 \text{ a}^3\]
   metal is-in abdomen-of box decl
   'the metal object that is in the box'

   c. \[\text{aga}^3 \text{ nu}^3 \text{ rike}^3 ! \text{ cu}^5 \text{ a}^3\]
   metal is-in abdomen-of box decl
   'THE METAL OBJECT is in the box.'

This change plays a role in distinguishing a head noun followed by a relative clause from a sentence with one noun phrase in focus position, as seen in (118b) and (118c). Relative clauses often contain no other structural clues to their status, and the verbs that have special
continuative forms with $F_2$ commonly enter into relative clauses. This phenomenon is described in greater detail in Hollenbach (1982b).

The final use of $F_2$ is emphasis. Some speakers lower the tone of a sentence-initial word to make it more salient. I have observed this only with verbs, as seen in (119), but it may occur with other lexical categories as well:

(119) a. $\text{a} \text{c}{\text{a}} \text{5} \quad \text{z037 a} \text{32}$
   sings 3sgm decl
   'He is singing.'

b. $\text{a} \text{c}{\text{a}} \text{1h z037 a} \text{32}$
   sings 3sgm decl
   'He IS SINGING.'

It is of interest that this extremely diverse set of uses of $F_2$ includes some that are clearly derivational (e.g., denominal adjectives) and some that are clearly inflectional (e.g., possessed nouns). It therefore does not appear to be possible to assign inflection and derivation to separate components of the grammar of Trique without losing an important generalization. Furthermore, the different uses show varying degrees of productivity, and so it does not appear to be possible to make a rigid separation between parsing rules and generative rules either.
7.5 Formative Three: Additive Quantifiers

Unlike verbs and nouns, in which the first tone in the laryngeal tier representation of their stems is usually [+HIGH], numbers and other quantifiers have a [-HIGH] tone as the first tone in their laryngeal tier representation. To indicate the morphosyntactic category additive, which adds the meaning component 'more' or 'another' to the stem, some quantifiers (and one adverb of quantity) undergo $F_3$, which is the inverse of $F_1$ or $F_2$, i.e., it raises the tone of the stem in some way. This process is no longer productive, and so all additive quantifiers must be listed in the lexicon, but there are enough pairs to establish a fairly complete set of replacement rules. The individual rules are sometimes the inverse of $F_1$, sometimes the inverse of $F_2$, and sometimes the inverse of changes shared by $F_1$ and $F_2$.

The following pairs constitute a complete listing of all the pairs that differ only by $F_3$ that I have recorded to date:

(120) a. \( \text{do}^{13h} \) 'some'
b. \( \text{do}^{3h} \) 'more'

(121) a. \( \text{vu}^1 \) 'once'
b. \( \text{vu}^4 \) 'again'

(122) a. \( \text{yo}^2 \) 'one'
b. \( \text{yo}^4 \) 'another'
(123) a. \(\text{vane}^{1h}\) 'side'
b. \(\text{vane}^{5}\) 'other side'

(124) a. \(\text{ni}^{2} \text{ce}^{32h}\) 'one side of (body of water)'
b. \(\text{ni}^{5} \text{ce}^{32h}\) 'other side of'

There are also special additive forms for the numbers two through six, but these forms have \(\text{yo}^{4} \text{o}\) 'another' fused to the left side of the stem, in addition to the tone raising that realizes \(F_3\):

(125) a. \(\text{wi}^{1h}\) 'two'
b. \(\text{ya}^{3} \text{wi}^{5h}\) 'two more'

(126) a. \(\text{wa}^{2} \text{nu}^{1h}\) 'three'
b. \(\text{ya}^{3} \text{nu}^{5h}\) 'three more'

(127) a. \(\text{ka}^{2} \text{a}^{13h}\) 'four'
b. \(\text{yu}^{3} \text{ka}^{2} \text{a}^{3h}\) 'four more'

(128) a. \(\text{u}^{2} \text{u}^{17}\) 'five'
b. \(\text{yu}^{3} \text{u}^{37}\) 'five more'

(129) a. \(\text{wa}^{t} \text{a}^{17}\) 'six'
b. \(\text{ya}^{3} \text{t}^{37}\) 'six more'

The individual changes that form part of \(F_3\) include seven rules, which are completely unproductive and function simply as parsing rules.
In order to facilitate comparison with $F_1$ and $F_2$, however, I use the same generative format.

There are five rules that apply to stems that have tone 1. The first rule deletes the 1 preceding a 3; it accounts for examples (120) and (127), and it is the inverse of rules (28) and (77) in Sections 7.3 and 7.4.1:

(130) Deletion of Tone 1

$$\begin{array}{c}
\begin{array}{c}
1 \\
[-\text{HIGH}] \\
[-\text{CENT}] \\
\end{array} \\
\rightarrow \emptyset / \quad
\begin{array}{c}
3 \\
[+\text{HIGH}] \\
[+\text{CENT}] \\
\end{array}
\end{array}
\quad ([+\text{GLOT}]) \# \quad || \quad F_3
$$

The second rule replaces 1 by 3 in words with final 2; it accounts for examples (128) and (129), and it is the inverse of rules (29) and (79):

(131) Replacement of 1 by 3

$$\begin{array}{c}
\begin{array}{c}
1 \\
[-\text{HIGH}] \\
[-\text{CENT}] \\
\end{array} \\
\rightarrow
\begin{array}{c}
3 \\
[+\text{HIGH}] \\
[+\text{CENT}] \\
\end{array}
\end{array}
\quad / \quad
\begin{array}{c}
\begin{array}{c}
2 \\
[+\text{GLOT}] \\
\end{array} \\
[-\text{SPR}] \\
[-\text{HSP}] \\
\end{array}
\quad || \quad F_3
$$

The third rule replaces a word-final 1 by 4; it accounts for example (121), and it is the functional inverse of rules (32) and (83):

(132) Replacement of 1 by 4

$$\begin{array}{c}
\begin{array}{c}
1 \\
[-\text{HIGH}] \\
[-\text{CENT}] \\
\end{array} \\
\rightarrow
\begin{array}{c}
4 \\
[+\text{HIGH}] \\
\end{array}
\quad / \quad
\begin{array}{c}
\# \\
\end{array}
\quad || \quad F_3
$$
The fourth and fifth rules apply to stems with 1h that do not undergo the first rule. These stems sometimes replace 1 by 5 and lose the h, as seen in (123); this change is the inverse of rules (40) and (87):

(133) Replacement of 1h by 5

\[
\begin{array}{ll}
1 & h \\
[-\text{HIGH}] & [+\text{GLOT}] \\
[-\text{CENT}] & [+\text{SPR}] \\
\end{array}
\Rightarrow
\begin{array}{ll}
5 & \emptyset \\
[+\text{HIGH}] & \\
[-\text{CENT}] & [-\text{GLOT}] \\
[+\text{EXTR}] & \\
\end{array}
\]

Other stems with 1h replace 1 by 5 but retain the h, as seen in (125) and (126); this change is the inverse of rule (85):

(134) Replacement of 1 by 5 Before h

\[
\begin{array}{ll}
1 & 5 \\
[-\text{HIGH}] & [+\text{GLOT}] \\
[-\text{CENT}] & [+\text{EXTR}] \\
\end{array}
\Rightarrow
\begin{array}{ll}
5 & h \\
[+\text{HIGH}] & \\
[-\text{CENT}] & [+\text{SPR}] \\
\end{array}
\]

There are two rules that apply to stems that have tone 2. The first one applies only to stems that have a lexically linked 2, and the second applies to stems that have an underlyingly unassociated 2. The first rule replaces the linked 2 by 5; it accounts for example (124), and it is the partial inverse of rules (57) and (91):
The second rule replaces the unassociated 2 by 4; it accounts for example (122), and it is the inverse of rule (33).

(136) Replacement of 2 by 4

\[
\begin{align*}
2 & \rightarrow 4 \\
\begin{bmatrix} -\text{HIGH} \\ +\text{CENT} \end{bmatrix} & \rightarrow \\
\begin{bmatrix} +\text{HIGH} \\ -\text{CENT} \\ +\text{EXTR} \end{bmatrix} & \rightarrow \\
& \text{F}_3 \\
\end{align*}
\]

7.6 Compounds

In Copala Trique, compounding is an historical process that takes place when a particular idiom that consists of two words reduces to a single word. The kinds of idioms that are most likely to become compounds are those that consist of a verb or noun immediately followed by a modifier (see Chapter 6, Section 6.3, for a description of verbal idioms). The crucial change in compounding can be viewed as the loss of a word boundary; other changes follow automatically as a consequence of this one because of the phonotactic constraints on the structure of each tier.

The incorporation of two words into a single one usually results in the creation of a complex word, as seen in the following examples:
(137) ru³ci¹ 'guava' (ču³h 'fruit' + ci¹ 'sweet')

(138) ka³nu¹³h 'shoe' (ka³h 'sandal' + nu¹³h 'of skin' [nu³h 'skin' + F₂])

(139) ya⁵nu¹³h 'drum' (yaʔa⁵h 'instrument' + nu¹³h 'of skin')

(140) ku³ya¹h 'candle' (ku⁵ 'bone' + ya¹h 'waxy' [ya⁵h 'wax' + F₂])

(141) ta³ga³ 'jail' (tukwa⁴ 'house of' + aga³ 'metal')

(142) ra³zu² 'thing', 'tool' (raʔa³ 'hand of' + zu² 'worklike' [zu² 'work' + F₂])

(143) sno⁵o³2i 'man' (zi⁵ '3sgm [non-phrase-final]' + no³o³2i 'man', 'male')

(144) ka³šu¹h 'noon' (aga³ 'metal', 'bell' + šuwi¹h 'twelve')

(145) na³ka⁵ 'gasoline', 'kerosene' (na³2 'water' + aka⁵ 'burns')

(146) a. ri⁵ce³ 'burned incense' (kaši⁵h 'tucked in' + kace³ 'smoke')
One important change in these words is a reduction in the number of syllables that they contain, so that they conform to the preferred Trique word length, which is two or three syllables. Sometimes the reduction is accomplished by simply deleting the nonfinal (unstressed) syllables of the original words, as in (146) and the first part of (144). Sometimes it is accomplished by deleting the onset of the final syllable and fusing the vowels, as in the first part of (141) and the second part of (144). This kind of reduction is particularly common if the onset is ʔ, as in the first part of (139) and (142). In a few cases, the final vowel of the original first word is lost, leaving a sibilant plus nasal consonant cluster, as in (143) and (147); in such cases, the tone of the deleted vowel is not lost, but instead appears on the following syllable. These examples illustrate the phenomenon of stability, which is one of the classic pieces of evidence in favor of placing tone on a separate tier from segments, as pointed out by Goldsmith (1976:27).

Changes other than syllable reduction are almost entirely predictable, both those on the segmental tier and those on the laryngeal...
tier. The second word in the compound, or at least its final syllable, is preserved intact because this syllable becomes the final syllable of the compound and so permits the full range of phonological distinctions. This is seen in all of the above examples except (144). The first word in the compound, however, undergoes various changes because it becomes a nonfinal syllable in the compound and is therefore subject to the phonotactic constraints discussed in Chapters 3-5. Lax stops are replaced by tense ones, as seen in (144); dental and alveopalatal affricates and lax sibilants are replaced by tense sibilants, as seen in (147) and (143); and the retroflex affricate and tense sibilant are replaced by the lax sibilant ɾ, as seen in (137) and (146). Sonorants remain unchanged, as seen in (139), (143), (145), and (147), but onset laryngeals are lost, as seen in (139) and (142). Vowels lose the feature specification [+nasal], as seen in (138) and (139), but are otherwise unchanged, as seen in (137), (140), (144), (145), and (146). On the laryngeal tier, all laryngeals delete from the first word in the compound, as seen in most of the above examples. The tone system reduces from eight patterns to four in the following way. Levels 1 and 2 merge to 2, as seen in (146b) and (147b); levels 3 and 4 and sequence 32 merge to 3, as seen in (137), (138), (141), (142), (144), and (145); and level 5 remains 5, as seen in (139), (143), (146a), and (147a). Sequence 31 probably remains 3, and sequence 13 probably becomes 2 (no examples have been recorded). In one word, (140), level 5 dropped to 3 under obscure conditions.
Sometimes a complex word undergoes deletion of its linked tone pattern to become a simple word, as seen in the following compounds:

(143) \( \text{raču}^{5} \) 'bread' (\( \text{ča}^{3} \) 'tortilla' + \( \text{ču}^{5} \) 'box',
'a oven')

(149) \( \text{raga}^{37} \) 'key' (\( \text{ra}^{3} \) 'hand of' + \( \text{ag}^{2} \) 'metal')

Compounding is the main source of complex words in Copala Trique. All complex verbs and nouns show a laryngeal tier change in their linked tone pattern, rather than in their unassociated tone pattern, when they undergo either \( F_1 \) or \( F_2 \); and the historical facts about compounding explain why this is so. The first part of the compound always corresponds to the original head of the phrase, and the second part to the original modifier. It is the original head that undergoes \( F_1 \) or \( F_2 \), resulting in the replacement of the linked tone pattern of complex words by tone 2, which is the only [-HIGH] tone that occurs alone in nonfinal syllables.

Some verbs that are simple words in their stem form become complex words in potential aspect. It is perhaps the case that these verbs are old compounds.
NOTES FOR CHAPTER 7

1. It seems likely that at some recent period in the history of Copala Trique, causative stems with tone 3 also added a lexically linked tone 2 and therefore had a complex word as the potential aspect form. Copala Trique subsequently underwent a sound change, however, in which a low tone on an earlier syllable of the word preceding a simple tone 3 moved to the right to create the 13 tone sequence. Compare Copala Trique marc13 'red' and nica13 'full' with Chicahuaxtla Trique mar2re3 'red' and nica3 (Longacre 1957:185, 187). (Tone numbers in the Chicahuaxtla forms have been inverted to conform to the system I am using for Copala Trique, in which 1 represents low tone.) There are, however, some words in Copala Trique at present that have a lexically linked tone 2 followed by a simple tone 3, such as rïce3 'will burn incense'.

2. I gave serious consideration to an abstract analysis in which certain words were assigned underlying representations with 312 and 323. These sequences do not occur on the surface, and would have to be changed to 32 by the independently necessary rule of Downglide Simplification, described in Chapter 9, Section 9.3.1. Such an analysis would be historically accurate and would explain why some stems that have 32 on the surface become 12 or 22 when they undergo F1 or F2, instead of becoming 133. These stems would simply undergo Low Tone.
Deletion, which is perfectly regular for stems in 31 and 32, instead of undergoing a minor rule. Attractive as this analysis is, however, there is a problem with the tone sandhi rules described in Chapter 8, Section 8.2. Stems with 3 and 31 undergo sandhi, while stems with 32 do not. Nevertheless, all stems in 3?, including those that would have underlying 32? in the abstract analysis to account for the alternation of 3? and 2?, undergo sandhi. Furthermore, there is no way to order the rules to avoid the problem. The fact that native speakers respond to such stems as members of the class that undergoes sandhi shows that the abstract analysis has no psychological reality, and that the minor rule analysis is therefore to be preferred.

3. In the formation of denominal adjectives, most of which must be lexically listed for semantic reasons, the rules that make up F2 function mainly as parsing rules. In forms to which rule (91) has applied and which have a [-HIGH] tone as the first unassociated tone in their laryngeal tier representation, such as ʂaⁿa²¹ 'female', there is an indeterminacy concerning the linked tone. There is no difference in the surface form between words with a linked tone 2 and words with no linked tone. It is therefore very probable that the lexically linked tone is lost from the underlying representation of the adjective as soon as it loses a generative relation with the source noun. For example, ʂaⁿa²¹ is likely to simplify to šana¹ when it loses its generative relation to ʂaⁿa³¹ 'woman'.
4. Even though verb aspect is normally considered to be inflectional, the kV- 'noncontinuative' prefix often occurs inside of a clearly derivational prefix like tV- 'causative', as in tikawi 'to kill'; cf. awi 'dies' and kawi 'died'. Perhaps aspect was at one time a derivational, rather than an inflectional, category in Copala Trique. See S. Anderson (1982:585-91) for a discussion of the problem of distinguishing between these two types of morphology.
CHAPTER 8

WORD-EXTERNAL MORPHOLOGY: TONE SANDHI

In this chapter I turn from a consideration of processes which take place within the lexicon and which are within the span of a single word, to processes which involve two distinct words and which must therefore take place following lexical insertion. There are two kinds of processes of the latter type in Copala Trique: tone sandhi, which involves a morphologically conditioned rule; and clitic pronouns, which involve the fusion of two words into one. I describe sandhi first, partly because it is simpler than the clitics, and partly because the cliticization process incorporates sandhi.

Before proceeding to a description of tone sandhi in Copala Trique, and a discussion of the theoretical implications of these rules, some preliminary remarks about sandhi are necessary. I begin this chapter, therefore, with a definition of tone sandhi, in which I distinguish it from both lexical tone and tonal morphology, and also present a brief typology of sandhi processes.

8.1 The Concept of Tone Sandhi

In the introductory part of Chapter 7, I distinguished lexical tone from morphological tone. In lexical tone, a tone difference can be the only difference between two unrelated lexical items. In
morphological tone, the replacement of one tone pattern by another does not change a word into a completely unrelated one, but rather affects the properties of the word in some way. For example, in Copala Trique, such replacements mark potential aspect in verbs and create denominal adjectives. There is, however, still a third way in which tone functions in Copala Trique, which I refer to as morphophonemic tone, or tone sandhi. In tone sandhi, there is an alternation between tone patterns that are distinctive elsewhere, but the alternation does not affect the properties of the word in any way; it is rather conditioned by some overt item in the environment.¹

There is, of course, nothing new in the above discussion. The distinction among the three functions of tone was very ably drawn by Welmers fully a quarter of a century ago (1959). The parallels to segmental phonology should be fairly obvious. In English, for example, the feature [voiced] carries all three functions. It is lexical, in that bet and bed, which differ phonologically only in the voicing of their final segment, are different and unrelated stems. Voicing is also morphological, in that the process of voicing a final voiceless consonant in a noun sometimes serves to create a denominal verb, as in halve from half. And, in addition, voicing is also a sandhi phenomenon, both internal, as seen in the alternation between [d] and [t] in the past tense suffix -ed, and external, as seen in the flapping in at Ed's [æDɛdz].
In practice, however, it is sometimes difficult to distinguish between tonal morphology and tone sandhi. The criterion I use in this study is that sandhi is a conditioned change, i.e., a change that occurs together with some overt element that can plausibly be posited as the conditioning factor, while tonal morphology involves changes that are themselves the sole features that signal a change in the properties of words, i.e., there is no overt conditioning factor in the environment. Given a sufficiently abstract analysis, however, this criterion can be blurred. An abstract entity can be posited to condition some "sandhi" change, after which it is deleted.

Two intriguing analytical problems of this type are found in Mixtec, a group of closely related languages that belongs to the same family within Otomanguean as Trique. One problem is that the same set of changes that are conditioned sandhi changes in one environment serves as the sole overt marker of continuative aspect in a different environment. Pike (1948:82) posited a zero word with no segmental or tonal content, only with sandhi-causing influence, as the marker of continuative aspect in San Miguel El Grande Mixtec. Mak (1958:67) follows this analysis for Santo Tomás Ocotepec Mixtec as well. The second problem concerns "sandhi" changes that take place only in restricted syntactic environments. For the same two Mixtec languages, (Pike 1948:82–87, Mak 1958:62–66), and also for San Esteban Atatláhuca Mixtec (Mak 1953:88, 93–95), Pike and Mak posit tone sandhi processes that take place only in special constructions, in addition to regular sandhi processes that take
place whenever the phonological conditions are met. For example, the
tone of a noun that immediately follows another noun and serves to mod-
ify it is replaced by a higher tone. By the definition I am using, both
of these special kinds of "sandhi" in Mixtec are not sandhi at all, but
rather tonal morphology. It seems to be clear that, historically, these
tone changes started out as regular sandhi processes, but that the condi-
tioning factor was lost at some point, leaving the "sandhi" changes as
the only overt realization of some meaningful element. It is not always
easy to know at what point the morphologization has been accomplished,
but the existence of borderline cases does not invalidate the distinc-
tion between tonal morphology and tone sandhi.

Segmental phonology and morphology also show many such gray
areas, in which a difference that is clearly conditioned in one environ-
ment is meaningful in another one because of the loss of the condi-
tioning factor. The derivation of English verbs by voicing the final
consonant of nouns, for example, started out historically as not only a
conditioned change, but an allophonic one. At earlier stages, English
had no voicing opposition in fricatives: they were voiced intervocali-
cally and voiceless elsewhere. The form that developed into Modern
English halve had [v] because a vowel followed, whereas the form that
developed into half had [f] because it was word-final. What started out
as a conditioned change became the sole feature that signaled a change
in the properties of the word when the conditioning factor, i.e., the
final vowel, was lost. Examples could be multiplied, but I hope the
point is clear: even though sandhi processes often lead to morphological alternations historically, the two must be distinguished synchronically.

There are a number of parameters along which tone sandhi processes may vary. Four of them are described below.

One parameter is internal versus external sandhi. Internal sandhi takes place within a prosodic domain of a certain size, usually word, and external sandhi takes place across the boundaries of that domain. Internal sandhi is common in languages which have a great deal of productive morphology. Even in languages with little morphology, however, frozen remnants of formerly productive sandhi processes are common. External sandhi, on the other hand, is common even in languages that have little morphology. In addition to its lower bound at the word level, external sandhi often has an upper bound at some level like the phonological phrase. Tone sandhi processes do not customarily take place across pause, as Pike (1948:80) noted for the sandhi found in San Miguel Mixtec.

A second parameter is progressive versus regressive sandhi. In progressive sandhi, the environment for the rule precedes the changed element. In regressive sandhi, the environment follows the changed element. Sandhi may also be mutual, i.e., both progressive and regressive.

A third parameter along which sandhi processes may differ is in their degree of phonetic plausibility. Unlike the previous two
parameters, this one is scalar, rather than binary, because processes may be natural to a greater or lesser degree. Perhaps because tone is so closely tied to fundamental frequency and because there are so few kinds of natural tonal processes, tone sandhi processes tend, in my experience, to lack apparent phonetic motivation.

Still a fourth parameter along which sandhi processes may vary is in terms of their degree of generality. In the most regular case, the sandhi rule operates because of some phonotactic constraint within the language: a nonpermitted sequence is replaced by a permitted one. (There is, of course, nothing within such a constraint to indicate either which element of such a sequence will be changed, or in what way.) In less regular cases, no constraint is violated. It just happens to be the case that some, but not all, instances of a certain sequence are changed, and that the conditions under which the change occurs—or fails to occur—must be stated in terms of some list or class, i.e., in terms of morphological information. The irregularity in such rules is sometimes found in the element that undergoes the change, sometimes in the environment that conditions the change, or even in both. All such processes require some kind of information to be included in lexical entries.

It is important to distinguish between phonetic plausibility and generality. Even though there is undoubtedly a positive correlation between plausible processes and general ones, the two are by no means the same thing. It is theoretically possible for a rule to be phonetically
natural, yet apply only in a restricted set of cases, or to be totally arbitrary in the change it effects, yet to apply without exception.

Each of these four parameters applies, of course, to segmental sandhi processes, as well as to tonal ones; see, for example, the discussion in Matthews (1974:97-113, 196-213).

8.2 Copala Trique Tone Sandhi

There is only one kind of productive sandhi process in Copala Trique, namely, the replacement of one tone pattern by another one before certain pronouns. In the typology presented above, this sandhi has the following characteristics: it is external, regressive, extremely arbitrary in the change it effects, and completely regular in its application, though exceptional in its environment.

This sandhi is caused by a group of non-third-person pronouns, specifically, by $\overline{\text{1h}}$ 'first person singular', $\overline{\text{0}}$ 'second person singular (unmarked)', and $\overline{\text{1}}$ 'second person singular intimate'. Any word that has certain tone patterns and that immediately precedes one of these pronouns in linear order raises its tone. The lexical category of the word undergoing the change is irrelevant, and so are the syntactic function of the pronoun and the syntactic relation between the word and the pronoun. The following discussion first outlines briefly the range of lexical and syntactic environments in which sandhi is found, and then describes the process in detail.

The following examples show tone sandhi on a variety of lexical categories: verb, adjective, adverb, indeterminate element,
preposition, and noun. The (a) part of each example shows the basic form of the word before the non-sandhi-causing pronoun \( z_0^3 \) 'third person singular masculine', and the (b) part shows the form of the word with a raised tone before \( z_0^1 \) 'second person singular'.

(1) a. \( \overset{\text{na}}{\text{?na}} \overset{\text{z}_0^3}{\text{z}_0^3} \overset{\text{a}}{\text{a}} \overset{\text{32}}{\text{32}} \)
   comes \( 3 \text{sgm decl} \)
   'He comes.'

b. \( \overset{\text{na}}{\text{?na}} \overset{\text{z}_0^1}{\text{z}_0^1} \overset{\text{a}}{\text{a}} \overset{\text{32}}{\text{32}} \)
   comes \( 2 \text{sg decl} \)
   'You come.'

(2) a. \( \overset{\text{kunu}}{\text{kunu}} \overset{\text{maru}}{\text{maru}} \overset{\text{z}_0^3}{\text{z}_0^3} \overset{\text{a}}{\text{a}} \overset{\text{32}}{\text{32}} \)
   became black \( 3 \text{sgm decl} \)
   'He turned black.'

b. \( \overset{\text{kunu}}{\text{kunu}} \overset{\text{maru}}{\text{maru}} \overset{\text{z}_0^1}{\text{z}_0^1} \overset{\text{a}}{\text{a}} \overset{\text{32}}{\text{32}} \)
   became black \( 2 \text{sg decl} \)
   'You turned black.'

(3) a. \( \overset{\text{ge}}{\text{ge}} \overset{\text{yo}}{\text{yo}} \overset{\text{z}_0^3}{\text{z}_0^3} \overset{\text{a}}{\text{a}} \overset{\text{32}}{\text{32}} \)
   walks quickly \( 3 \text{sgm decl} \)
   'He walks quickly.'
b. ḍe⁵ yo⁴ zo¹ a³²
   walks quickly 2sg decl
   'You walk quickly.'

(4) a. ṅa³² niko³ zọ⁰ a³²
    comes back 3sgm decl
    'He comes back.'

b. ṅa³² niko⁴ zọ⁰ a³²
    comes back 2sg decl
    'You come back.'

(5) a. go³² sə₂ na¹ sə² a³² ma³ zọ³ a³²
    gave woman money to 3sgm decl
    'The woman gave money to him.'

b. go³² sə₂ na¹ sə² a³² ma⁴ zọ¹ a³²
    gave woman money to 2sg decl
    'The woman gave money to you.'

(6) a. aŋə² ra³² zọ² a³²
    throbs hand-of 3sgm decl
    'His hand throbs.'

b. aŋə² ra⁴ zọ a³²
    throbs hand-of 2sg decl
    'Your hand throbs.'
These examples also illustrate the most important syntactic environments in which pronouns occur. Examples (1)-(4) show the pronoun as the subject of the clause, and the word that undergoes sandhi is the final element in the verb phrase. Example (5) shows the pronoun as the complement of a preposition, with the preposition undergoing sandhi; and (6) shows the pronoun as the possessor of a noun, with the noun undergoing sandhi. The contrast between examples (1) and (4) is particularly instructive. In both, the pronoun is the subject of the sentence, and the inflected verb is 贾 "comes". The verb undergoes sandhi only in (1), however, where it immediately precedes the pronoun in linear order. In (4), the modifying word 背 "back" intervenes between the verb and the subject pronoun, and it is this word that undergoes sandhi because it immediately precedes the pronoun in linear order. See Chapter 6 for a description of these syntactic patterns, and Chapter 9, Section 9.1, for a more detailed description of the syntactic environments in which pronouns occur.

Tone sandhi takes place after primary and secondary tone association, but before tertiary tone association (see Chapter 4, Section 4.3), as will be shown below. In the remainder of this chapter, therefore, I write tone on all syllables to show the result of primary and secondary association. I also write secondary stress.

Leaving aside for the moment stems with final 背, tone sandhi can be stated informally as follows: any word with tone pattern 背, 背, or 背 changes its tone pattern to 背 before the three sandhi-causing
pronouns. Note that this change, like the changes described in Chapter 7, is limited to the laryngeal tier. The following sentences show the operation of the sandhi process by contrasting the forms that words take before $z_3$ 'third person singular masculine', which does not cause sandhi, with their forms before $z_1$ 'second person singular', which causes it:

(7) a. $ka^3wi_3 ni_3 z_0^3 a_32$
    died mother-of 3sgm decl
    'Hi's mother died.'

    b. $ka^3wi_3 ni z_0^17 a_32$
    died mother-of 2sg decl
    'Your mother died.'

(8) a. $ka^3wi_3 ta^3?nu_3 z_0^3 a_32$
    died uncle-of 3sgm decl
    'His uncle died.'

    b. $ka^3wi_3 ta^3?nu_47 z_0^17 a_32$
    died uncle-of 2sg decl
    'Your uncle died.'

(9) a. $ta^3?a_32 gwa^4 sa^32h ra^3?a_31 z_0^3 a_32$
    grabs John money hand-of 3sgm decl
    'John takes the money from him.'
b. \( \text{tə} \text{a}_2 \text{a} \text{32} \text{ gwa}_4 \text{ sa}_3 \text{a}_2 \text{h} \text{ ra}_3 \text{a}_4 \text{!} \text{ zo}_1 \text{?} \text{ a}_3 \text{2} \)

grabs John money hand-of 2sg decl

'John takes the money from you.'

(10) a. \( \text{a}_3 \text{na}_3 \text{1} \text{ zo}_2 \text{?} \text{ a}_32 \)

washes-face 3sgm decl

'He washes his face.'

b. \( \text{a}_3 \text{na}_4 \text{ zo}_1 \text{?} \text{ a}_32 \)

washes-face 2sg decl

'You wash your face.'

(11) a. \( \text{ka}_2 \text{ra}_13 \text{ zo}_3 \text{?} \text{ na}_32 ! \text{ ra}_4 \text{!} \text{ ū}_3 \text{h} \text{ a}_32 \)

will-put-in 3sgm water in pot decl

'He will fill the pot with water.'

b. \( \text{ka}_2 \text{ra}_4 \text{ zo}_1 \text{?} \text{ na}_32 ! \text{ ra}_4 \text{!} \text{ ū}_3 \text{h} \text{ a}_32 \)

will-put-in 2sg water in pot decl

'You will fill the pot with water.'

(12) a. \( \text{ka}_2 \text{no}_2 \text{ko}_13 ? \text{ zo}_3 \text{?} \text{ ūko}_4 \text{!} \text{ gwa}_4 \text{ a}_32 \)

will-follow 3sgm behind John decl

'He will follow John.'

b. \( \text{ka}_2 \text{no}_2 \text{ko}_4 ? \text{ zo}_1 \text{?} \text{ ūko}_4 \text{!} \text{ gwa}_4 \text{ a}_32 \)

will-follow 2sg behind John decl

'You will follow John.'
(13) a. \( \text{ke'ne}_2^2\text{e}_2^2\text{zo}_2^3\text{su}_3^3\text{we}_3^3\text{a}_3^2 \)

will-see 3sgm dog decl

'He will see the dog.'

b. \( \text{ke'ne}_2^2\text{e}_2^4\text{zo}_1^2\text{su}_3^3\text{we}_3^3\text{a}_3^2 \)

will-see 2sg dog decl

'You will see the dog.'

The words with underlying tone sequence 13, as seen in examples (11)-(13), provide the evidence that tone sandhi takes place after primary and secondary tone association. As described in Chapter 2, Section 2.1, and Chapter 4, Section 4.3, the tone of nonfinal syllables in simple words is predictable from the first unassociated tone that is specified in the lexical entry for the stem. If the first tone is [+HIGH], then nonfinal syllables have tone 3; and if the first tone is [-HIGH], nonfinal syllables have tone 2. In a word with underlying 13, the first tone level is 1, which is [-HIGH], and therefore the secondary association process epenthesizes tone 2 and associates it with nonfinal vowels. In tone sandhi, 13 is raised to 4, which is [+HIGH]. If tone sandhi took place before secondary association, then we would expect epenthesis to create tone 3 and to associate it with nonfinal syllables. But tone 3 does not occur there; tone 2 does instead. The most plausible explanation for the presence of this otherwise unpredictable 2 is that tone sandhi takes place after secondary association has placed the 2 there by regular rules.
Tone sandhi does, however, precede tertiary association, which creates upglides or downglides from both underlying tone levels 4 and 5 and the instances of 4 that result from the application of sandhi.

The following partial derivations show the ordering of sandhi among the regular phonological rules.

(14) Underlying Form 1 3 1 ? 'you will fill'
   \underline{kara} \underline{zo}

   Primary Association 1 3 1 ?
   \underline{1/} \underline{1/}
   \underline{kara} \underline{zo}

   Secondary Association 2 1 3 1 ?
   \underline{1/} \underline{1/}
   \underline{kara} \underline{zo}

   Sandhi 2 4 1 ?
   \underline{1/} \underline{1/}
   \underline{kara} \underline{zo}

   Tertiary Association 2 3 4 1 ?
   \underline{1/} \underline{1/}
   \underline{kara} \underline{zo}

(15) Underlying Form 1 3 1 h 'I will see'
   \underline{ken?e} \underline{?u}

   Primary Association 1 3 1 h
   \underline{1/} \underline{1/}
   \underline{ken?e} \underline{?u}
Secondary Association  
\[
\begin{array}{c|c|c}
2 & 1 & 3 \\
\hline
/\!\!\!\!\!\!\!\!/ & \!\!\!\!\!\!\!\!/ & \!\!\!\!\!\!\!\!\!\\
\text{kene?e} & \text{?u} & \\
\end{array}
\]

Sandhi  
\[
\begin{array}{c|c|c}
2 & 4 & 3 \\
\hline
/\!\!\!\!\!\!\!\!/ & \!\!\!\!\!\!\!\!/ & \!\!\!\!\!\!\!\!\!\\
\text{kene?e} & \text{?u} & \\
\end{array}
\]

Tertiary Association  
\[
\begin{array}{c|c|c}
2 & 4 & 3 \\
\hline
/\!\!\!\!\!\!\!\!/ & \!\!\!\!\!\!\!\!/ & \!\!\!\!\!\!\!\!\!\\
\text{kene?e} & \text{?u} & \\
\end{array}
\]

The tone sandhi process provides evidence to support the analysis of the [34] upglide and the [43] downglide as variant surface realizations of a single underlying level \( \text{4} \). If these were analyzed as two different underlying tone sequences, the sandhi process would be more complex to state because one rule would be required for words with no laryngeal or with final \( \text{?} \), and a different rule would be required for words with final \( \text{!} \).

On stems with final \( \text{!} \), the tone sandhi process is more complex. Stems in \( \text{3h} \) and \( \text{13h} \) undergo sandhi before the same three pronouns, but instead of changing their tone to \( \text{4} \), they change it to \( \text{5} \) instead, and they also lose the \( \text{!} \). In the data I have gathered to date, there is only a single stem with \( \text{31h} \), \text{ma'ya\textsuperscript{31h}} 'yellow', and this word does not undergo sandhi. Even though the sandhi change that takes place in stems with final \( \text{!} \) is somewhat more complex than a simple replacement by \( \text{4} \), it is nevertheless entirely regular in its application. The following sentences show the operation of sandhi in words with \( \text{3h} \) and \( \text{13h} \):
(16) a. \( \text{ki}^3\text{ya}^3\text{h} \, \text{zo}^3\text{?} \, \text{we}^3\text{?} \, a^3^2 \)
   made 3sgm house decl
   'He built the house.'

   b. \( \text{ki}^3\text{ya}^5 \, \text{zo}^1\text{?} \, \text{we}^3\text{?} \, a^3^2 \)
   made 2sg house decl
   'You built the house.'

(17) a. \( \text{ki}^2\text{ya}^1\text{h} \, \text{zo}^3\text{?} \, \text{we}^3\text{?} \, a^3^2 \)
   will-make 3sgm house decl
   'He will build the house.'

   b. \( \text{ki}^2\text{ya}^5 \, \text{zo}^1\text{?} \, \text{we}^3\text{?} \, a^3^2 \)
   will-make 2sg house decl
   'You will build the house.'

Words with 13h provide further evidence for the ordering of sandhi between secondary association and tertiary association. Nonfinal syllables of words with underlying 13h have tone 2, not tone 3, and the 5 that results from sandhi becomes a [35] upglide on the surface, just as underlying tone 5 does. The following partial derivation shows this ordering:

(18) Underlying Form \( 1 \, 3 \, h \, 1 \, ? \) 'you will make'
    \( \text{ki}^?\text{ya} \, \text{zo} \)
Primary Association

\[
\begin{array}{ccc}
1 & 3 & h \\
\|/ & & \|/
\end{array}
\]

\text{ki?ya} \rightarrow z0

Secondary Association

\[
\begin{array}{ccc}
2 & 1 & 3 \\
\|/ & & \|/
\end{array}
\]

\text{ki?ya} \rightarrow z0

Sandhi

\[
\begin{array}{ccc}
2 & 5 & 1 \\
\| & & \|/
\end{array}
\]

\text{ki?ya} \rightarrow z0

Tertiary Association

\[
\begin{array}{ccc}
2 & 3 & 5 \\
\|/ & & \|/
\end{array}
\]

\text{ki?ya} \rightarrow z0

All of the sandhi changes described above are summarized on Table 20. This table has only three rows, one for each of the tone patterns that undergo sandhi, \(3, 13\), and \(31\). The remaining tone patterns, \(1, 2, 4, 5\), and \(32\), do not undergo sandhi, and so they are not included on the table. Lexically linked tones, which are associated with non-final syllables, are not affected by tone sandhi, and so they are not included on the table either.

Now that the facts have been described and illustrated, it is necessary to formalize the sandhi process by writing rules that will generate the correct forms. Two rules are needed, one for stems with final \(h\), and another one for stems with final \(?, \), or no laryngeal. These two rules are internally unordered. They are limited to the
### Table 20. Tone Sandhi Changes

<table>
<thead>
<tr>
<th></th>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>!</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>31</td>
<td>4</td>
<td>X</td>
<td>NS</td>
<td>X</td>
</tr>
</tbody>
</table>

X = does not occur in language

NS = no sandhi occurs on this combination
laryngeal tier, except, of course, for the pronoun environment. I treat the rule for $h$-final stems first.

Even though the rule for words that end in $h$ is regular, its statement is fairly complex. First of all, the conditioning environment is morphological: the rule applies only before three specific pronouns. Note that it is not something about the phonological shape of these pronouns that causes them to have this effect on the preceding word. For example, even though they all have tone $\text{1}$, it is not the case that all monosyllabic words with tone $\text{1}$ cause sandhi. Nor is it the case that all pronouns with tone $\text{1}$ do, because $\text{ro}^{17}$ "inclusive dual" does not. The sandhi-causing feature is simply a fact about three particular pronouns. The second complexity in the rule is the fact that its input consists of more than a single segment; it therefore must be stated as a transformation, rather than as a simple phonological rule, in which only a single segment is changed. The sandhi rule for words with final $h$ may be stated as follows:

(19) Tone Sandhi One

\[
\begin{array}{cccccc}
\text{1} & \text{3} & \text{h} & \text{5} & \text{ru}^{1h} \\
[-\text{HIGH}] & [+\text{HIGH}] & [+\text{GLOT}] & [\text{CENT}] & \varnothing / \text{co}^{17} \\
\text{1} & \text{2} & \text{3} & \text{1} & \text{2} & \text{3}
\end{array}
\]

Note that this rule is simplified by the analysis of "long" vowels as simple vowels and "short" vowels as vowels checked by '. If,
in addition to deleting the h, this rule also had to geminate or lengthen the vowel, it would be a cross-tier rule and would therefore be even more complex to state than it now is.

The tone sandhi rule for words that do not have final h requires a complex input with two optional tones. Its environment includes both an optional laryngeal other than h and the three sandhi-causing pro-nouns. This rule is:

(20) Tone Sandhi Two

\[
\begin{align*}
\frac{1}{[-\text{HIG}]} \frac{3}{+\text{HIG}} \frac{1}{[-\text{HIG}]} \Rightarrow \emptyset [-\text{CENT}] \emptyset / \emptyset \left( \begin{array}{c}
2, 1 \\
+\text{GLOT} \\
\text{CENT}
\end{array} \right)
\end{align*}
\]

There does not appear to be any way in which this rule can be simplified. The complexity resides in the data, not in the particular analysis that I have applied to them. It is, of course, possible to group together the tone patterns \(3\) and \(13\) as all those that have \(3\) as their final tone, but there is no way to incorporate \(31\) into this generalization. It is not the case that all patterns that contain tone \(3\) undergo sandhi, because \(32\) does not; nor is it the case that all patterns that contain tone \(1\) undergo sandhi, because \(1\) alone does not. There does not appear to be any analysis in which tone sandhi falls out as a natural process, or even as a simple one. In all probability, tone sandhi started as a natural process, but at present the two sandhi rules simply
describe arbitrary paradigmatic replacements. Schuh (1978:248-51) claims that rules of this sort are common in Asian tone systems, but not in either African or Mexican systems. Rules of this type are, however, attested in Mixtec (cf. Pike 1948:77-81), as well as in Copala Trique; see the discussion in Section 8.3 below.

In order to generate the correct forms, it is necessary to adopt two conventions that apply to the output of these two rules. These conventions are:

(21) Any segment that replaces an already associated segment takes over the original segment's association line.

(22) The association line for a deleted segment is pruned from the representation.

The derivations in (14), (15), and (18) show the operation of these conventions.

The application of tone sandhi occasionally results in a loss of contrast between two distinct underlying forms, as seen in the following examples:

(23) a. 3sgm soldier decl

'He became a soldier.'
b.  \text{gu}^4 \text{zo}^{17} \text{ta}^{3} \text{nu}^{3} \text{a}^{32} \\
became 2sg soldier decl \\
'You became a soldier.'

c.  \text{gu}^{13} \text{zo}^{37} \text{ta}^{3} \text{nu}^{3} \text{a}^{32} \\
will-become 3sgm soldier decl \\
'He will become a soldier.'

d.  \text{gu}^4 \text{zo}^{17} \text{ta}^{3} \text{nu}^{3} \text{a}^{32} \\
will-become 2sg soldier decl \\
'You will become a soldier.'

(24) a.  \text{ka}^{3} \text{nu}^{3} \text{zo}^{37} \text{a}^{32} \\
wrung 3sgm decl \\
'He wrung it.'

b.  \text{ka}^{3} \text{nu}^{4} \text{zo}^{17} \text{a}^{32} \\
wrung 2sg decl \\
'You wrung it.'

c.  \text{ka}^{3} \text{nu}^{31} \text{zo}^{37} \text{a}^{32} \\
exploded 3sgm decl \\
'He exploded.'

d.  \text{ka}^{3} \text{nu}^{4} \text{zo}^{17} \text{a}^{32} \\
exploded 2sg decl \\
'You exploded.'
Tone sandhi provides evidence in favor of the analysis of 3h as 3h, rather than as 4h, even though its fundamental frequency is higher than other instances of tone 3. Stems with underlying 3h undergo sandhi, just as other stems with tone 3 do. Stems with 4, on the other hand, never undergo sandhi, and an analysis of 3h as 4h would require a new rule changing 4 to 5.

8.3 Historical Perspective

It can be seen from the above description that Copala Trique tone sandhi is anomalous in certain respects. On one hand, it is automatic in that it applies without exception. No lexical entry needs to be marked either to undergo tone sandhi or not to undergo it. On the other hand, it is highly idiosyncratic. The environment that conditions the process is restricted to a specific list of morphemes, and the structural description of the rules is complex. Furthermore, the changes that take place, i.e., the raising of the tone and the loss of 3h, appear to be totally lacking in phonetic motivation. In other words, there is nothing about the statement of these sandhi rules that looks like a natural process. The facts about Copala Trique are therefore not in accord with the strong tendency for exceptionless processes to be phonetically transparent, and for rules that lack naturalness to be restricted in their application to some arbitrary class of forms. In order to understand this unusual situation, it may be helpful to consider some historical data.
First of all, there is a clear historical reason for the fact that words with final h behave differently from other words with respect to sandhi rules. In his reconstruction of Proto-Mixtecan, Longacre (1957:75, 81-82) claimed that the highest tone level in Trique developed via a split of the fourth tone; specifically, stems in *4h became 5 and lost the laryngeal. Preceding this split, sandhi was presumably a unified process in which all words with 3, 13, and 31 became 4 before a sandhi-causing pronoun. At that point, words with 3h and 13h became 4h. (There probably were no words with 31h; Maya 31h 'yellow' is almost certainly a recent development via tone spreading to the right.) When the sound change took place, the instances of 4h that resulted from tone sandhi were changed to 5 along with underlying instances of 4h. Tone sandhi therefore became more complex.

There is also solid historical evidence that tone sandhi before certain pronouns goes back to Proto-Trique times, at least. Chichahuaxtla Trique shows changes that are clearly cognate with the ones in Copala Trique, even though Longacre (1959:22-26) does not analyze them in the same way. Words with h change to the highest tone level and lose the h, while words with ? and those with no laryngeal change to the second highest level and retain the ?.

In Mixtec, a language that is more distantly related to Copala Trique, there are sandhi patterns that resemble the Trique case in a more general way. The most common kind of sandhi in San Miguel El Grande Mixtec involves an arbitrary group of words that raises the tone
of the following word in some way (Pike 1948:77-81). Pike gives the following pair of examples (p. 78):

(25) a. \underline{kee} \underline{ʔísò} \\
will-go-away rabbit \\
'The rabbit will go away.'

b. \underline{kee} \underline{ʔísò} \\
will-eat rabbit \\
'The rabbit will eat.'

The only overt difference between these two sentences is found in the tone of the word for 'rabbit'. The underlying difference, however, is that one of the two homophonous verbs, the one meaning 'will go away', does not affect the tone of the following word in any way, but the second verb, the one meaning 'will eat', raises the tone of the following word if it has certain tone patterns. In this case, it changes a mid-low pattern to mid-high. Mixtec tone sandhi differs from Trique tone sandhi in that it is progressive, rather than regressive, and in that a large group of words from various lexical categories cause the sandhi, not merely a few pronouns. Nevertheless, there are several similarities. Two of them are comparatively trivial: in both languages, tone sandhi is external, and it results in raising the tone to a higher level. There are, however, three similarities that are highly significant. First, the environment is an arbitrary list of lexical items, rather than some phonological property. Second, the input to the rule
is phonologically defined, so that the application of the rule is automatic. And third, only some of the possible tone patterns undergo sandhi; others remain unchanged.

What emerges from this comparison is that the unusual features of Copala Trique tone sandhi are present also in a language that is somewhat distantly related to it. Therefore, either these features are not really that unusual, or they reflect some fairly old characteristic of Mixtecan languages, or perhaps even of all Otomanguean languages.

The most surprising thing about these rules, given the time depth involved, is not that the environment is arbitrary, but that the application of the rules is regular. Over such a long time span, it might be expected that they would have become totally morphologized and would apply within the lexicon. In Chicahuaxtla Trique, sandhi applies only if the pronoun directly follows a stem, not if a suffix intervenes (Longacre 1959:23), and this constitutes a morphological condition on the application of the process. Furthermore, in San Miguel Mixtec, there are processes similar to the regular sandhi patterns that have morphological conditions or that constitute morphological processes themselves (Pike 1948:82-87), as noted in Section 8.1. In Copala Trique, however, sandhi continues to apply automatically.

There is one other way in which San Miguel Mixtec tone sandhi is similar to Copala Trique tone sandhi: both involve sequences of two tones. Pike posited a two-syllable unit called a couplet as the unit relevant for sandhi (p. 79). It is the tone pattern of the couplet, not
the tone of a single syllable, that determines whether or not a word will undergo sandhi, and what the change will be. For example, mid tone occurs as the first tone in three different couplet patterns: mid-high, mid-mid, and mid-low. Each of these patterns behaves differently with respect to sandhi. Following a sandhi-causing word, mid-high is unchanged, mid-mid becomes high-mid, and mid-low becomes mid-high. In Copala Trique, two of the tone patterns that undergo sandhi are the tone sequences 13 and 31, though not the third sequence, 32. Longacre (1957: 101) has shown that many tone sequences on single syllables in Trique developed from disyllabic sequences via a shifting of the tone to the right. It is apparently a pattern of considerable antiquity within the family for sandhi rules to refer to the entire tone pattern of a stem, rather than to single tones.

8.4 Alternative Analyses

There are two alternatives to the analysis adopted in Section 8.2 that I considered in an attempt to make the sandhi process less arbitrary. One of these was to recapitulate the historical change from *4h to 5 to handle the special changes connected with h-final words. The other was a floating tone analysis in which a tone 4 was posited as part of the underlying form of sandhi-causing pronouns. In this section, I explain each of these analyses, and show why they do not work.

In my present description of tone sandhi, there are two rules, one for h-final words, and one for all of the remaining cases. As I
have shown in Section 8.3, however, sandhi used to be a single process before the sound change of *₄h to ₂: all instances of ₂, ₁₂, and ₃₁ were changed to ₄ before the sandhi-causing pronouns, no matter what laryngeal the word ended in. The rule that described this process was identical to rule (20), except that the optional laryngeal segment did not contain the feature value [-SPR] and therefore included all three laryngeals. This rule is:

(26) Unified Tone Sandhi

\[
\begin{pmatrix}
\text{\text{-HIGH}} \\
\text{\text{-CENT}}
\end{pmatrix}
\begin{pmatrix}
\text{\text{+HIGH}} \\
\text{\text{+CENT}}
\end{pmatrix}
\Rightarrow \varnothing \ \text{[\text{-CENT}] \varnothing / (\text{[+COLT]}) \#}
\begin{pmatrix}
\gamma_{1\text{h}} \\
\varepsilon_0 \\
\delta_1
\end{pmatrix}
\]

I considered an analysis that omitted rule (19), employed rule (26) instead of rule (20) as the basic sandhi process, and supplemented it with a subsequent rule (or rules) that recapitulated the sound change from *₄h to ₂.

Unfortunately, however, rule (26) predicts that the one ₃₁h word I have recorded, \text{ma₃\text{ya₃₁h}} 'yellow', should undergo sandhi, and it does not. This alternative analysis therefore faces a problem even before any attempt is made at changing *₄h to ₂. Let us assume for the sake of the argument, however, that this problem can be solved by marking \text{ma₃\text{ya₃₁h}} as an exception to rule (26).
It now remains to change *4h to 5. The simplest way to do this, it would appear, is to have a set of two rules, one of which raises 4 to 5, and the other of which deletes h. There are two possible orderings for such a pair of rules: the tone-raising rule can either precede or follow the h-deletion rule. If we formulate these rules in their simplest possible form, the first ordering gives us:

(27) Tone Raising to 5
\[
\begin{align*}
&\begin{cases} 
  4 & \text{[+HIGH]} \\
  -\text{CENT} & \\
  -\text{EXTR} & 
\end{cases} \\
\rightarrow & \begin{cases} 
  5 & \text{[+EXTR]} \\
  4 & \text{[+GLOT]} \\
  -\text{CENT} & \text{~} \\
  +\text{SPR} & 
\end{cases} \\
&\begin{cases} 
  h & \\
  +\text{GLOT} & \\
  +\text{SPR} & 
\end{cases}
\end{align*}
\]

(28) Deletion of h
\[
\begin{align*}
&\begin{cases} 
  h & \text{[+GLOT]} \\
  +\text{SPR} & 
\end{cases} \\
\rightarrow & \begin{cases} 
  5 & \text{[+HIGH]} \\
  +\text{SPR} & \\
  -\text{CENT} & \text{~} \\
  +\text{EXTR} & 
\end{cases} \\
&\begin{cases} 
  \emptyset & \\
  4 & \text{[+GLOT]} \\
  +\text{SPR} & \\
  -\text{CENT} & \text{~} \\
  -\text{EXTR} & 
\end{cases}
\end{align*}
\]

If the h-deletion rule precedes the tone-raising rule, then we have the following pair of rules instead:

(29) Deletion of h (alternate version)
\[
\begin{align*}
&\begin{cases} 
  h & \text{[+GLOT]} \\
  +\text{SPR} & 
\end{cases} \\
\rightarrow & \begin{cases} 
  \emptyset & \\
  4 & \text{[+HIGH]} \\
  +\text{SPR} & \\
  -\text{CENT} & \text{~} \\
  -\text{EXTR} & 
\end{cases}
\end{align*}
\]
Unfortunately, however, these simple rule sequences make incorrect predictions. Rule (28) would incorrectly delete \( h \) from all \( 5h \) sequences, and rule (30) would incorrectly change all stems with underlying tone \( 4 \) to \( 5 \). Furthermore, it would not help to restrict the environment of these rules by adding the sandhi-causing pronouns to them, because words with underlying \( 5h \) retain this pattern before sandhi-causing pronouns, and words with underlying tone \( 4 \) also retain their tone before sandhi-causing pronouns.

It is necessary, therefore, to treat the change of \( 4h \) to \( 5 \) as a single process. The simplest statement of such a process is as a context-free coalescence rule:

\[
(31) \quad \text{Replacement of } 4h \text{ by } 5
\]

Unfortunately, however, this rule does not work, because this change is no longer a productive process in the language. There are cases
involving the first person singular clitic pronoun in which a rule generates *4h at an intermediate stage of a derivation, but it is lowered to 3h, not raised to 5 (with loss of h), as described in Chapter 9, Section 9.3.1. Because rule (31) makes incorrect predictions as it stands, it must be restricted in some way to apply only to the output of the sandhi rule. One way to accomplish this is to treat it as a context-sensitive rule and use the pronouns as the environment, as seen in rule (32):

(32) Replacement of 4h by 5 (revised)

\[
\begin{array}{c}
\begin{array}{c}
\text{[+HIGH]} \\
\text{[+CENT]} \\
\text{[+EXTR]}
\end{array}
\end{array} \quad h
\quad \Rightarrow
\quad \begin{array}{c}
\text{[+EXTR]} \\
\text{[+SPR]}
\end{array} \quad \emptyset \\
\text{\textbackslash n}
\quad \begin{array}{c}
1 \\
2 \\
1 \\
2
\end{array}
\]

The addition of the pronouns to the environment increases the complexity of this rule considerably, though it is still slightly simpler than rule (19), which it would replace. The alternative analysis employing rules (26) and (32) does, however, require that one word, ma3\text{\textunderscore}ya31h 'yellow', be treated as an exception to rule (26). Furthermore, it makes the prediction that any further words with 31h that should enter the language would undergo rule (26), which seems highly unlikely. In the original analysis, no exceptions are needed. All words with 3h and 13h undergo rule (19), after which all words with no h, but with tone patterns 3, 13, or 31, undergo rule (20). Also, I
believe the original analysis makes the correct prediction about new words with 31h, namely, that they will not undergo tone sandhi. For these reasons, I believe that my original analysis captures the essence of the synchronic tone sandhi process more faithfully.

A second way to make the tone sandhi rules less arbitrary is a floating tone analysis. In such an analysis, the underlying forms for the sandhi-causing pronouns include an initial tone 4 that is unassociated at the underlying level, but which becomes associated with the preceding word under the proper circumstances. Such an analysis has two major advantages. First of all, it obviates the necessity of using an arbitrary list of morphemes as the environment for sandhi. And second, it provides a plausible phonetic rationale for what is otherwise an arbitrary change. Unfortunately, however, such an analysis creates as many problems as it solves. There is no reason why the addition of tone 4 at the end of a word should result in the replacement of its tone(s) by the 4 if the word has 3, 13, or 31, but in the deletion of the 4 instead following tones 1, 2, 4, 5, or 32. This division of tone patterns into those that undergo sandhi and those that do not is simply an arbitrary fact about Copala Trique: no amount of phonetic juggling will make it either look more natural or disappear. The floating tone analysis also requires a rule that metathesizes the floating tone 4 and the laryngeals 2 and 1 at the end of the preceding word. Words with final h create further problems for this analysis. The floating tone 4 must be deleted after a word with 31h, but raised from 4 to 5 after 3h and 13h.
Finally, the $h$ must be deleted following tone $5$. The following sample derivations illustrate the rules that would be needed in such an analysis:

(33) Underlying Form  
<table>
<thead>
<tr>
<th>Underlying Form</th>
<th>$3 \ 2 \ 4 \ 1 \ 2$</th>
<th>'you obtained'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\text{kiri} \ \ 20$</td>
<td></td>
</tr>
</tbody>
</table>

  Primary Association  
<table>
<thead>
<tr>
<th>Primary Association</th>
<th>$3 \ 2 \ 4 \ 1 \ 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\vert \ \ \vert$</td>
</tr>
<tr>
<td></td>
<td>$\text{kiri} \ \ 20$</td>
</tr>
</tbody>
</table>

  Secondary Association  
<table>
<thead>
<tr>
<th>Secondary Association</th>
<th>$3 \ 3 \ 2 \ 4 \ 1 \ 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\vert \ \ \vert \ \ \vert$</td>
</tr>
<tr>
<td></td>
<td>$\text{kiri} \ \ 20$</td>
</tr>
</tbody>
</table>

  Word Tone Deletion  
<table>
<thead>
<tr>
<th>Word Tone Deletion</th>
<th>$3 \ 2 \ 4 \ 1 \ 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\vert \ \ \vert$</td>
</tr>
<tr>
<td></td>
<td>$\text{kiri} \ \ 20$</td>
</tr>
</tbody>
</table>

  Floating Tone Deletion 1  
| Floating Tone Deletion 1 | does not apply |

  Floating Tone Deletion 2  
| Floating Tone Deletion 2 | does not apply |

  Tone Raising to $5$  
| Tone Raising to $5$ | does not apply |

  $h$ Deletion  
| $h$ Deletion | does not apply |

  Tone Reassociation  
<table>
<thead>
<tr>
<th>Tone Reassociation</th>
<th>$3 \ 2 \ 4 \ 1 \ 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\vert \ \ \vert \ \ \vert$</td>
</tr>
<tr>
<td></td>
<td>$\text{kiri} \ \ 20$</td>
</tr>
<tr>
<td>Metathesis</td>
<td>3 4 2 1 2</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>1/</td>
</tr>
<tr>
<td></td>
<td>kiri</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tertiary Association</th>
<th>3 3 4 2 1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/</td>
</tr>
<tr>
<td></td>
<td>kiri</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(34) Underlying Form</th>
<th>1 3 h 4 1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'you will make'</td>
</tr>
<tr>
<td></td>
<td>ki?ya</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Association</th>
<th>1 3 h 4 1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/</td>
</tr>
<tr>
<td></td>
<td>ki?ya</td>
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<td>1/</td>
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<td></td>
<td>ki?ya</td>
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<table>
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<th>2 h 4 1 2</th>
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<table>
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<tr>
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<th>does not apply</th>
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<tr>
<td>Floating Tone Deletion 2</td>
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</table>

<table>
<thead>
<tr>
<th>Tone Raising to 5</th>
<th>2 h 5 1 2</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1/</td>
</tr>
<tr>
<td></td>
<td>ki?ya</td>
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<td>20</td>
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<table>
<thead>
<tr>
<th>h Deletion</th>
<th>2 5 1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/</td>
</tr>
<tr>
<td></td>
<td>ki?ya</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>
Tone Reassociation

\[
\begin{array}{c|c|c}
2 & 5 & 1 \\
\hline
\text{ki?ya} & & z0
\end{array}
\]

Metathesis does not apply

Tertiary Association

\[
\begin{array}{c|c|c}
2 & 3 & 5 & 1 \\
\hline
\text{ki?ya} & & z0
\end{array}
\]

(35) Underlying Form

\[
\begin{array}{c|c|c}
3 & 2 & 4 \\
\hline
\text{da} & z0
\end{array}
\]

Primary Association

\[
\begin{array}{c|c|c}
3 & 2 & 4 \\
\hline
\text{da} & z0
\end{array}
\]

Secondary Association does not apply

Word Tone Deletion does not apply

Floating Tone Deletion 1

\[
\begin{array}{c|c|c}
3 & 2 & 1 \\
\hline
\text{da} & z0
\end{array}
\]

Floating Tone Deletion 2 does not apply

Tone Raising to 5 does not apply

\h Deletion does not apply

Tone Reassociation does not apply
Metathesis does not apply

Tertiary Association does not apply

(36) Underlying Form

\[ \text{maya} \quad 3 \quad 1 \quad h \quad 4 \quad 1 \quad ? \]

'you are yellow'

Primary Association

\[ \text{maya} \quad 3 \quad 1 \quad h \quad 4 \quad 1 \quad ? \]

Secondary Association

\[ \text{maya} \quad 3 \quad 3 \quad 1 \quad h \quad 4 \quad 1 \quad ? \]

Word Tone Deletion does not apply

Floating Tone Deletion 1 does not apply

Floating Tone Deletion 2 does not apply

Tone Raising to 5 does not apply

h Deletion does not apply

Tone Reassociation does not apply

Metathesis does not apply

Tertiary Association does not apply
The floating tone analysis generates the correct sandhi changes, but it requires seven rules, some of which are quite complex to state, compared to two rules in my original analysis. I also considered a floating tone analysis with tone 5, rather than tone 4, as the floating tone. In such an analysis, the 5 must be lowered to 4 except following h. The resulting analysis was no simpler than the one that uses a floating tone 4.

I conclude, therefore, that the complexity of Copala Trique tone sandhi resides in the data, not in some particular analysis of those data, and that my original pair of rules, (19) and (20), express the process more adequately than any of the alternatives.

8.5 Theoretical Implications

I have described tone sandhi in Copala Trique in considerable detail because I believe it constitutes a significant counterexample to certain claims that are currently being made about the relation between morphology and phonology.

In the model developed in The Sound Pattern of English, Chomsky and Halle (1968) treated virtually all variation in the shape of a morpheme within phonology proper. Alternations that did not constitute language-wide processes were handled by means of minor phonological rules of various types. Individual lexical items could be marked with various kinds of features that affected their participation in certain rules. For example, in the case of fairly general processes, individual lexical items could be marked as exceptions to a particular rule, or as
exceptions to the conditioning environment for the rule. In the case of processes with very limited scope, individual lexical items could be marked either to undergo a particular rule or to condition one. This model was undoubtedly, at least in part, a reaction against some of the less insightful suggestions of structuralists who worked in the item-and-arrangement model of morphology, for example, Harris (1942), Hockett (1947), and Bloch (1947).

At the present time, however, the pendulum has swung back. Within the context of generative grammar, morphology is universally accorded a place of its own, even though the scope of the morphological component, and its place within an overall model of grammar, are hotly debated issues. The trend has been to handle more and more of the variation in the shape of individual morphemes within the morphological component, which is considered to be part of the lexicon, so that only the most general processes are treated as true phonological rules. Many authors have adopted various versions of this position. I discuss only the claims of Lieber (1982) and those of Kiparsky (1982) and Mohanan (1982).

Lieber argues that minor rules, i.e., those that require morphological information of some sort, should not be permitted by grammatical theory. Such devices should be replaced by a lexical listing of the allomorphs that their application would produce. Pairs of allomorphs can be related by redundancy rules, but such rules are not in any sense generative. Lieber's reasoning is, in general, persuasive for the cases
she considers, and I have adopted her solution for frozen remnants of sandhi found in Copala Trique (see Note 2 at the end of this chapter), and for certain forms that occur only before two clitic pronouns (see Chapter 9, Section 9.3.1). Unfortunately, however, Lieber does not consider cases of irregularity in which the need for morphological information lies in the environment, rather than in the form that undergoes the rule.

Lieber's proposed solution will not work in the Copala Trique tone sandhi case for reasons that should be obvious. Even though the irregular behavior is associated with three pronouns, we cannot handle the irregularity by listing allomorphs of these pronouns because they do not have any. The form of the pronouns remains constant; it is the form of the preceding word that changes. If we list allomorphs for the preceding word instead, we miss an obvious generalization. It would be necessary to list a special allomorph for every stem in the language with tone patterns 3, 13, or 31 (except for ma\textsuperscript{2}va\textsubscript{31h} 'yellow'). Furthermore, the form of the second allomorph would be completely predictable from the form of the first one. It is necessary, therefore, to treat Copala Trique tone sandhi as a productive and generative process in the language, in spite of its restricted environment. It cannot be incorporated into the lexicon without doing violence to the very conception of linguistics as a search for generalizations about language.

Another recent approach to the interface between phonology and morphology is the position taken by Kiparsky (1982) and Mohanan (1982).
In their theory, phonological rules apply after each morphological process. In the derivation of a word that contains several affixes, therefore, the action moves back and forth between the phonological and morphological components. They claim that phonological rules that apply to words that are still being formed may have access to morphological information of various sorts, but that postlexical rules must be blind to morphological structure, i.e., exceptionless (see, for example, Mohanan 1982:1-2). Unlike Lieber, who wants to eliminate morphologically conditioned rules as generative processes altogether, Kiparsky and Mohanan simply want to restrict them to the stages in a derivation that apply before the level that they call the lexical representation. The lexical representation is the output of the lexical component, and they claim that forms at this level have a certain psychological reality. They are stored in this form in the mental lexicon, and it is this form that serves as the input to lexical insertion (Mohanan 1982:11-13).

Any attempt to apply this model to Copala Trique again encounters problems. Copala Trique tone sandhi does not qualify as a postlexical process because it requires access to some information that is not strictly phonological, i.e., the identity of the three sandhi-causing pronouns. Clearly, however, it is not a lexical process either. The pronoun and the preceding word do not form a lexical unit, and sometimes they are not even part of the same syntactic constituent. All that is necessary for the application of the rule is that they be contiguous. In spite of its morphologically restricted environment, Copala
Trique tone sandhi is a very general process that takes place after lexical entries are fully formed, after syntactic structures have been generated, after lexical insertion, and also after some regular phonological rules have applied.

It is clear, therefore, that linguistic theory must continue to permit at least certain kinds of minor rules to operate as generative processes that are part of the phonological component of a grammar, rather than part of a lexical or morphological component.

I have given a great deal of attention in this chapter to a process that in a sense forms a very minor part of Trique structure. I have done so because I believe the existence of rules of this type has important theoretical consequences. This will become more apparent in the discussion of clitic pronouns in Chapter 9.
NOTES FOR CHAPTER 8

1. There is, of course, a sense in which any formal difference, even one that results from an allophonic process below the level of conscious awareness, is meaningful in that it provides cues to the listener about the identity of the item that conditions it. Tone sandhi alternations in Copala Trique certainly provide such cues. For a study of the meaningfulness of allophonic processes for automatic speech recognition in English, see Church (1983). It seems to me, however, that there is an important sense in which the meaningfulness of conditioned cues differs from the meaningfulness of morphological differences, and I shall continue to maintain the distinction in this study.

2. In addition to the productive process described in this chapter, there exist certain sporadic alternations that appear to be remnants of formerly productive sandhi processes. For example, the stem ta?ni⁵ 'child of' has a variant ta?ni³h that occurs only in certain close-knit syntactic compounds, such as ta?ni³h sana¹ 'daughter of' and ta?ni³h si?no¹ 'grandchild of'. I handle such relationships by listing both allomorphs as part of the lexical entry for 'child of'.

3. As it stands, the above statement is not quite true. Tone sandhi does apply without exception, but there is one set of circumstances in which it appears to apply iteratively: with doubled
elements. It is possible to repeat an entire verb or adverb to intensify its meaning in various ways. If such a word meets the conditions for the sandhi process, both instances of the word undergo sandhi, not simply one of them. In other syntactic environments in which the same stem occurs twice in succession, however, only the instance that immediately precedes the pronoun undergoes sandhi. See Hollenbach (1974) for examples and further discussion. Even though this phenomenon appears to establish syntactic conditions on sandhi, I reject this analysis in favor of a view of reduplication as a late process. For a discussion of various problems connected with the interaction of reduplication and phonological rules, see Wilbur (1973) and Carrier (1979). For a discussion of other kinds of interaction between meaningful elements and phonological rules, see S. Anderson (1975) and Zwicky and Pullum (1983).

4. In addition to these three free pronouns, there are also two clitic pronouns that cause sandhi, according to the analysis adopted in this study. These clitic pronouns are described in Chapter 9. In Chapter 8, however, I cover only sandhi between full words, and so I omit the clitics from consideration.

5. In glosses, I use the English third person singular form with final -s to indicate continuative aspect in Trique, even when the subject has a different person-number specification.
6. The situation must of necessity be more complex than this because Chicahuaxtla Trique currently has a 4h sequence, and Copala Trique has a 5h sequence that is cognate with it. Longacre did not address the apparent inconsistency involved in claiming both that *4h developed into 5 and that the language currently has both 4h and 5 in contrast.

I have taken certain liberties with Longacre's transcription system and with his analysis of Chicahuaxtla Trique. First, I have turned his numbering system upside down to conform to the system I use here for Copala Trique, with 1 representing the lowest level. Second, I have reinterpreted certain schemas. For example, Longacre analyzes a 2-1 sequence, which I refer to simply as 5; see the discussion of the predictable upglide in Chapter 4, Sections 4.1 and 4.3.

7. Longacre treats changes in the tone of a stem preceding certain pronouns as part of the realization of that pronoun, rather than as a process conditioned by the pronoun. In choosing this analysis, Longacre was clearly influenced by the kinds of factors mentioned in Note 1 above; see the discussion in Longacre (1959:6–7). Also, in Chicahuaxtla Trique, tone sandhi is not quite automatic in its application: it occurs only on stems with the specified tone patterns, not on stems that have suffixes added to them (Longacre 1959:22–23).
CHAPTER 9

WORD-EXTERNAL MORPHOLOGY: CLITIC PRONOUNS

In this chapter I discuss a thorny problem at the interface among syntax, morphology, and phonology, and propose a clitic solution to it. As I use the term in this study, a clitic is an element whose distribution is determined by syntactic, i.e., word-external, principles, but which appears on the surface as a part of some other word that serves as its host.

There are three elements in Copala Trique that I analyze as clitic pronouns. From the point of view of distribution, these elements pattern as syntactic units, specifically, as heads of noun phrases. In their surface realization, however, they show up as a change in the laryngeal tier representation of the preceding word. They are always tightly bound to this word and do not add any extra syllables to it. They usually add or replace a nuclear laryngeal at the end of the stem, and they often change the stem tone in some way. Some of these changes can be accounted for most simply by assuming that two of the clitic pronouns cause tone sandhi in the same way that three free pronouns do (see Chapter 8). In some cases, however, clitic pronouns are realized by deleting material from the stem.
The best analysis of these elements is, I claim, one in which, at the underlying level, they are treated as syntactic elements with full lexical entries, but later undergo a postlexical cliticization process in which they are fused to the preceding word. Note that, in this analysis, clitics are treated as "things," rather than as "processes," at the underlying level (see Chapter 7, Section 7.1). Cliticization involves a set of rules that apply to produce the surface forms. Some of these rules are relatively natural processes, others are regular, though not especially natural, and still others require access to morphological information of various types. This chapter presents further evidence that not all irregular rules are to be relegated to the lexicon; some of them must be postlexical.

I begin my treatment with the syntactic aspect of the problem. I first argue that clitic pronouns show a distributional pattern that is identical to that of phrase-final free pronouns. I also argue that clitics should not be treated as reduced variants of any of the free pronouns, but constitute separate lexical entries in their own right. Following this discussion, I move to the phonological and morphological aspects of the problem. For two of the clitics, I propose an underlying form on which regular rules operate. For the third one, however, I simply posit a set of morphological rules that specify its surface form.

After presenting my analysis of these clitics, I briefly consider possible alternative analyses and show why none of them gives a correct characterization of the facts in Copala Trique. I close with a
brief discussion of some theoretical implications of my analysis for theories of morphology in general and of clitics in particular.

9.1 Clitics As Pronouns

In this section I argue that clitic pronouns, in spite of their phonological status as a part of the preceding word, should be assigned to the category pronoun and treated as full lexical entries. Specifically, according to the classification of pronouns presented in Chapter 6, Section 6.6, they are definite pronouns, rather than indefinite ones, and they are phrase-final, rather than non-phrase-final. Clitic pronouns, like other phrase-final pronouns, therefore, function as heads of noun phrases when no further material follows within those noun phrases.

The three clitic pronouns include one that means 'first person singular', one that means 'first person plural generalized inclusive' (hereafter simply 'inclusive'), and one that means 'third person singular' (unspecified as to gender). Unlike the set of free pronouns given in Table 17 in Chapter 6, the clitic pronouns do not constitute a full person-number set. The clitic pronoun that means 'first person singular' always causes the word to which it is attached to end in the nuclear laryngeal \( _\text{h} \), the one that means 'inclusive' always causes the word to end in \( _\text{?} \), and the one that means 'third person singular' always causes the word to have tone \( 3 \) as its final tone and to end in either \( _\text{h} \) or no laryngeal. I posit \(-\text{h}\) and \(-\text{?}\) as the underlying forms for the first person singular and inclusive clitics. For the third person
singular clitic, however, I do not posit any underlying form. I use its morphosyntactic category specification as the environment for a set of morphological rules that produce the surface forms. In this, the third person singular clitic is like the $F_1$ and $F_2$ laryngeal tier changes described in Chapter 7. Unlike those changes, however, which take place in the lexicon, the attachment of the clitic pronoun is post-lexical.

My claim that clitics are phrase-final pronouns at the underlying level is based on four kinds of evidence. First, clitics occur in all environments where free pronouns do. Second, no doubling occurs, i.e., clitics never occur together with a free pronoun or noun with both of them marking the same head of noun phrase position. (If such doubling were possible, it would, of course, not be possible to claim that the clitic and free pronouns occupy the same position.) Third and fourth, there are no special morphological or syntactic conditions on cliticization. Clitics are attached to the word that immediately precedes them in linear order without regard to either the lexical category of the host or the constituent relation between clitic and host. As with tone sandhi, the main condition is simply linear order.

I begin by cataloguing the various positions where a free pronoun can occur, and showing that a clitic pronoun can occur in each one.

First of all, pronouns are heads of noun phrases, not full noun phrases, and, as heads, they can enter into certain noun phrase expansions. Specifically, phrase-final pronouns can take an optional
preceding quantifier or article, even though they cannot take any following modifiers. The following examples show free pronouns in expanded noun phrases:

(1) \[
\text{one} \quad 3\text{sgm}
\]

'one person' or 'one man' or 'one of them'

(2) \[
\text{du-def} \quad 3\text{sgm}
\]

'the two of them'

Clitic pronouns can likewise take an optional quantifier or article. Because the quantifier or article is the word that precedes the clitic in linear order in such cases, the clitic is attached to it, as seen in the following examples, which contain the third person singular clitic:

(3) \[
\text{one-} 3\text{sg}
\]

'one person' or 'one of them'

(4) \[
\text{du-def-} 3\text{sg}
\]

'the two of them'

In the vast majority of cases, however, a phrase-final pronoun is the only word in its own noun phrase. When a clitic occurs as the
only word in its noun phrase, it must, of course, be attached to something outside of it. What it can be attached to is a function of the syntax of the language. Specifically, there are four basic noun phrase positions in which a pronoun can occur: subject of a clause, complement of a preposition, possessor of a noun, and coordinate conjunct. I discuss each of these uses in turn.

In the unmarked word order, the subject of a clause immediately follows the verb phrase. If the verb phrase has no modifiers after the verb, then a free pronoun immediately follows the verb, and a clitic pronoun is attached to the verb stem. In the following examples, the (a) part shows a free pronoun, and the (b) part shows a clitic pronoun:

\[(5)\]
\[
\begin{align*}
(5) &. \quad \text{aa}^5 \quad \text{nu}^{1h} \quad a^32 \\
& \text{sings 1sg decl} \\
& 'I sing.' \\
(5) &. \quad \text{aa}^5h \quad a^32 \\
& \text{sings-1sg decl} \\
& 'I sing.'
\end{align*}
\]

If a verb phrase contains a postverbal modifier, or if a verbal idiom occurs, a free pronoun immediately follows the final modifier, and a clitic pronoun is attached to it. Because the final modifier in a verb phrase may belong to any major lexical category in the language, clitic pronouns may therefore be attached to any major lexical category. The
following examples show pronouns following a noun, adjective, manner adverb, and intensifying adverb:

(6) a. ṇe⁵ kwayo⁴! ni⁴? a³2
    walks horse pl-incl decl
    'We crawl.'

b. ṇe⁵ kwayo⁴? a³2
    walks horse-incl decl
    'We all crawl.'

(7) a. ṇe⁵ za¹? ŋu¹h a³2
    walks good 1sg decl
    'I walk well.'

b. ṇe⁵ za¹h a³2
    walks good-1sg decl
    'I walk well.'

(8) a. ṇe⁵ nana³2h no³? a³2
    walks slowly 3sgf decl
    'She walks slowly.'

b. ṇe⁵ nana³ a³2
    walks slowly-3sg decl
    'He/she/it walks slowly.'
(9) a. ṭe₅ ndoʔo³²? ṭu₁h a³²
   walks much 1sg decl
   'I walk a lot.'

b. ṭe₅ ndoʔo³²h a³²
   walks much-1sg decl
   'I walk a lot.'

The second basic position in which a pronoun can occur is as the complement of a preposition. Because prepositions do not take any optional modifiers, the complement always immediately follows the preposition, and a clitic pronoun is therefore attached to the preposition, as seen in (10) and (11):

(10) a. keneʔe³¹ gwa⁴ mä³¹ no³ʔ a³²
   saw John to 3sgf decl
   'John saw her.'

b. keneʔe³¹ gwa⁴ mä³ a³²
   saw John to-3sg decl
   'John saw him/her/it.'

(11) a. kirāⁿ gwa⁴ ?nu⁵ ṭeʔe⁴! ṭu₁h a³²
   bought John corn for 1sg decl
   'John bought corn for me.'
b. *kiri a^{5h} gwa a^{4} nu a^{5} 5e a^{3h} a^{32}*
   bought John corn for-lsg decl
   'John bought corn for me.'

The third position in which a pronoun can occur is as the possessor of a noun. Because the possessor always immediately follows the head noun of a possessive noun phrase, a clitic pronoun is therefore attached to the head noun, as seen in (12):

(12) a. ta^{ni} a^{5} \text{nui a^{1h}}
   child-of 1sg
   'my child'

   b. ta^{ni} a^{5h}
   child-of-lsg
   'my child'

Possessive noun phrases, including those with clitics, like basic noun phrases, can occur in all three positions: subject, complement of a preposition, and possessor of another noun. Example sets (13)-(15) show these three uses:

(13) a. a^{nga} a^{32h} ra a^{3} zo a^{3} a^{32}
   throbs hand-of 3sgm decl
   'His hand is throbbing.'
b. a nga\textsuperscript{32h} ra\textsuperscript{3} a\textsuperscript{32} 
throbs hand-of-3sg decl
'His/her hand is throbbing.'

(14) a. go\textsuperscript{3} gwa\textsuperscript{4} sa\textsuperscript{32h} m\textsuperscript{3} ta\textsuperscript{5} ni\textsuperscript{5} no\textsuperscript{3} a\textsuperscript{32} 
gave John money to child-of 3sgf decl
'John gave money to her child.'

b. go\textsuperscript{3} gwa\textsuperscript{4} sa\textsuperscript{32h} m\textsuperscript{3} ta\textsuperscript{3} ni\textsuperscript{3} a\textsuperscript{32} 
gave John money to child-of-3sg decl
'John gave money to his/her child.'

(15) a. ta\textsuperscript{5} ni\textsuperscript{5} tin\textsuperscript{5} \textsuperscript{\textsuperscript{32h}} 
child-of brother-of 1sg
'my brother's child'

b. ta\textsuperscript{5} ni\textsuperscript{5} tin\textsuperscript{5h} 
child-of brother-of-1sg
'my brother's child'

The fourth position in which a pronoun can occur is as a conjunct in a coordinate noun phrase linked by the conjunction ga\textsuperscript{2}\textsuperscript{!} 'and'. If the second conjunct is a clitic pronoun, it attaches to ga\textsuperscript{2}\textsuperscript{!}, as seen in (16):
If the first conjunct is a clitic pronoun, however, it attaches to the preceding word, which is outside the coordinate noun phrase. The identity of this word depends on which position in the clause the coordinate noun phrase is filling: subject, complement of preposition, or possessor of noun. Because all of these positions are possible, the clitic pronoun that expresses the first conjunct may be attached to a verb, a verbal modifier, a preposition, or a possessed noun, as seen in examples (17)-(20):

(17) a. \( \text{a\'ca}^5 \text{ ga}^1 \text{ pe}\text{dro}^4! \text{ a}^3 \)  
    sings 1sg and Peter decl  
    'I and Peter sing.'

b. \( \text{a\'ca}^5 \text{ ga}^2! \text{ pe}\text{dro}^4! \text{ a}^3 \)  
    sings-1sg and Peter decl  
    'I and Peter sing.'
(18) a. če⁵ za¹⁷ υ¹h ga²! pe³dro⁴! a₃²  
walks good 1sg and Peter  decl  
'I and Peter walk well.'

b. če⁵ za¹h ga²! pe³dro⁴! a₃²  
walks good-1sg and Peter  decl  
'I and Peter walk well.'

(19) a. kir₅h gwa⁴ nu⁵ se²e⁴! υ¹h ga²! pe³dro⁴! a₃²  
bought John corn for 1sg and Peter  decl  
'John bought corn for me and Peter.'

b. kir₅h gwa⁴ nu⁵ se³h ga²! pe³dro⁴! a₃²  
bought John corn for-1sg and Peter  decl  
'John bought corn for me and Peter.'

(20) a. ta²ni⁵ υ¹h ga²! pe³dro⁴!  
child-of 1sg and Peter  
'the child of me and Peter'

b. ta²ni⁵h ga²! pe³dro⁴!  
child-of-1sg and Peter  
'the child of me and Peter'

It is also possible for both conjuncts to be clitic pronouns, in which case the first conjunct is attached to the word immediately preceding the coordinate noun phrase, and the second conjunct is attached to ga²!
Such coordinate noun phrases may occur in any functional position. The following two pairs of examples show them as complements in a prepositional phrase functioning as the direct object of the clause:

(21) a. \( \overline{\text{kene?e}}^{3} \overline{\text{gwa}}^{4} \overline{\text{ma}}^{3} \overline{\text{no}}^{3i} \overline{\text{ga}}^{2} \overline{\text{c?h}}^{1h} \overline{\text{a}}^{32} \)
    saw     John to     3sgf and     1sg decl
    'John saw her and me.'

b. \( \overline{\text{kene?e}}^{3} \overline{\text{gwa}}^{4} \overline{\text{ma}}^{3} \overline{\text{ga}}^{2h} \overline{\text{a}}^{32} \)
    saw     John to-3sg and-1sg decl
    'John saw him/her/it and me.'

(22) a. \( \overline{\text{kene?e}}^{3} \overline{\text{gwa}}^{4} \overline{\text{ma}}^{4} \overline{\text{n?h}}^{1h} \overline{\text{ga}}^{2} \overline{\text{no}}^{3i} \overline{\text{a}}^{32} \)
    saw     John to     1sg and     3sgf decl
    'John saw me and her.'

b. \( \overline{\text{kene?e}}^{3} \overline{\text{gwa}}^{4} \overline{\text{ma}}^{3h} \overline{\text{ga}}^{13h} \overline{\text{a}}^{32} \)
    saw     John to-1sg and-3sg decl
    'John saw me and him/her/it.'

I have now shown that clitic pronouns can occur in all of the syntactic functions in which phrase-final free pronouns can occur. Because Copala Trique is a VSO language, the normal position for all noun phrases is postverbal, and so all of the examples so far have shown pronouns following the verb phrase. As mentioned in Chapter 6, Section 6.2, however, one argument or adjunct may be fronted to preverbal
position for focus. There are three different sets of circumstances in which pronouns may occur in preverbal position.

In the first of these, the pronoun is the sole element in the fronted argument, and the fronted argument is in absolute sentence-initial position. In such cases, free pronouns can occur, but not clitics, as seen in the following example set:

(23) a. ʔa1h kiʔya3h we27 a32
    1sg made house decl
    'I built the house.'

b. * h kiʔya2h we27 a32
    1sg made house decl
    'I built the house.'

The obvious explanation for this limitation is that an enclitic must have something to which it can attach, and in absolute sentence-initial position, there is nothing. This limitation is therefore phonological rather than syntactic, and it does not constitute a true exception to my claim that the syntactic environments of clitics and free pronouns are identical.

A second circumstance in which pronouns occur in preverbal position is like the first, except that some conjunction or discourse element that is outside the structure of the clause proper occurs in absolute sentence-initial position, followed by the pronoun. In this
circumstance, either a free or a clitic pronoun can occur (though neither is common), as seen in the following example set:

(24) a. asno₄h kīya₃h we₃h a₃2
   first 1sg made house decl
   'First, I built the house.'

   b. asno₃h kīya₃h we₃h a₃2
   first-1sg made house decl
   'First, I built the house.'

The third circumstance in which pronouns occur in preverbal position involves arguments or adjuncts in which the pronoun is not the first element in the fronted phrase. In this position, both free and clitic pronouns occur freely, as seen in the following examples:

(25) a. riā₃h ʔū₃h nikū₃h gwa₄ a₃2
   before 1sg stands John decl
   'John is standing in front of me.'

   b. riā₃2h nikū₃h gwa₄ a₃2
   before-1sg stands John decl
   'John is standing in front of me.'

(26) a. taʔni₅ zo₃h kawi₃h a₃2
   child-of 3sgm died decl
   'His child died.'
b.  
\[
\begin{array}{c}
ta?ni^3 \\
\text{kawi}^3 a^32
\end{array}
\]
child-of-3sg died decl
'His/her child died.'

On the basis of the above data, therefore, I conclude that clitic pronouns show no significant distributional differences from free pronouns.

The second kind of evidence in support of my analysis is that clitic pronouns never occur together with free pronouns to express the same noun phrase position. Sentences like the following are all ungrammatical:

(27) \* a\*a^5h \*\*u\*1h a\*32
sings-1sg 1sg decl
'I sing.'

(28) \* g\*g^3? gwa\*4 sa\*a\*32h m\*3  no\*3? a\*32
gave John money to-3sg 3sgf decl
'John gave money to her.'

(29) \* ni\*a^5h me\*31 tako\*4? ni\*4? a\*32
this is foot-of-incl pl-incl decl
'These are our feet.'

The third kind of evidence in support of my analysis is that clitic pronouns attach to the word that precedes them in linear order without regard to its lexical category. The above examples show clitics
attached to every major category in the language and a number of minor ones as well. The major categories are: verb, as seen in (5) and (17); manner adverb, as seen in (8); preposition, as seen in (10), (11), (19), (21), (22), and (25); unpossessed noun, as seen in (6); possessed noun, as seen in (12), (13), (14), (15), (20), and (26); and adjective, as seen in (7) and (18). The minor categories are: number, as seen in (3); article, as seen in (4); intensifying adverb, as seen in (9); conjunction, as seen in (16), (21), and (22); and sentence introducer, as seen in (24). Examples could be given of clitics attached to other minor categories as well. The important point is that clitics attach to words of any category that precedes them: if the syntax generates a structure in which a word of a given category immediately precedes a phrase-final pronoun in linear order, then a clitic can attach to that category. The only categories to which a clitic cannot attach are those that the syntax does not permit to immediately precede pronouns.

The fourth kind of evidence in support of my analysis is that clitics are not sensitive to the constituency relation between themselves and their host. This is somewhat more difficult to show than the insensitivity to lexical category, because Copala Trique has a fairly rigid word order, a consequence of which is that the kinds of syntactic domains that can immediately precede the head of a noun phrase in linear order are somewhat restricted. It may therefore appear that there are syntactic restrictions on cliticization, but my claim is that the restrictions are general syntactic restrictions on the head of noun phrase
position, not restrictions on cliticization as such. As stated above, the basic noun phrase positions in which phrase-final pronouns (including clitics) appear is as subject, complement of a preposition, and possessor of a noun. When a clitic is the subject, it attaches to the final element of the verb phrase, which may or may not be the verb itself; and when a clitic is a complement or possessor, it attaches to the preposition or possessed noun, respectively. It may therefore seem that clitics can be attached only to verb phrases, prepositions, or possessed nouns; and that their attachment creates verb phrases inflected for subject, prepositional phrases with the complement expressed by inflection, and possessive noun phrases with the possessor expressed by inflection. I maintain, however, that this is not the case, and that the attachment of clitic to host is a surface phenomenon.

The strongest argument for my position is found in the cases where a clitic attaches to something within its own noun phrase. In examples (3) and (4), I showed clitics attached to the optional prenuclear quantifier and article positions within their own noun phrases. Examples like (3) and (4) can occur in all the basic noun phrase positions; and when they do, the clitic is, of course, attached to the quantifier or article, and not to the verb phrase, preposition, or possessed noun, as seen in the following examples:

(30) a.  
\[ \begin{array}{l}
\text{ęca}^5 \ 
\text{ro}^{1h} \ 
\text{no}^{37} \ 
\text{a}^{32} \\
\text{sings du-def 3sgm decl}
\end{array} \]
'The two of them sing.'
b. ača₅ ro₁₃ a₃²
sings du-def-3sg decl
'The two of them sing.'

(31) a. kene₂²e³! gwa₄ ma³! yo₂²! zo³? a₃²
saw John to one 3sgm decl
'John saw one of them.'

b. kene₂²e³! gwa₄ ma³! yo₁³h a₃²
saw John to one-3sg decl
'John saw one of them.'

(32) a. ta₅ni⁵ ro₁h zo³?
child-of du-def 3sgm
'the child of the two of them'

b. ta₅ni⁵ ro₁₃
child-of du-def-3sg
'the child of the two of them'

Examples like (30b)-(32b) create problems for an analysis that treats clitics as inflectional elements on major categories, because these sentences show clitics attached to minor categories. They do not, however, create any problems for my analysis of clitics as pronouns at the underlying level.

Further evidence for the fact that clitics are not sensitive to the constituent relation between themselves and their host is found in
coordinate noun phrases. When, for example, a coordinate noun phrase occurs as the complement of a preposition, the complement clearly includes both conjuncts in its domain, not simply the first one. Nevertheless, as I have shown in examples (19), (21), and (22), only the first conjunct attaches to the preposition. The second conjunct can attach only to the conjunction ga? 'and'. In similar fashion, when the coordinate noun phrase occurs as a subject or as the possessor of a noun, only the first conjunct can attach to the verb phrase or to the possessed noun, respectively, as shown in examples (17), (18), and (20). Again, these examples pose problems for an analysis that treats clitics as elements that are somehow attracted to major syntactic categories, but they create no problems for my analysis of clitics as underlying pronouns.

On the basis of the above evidence, I conclude that the distribution of clitic pronouns is governed by syntactic, rather than morphological, principles, and that there is therefore good reason to treat them as syntactic units at the underlying level. It follows from this that clitics should be lexical entries. In the following section, I argue that each clitic should be treated as a full lexical entry in its own right, rather than as a reduced form of some other entry; and in Section 8.3, I discuss the underlying forms of these pronouns and the processes they undergo in order to arrive at the surface form.
9.2 Clitics As Lexical Entries

I move now to the task of establishing that the clitics are separate lexical entries in their own right, not simply reduced forms of free pronouns. The strongest evidence for this claim is found in their meanings.

The third person singular clitic pronoun carries no specification as to gender, and can therefore refer to any third person entity. Each of the definite phrase-final third person free pronouns, on the other hand, refers to a specific gender: \textit{zo}³\textsuperscript{f} 'masculine human', \textit{no}³\textsuperscript{f} 'feminine human', \textit{zo}³\textsuperscript{h} 'animal', and \textit{yo}³\textsuperscript{h} 'inanimate'. If the clitic pronoun is a reduced form of a free pronoun, we are immediately faced with the problem of deciding which one it is a reduction of, and any choice we make wrongly predicts that the referents of the clitic should be restricted to a single gender. Furthermore, the clitic is never anaphoric with any of the free pronouns within a sentence; if both a free pronoun and the clitic occur in the same sentence, they are invariably disjoint in reference, as shown in the following example:

\textbf{(33)} \begin{tabular}{llll}
\textit{kene}³\textsuperscript{f} & \textit{no}³\textsuperscript{f} & \textit{må}³ & \textit{a}³\textsuperscript{f} \\
\textit{saw} & \textit{3sgf} & \textit{to-3sg decl} & \\
'She\textsubscript{i} saw him/her\textsubscript{j}/it.'
\end{tabular}

The inclusive clitic pronoun also shows a difference in meaning from the two inclusive free pronouns, \textit{ro}¹\textsuperscript{f} 'dual inclusive' and \textit{ni}⁴\textsuperscript{f} 'plural inclusive'. This meaning difference is somewhat difficult to
specify in terms of features; I have chosen to use the term 'generalized' to describe the clitic form, even though it is less than satisfactory. The two free pronouns usually refer to a specific group of people mentioned in the context, while the clitic pronoun is used mainly in the citation form for inherently possessed nouns, such as body parts and kinship terms, and also in soliloquy. The following examples show these uses:

(34) \( \text{ká}^2 \text{á}^{2\text{h}} \text{ní}^{4\text{p}} \text{a}^4 \)  
will-go pl-incl persuasive-imperative  
'Let's go!'  

(35) \( \text{ní}^{5\text{h}} \text{me}^{3!} \text{tako}^{4?} \text{a}^{32} \)  
this is foot-of-incl decl  
'These are (our) feet.'  

(36) \( \text{da}^{1\text{h}} \text{ki}^2 \text{ya}^{4?} \text{ga}^2 \)  
how will-do-incl neutral-WH-interrogative  
'What will I do?' (talking to oneself)  

The clitic is never anaphoric with either of the free pronouns within a sentence, as seen in the following example:

(37) \( ? \text{kene}^{3!} \text{ní}^{4\text{p}} \text{ma}^{4\text{p}} \text{a}^{32} \)  
saw pl-incl to-incl decl  
'We_{i} saw u_{j}.'
In the case of the first person singular forms, it is clearly impossible to claim that the clitic differs from the free pronoun in reference; both must refer to the speaker, or they would not be first person singular. Also, both may occur within a single sentence and be anaphoric. It would therefore be possible to claim that the clitic is a reduced form of the free pronoun. I would like to claim, however, that even in this case, the clitic pronoun should be made a separate lexical entry. The reason I make such a claim is that there is a condition on the occurrence of both forms in a single sentence: the free pronoun 32 cannot follow the clitic. It is quite common to have three instances of a first person singular pronoun in a sentence. All can be free, all can be clitic, or at any point the speaker can change from free to clitic. Once he has chosen the clitic form, however, he cannot use the free form later. In the following examples, I use a double underline under both the free and the clitic pronouns to help the reader see the relationships; the first set shows the possible combinations:

(38) a. \[
\[
\]
put-in 1sg tortilla-of 1sg in basket-of 1sg decl
'I put my tortilla in my basket.'

b. \[
\[
\]
put-in 1sg tortilla-of 1sg in basket-of-1sg decl
'I put my tortilla in my basket.'
The following set of examples, however, shows combinations that are ungrammatical:

(39) a. *kara\(^4\) ˌ\(\text{u}\)\(^{1h}\) ra\(^{5h}\) ˌ\(\text{u}\)\(^{1h}\) ra\(^{4!}\) do\(^{3h}\) \(\text{a}\)\(^{32}\)

put-in lsg tortilla-of-lsg in basket-of-lsg decl

'I put my tortilla in my basket.'

d. *kara\(^3h\) ra\(^{5h}\) ra\(^{4!}\) do\(^{3h}\) \(\text{a}\)\(^{32}\)

put-in-lsg tortilla-of-lsg in basket-of-lsg decl

'I put my tortilla in my basket.'
I believe that it makes more sense to state this condition as a restriction on lexical insertion than as a restriction on a process of reduction or cliticization. If the underlying representation of the clitic is \(-h\), this constraint can be formalized as:

\[(40) \hspace{1cm} S[ X -h X \mathcal{g}^{1h} ]_S\]

The reason for the existence of such a constraint is perhaps to be sought in the degree of emphasis. The free pronoun contains a full syllable and can therefore receive emphatic stress, while the clitic is less than a syllable and so cannot. Whatever the reason, however, the constraint exists and must be accounted for within a grammar of Copala Trique. I suggest that it can be expressed more simply if we consider the two first person singular pronouns to be separate lexical entries.

Before leaving the topic of reduction, there is one further point to be made. There is a phonological resemblance between the \(h\) of the first person singular clitic and the free pronoun \(\mathcal{g}^{1h}\), between the \(\mathcal{g}\) of the inclusive clitic and the free pronouns \(\mathcal{g}^{0}\) and \(\mathcal{g}^{4}\), and between the tone \(\mathcal{g}\) of the third person singular clitic and the free pronouns \(\mathcal{g}^{3}\), \(\mathcal{g}^{3}\), \(\mathcal{g}^{3}\), and \(\mathcal{g}^{3}\). These resemblances make it appear that, historically at least, the clitics are reduced forms of the free pronouns. From what I know of the history of Trique, however, the resemblances in first person singular and third person singular are purely the result of chance, and the resemblance in inclusive, while genuine, does not result from a reduction. The free forms are rather a fusion
of the articles $\text{ro}^{1h}$ 'dual definite' and $\text{ni}^{3h}$ 'plural definite' with the clitic. This fusion is the result of totally regular phonological processes, as described in Section 9.3.1 below, but the free pronouns and the clitic pronouns must each receive a separate lexical listing synchronically because of the semantic difference described above.

It is almost certainly the case that, at some remote historical horizon, the ancestors of the present Copala Trique clitic pronouns were full syllable enclitics. Pike (1949:128–30) describes precisely such a set of enclitic pronouns for San Miguel El Grande Mixtec, and argues vigorously on distributional grounds that these elements should not be considered affixes. Within Trique, however, clitic pronouns are largely restricted to tones and laryngeals, as shown by a comparison of the Copala forms with the clitic pronouns of Chicahuaxtla Trique, which are described in Longacre (1959:26–34). It is clear that the reduction took place at such a great historical depth that no synchronic free pronoun is likely to have served as the source for any of them.

To sum up this section, I have argued that each of the three clitic pronouns should be accorded the status of a separate lexical entry, even though none of them is ever realized as an independent phonological word. Therefore, the set of pronouns shown in Table 17 should be expanded to include the clitics. Table 21 shows the revised set of pronouns.
Table 21. Copala Trique Personal Pronouns (Revised)

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>dual</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>definite</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>first</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>emphatic</td>
<td>ŋů₁ʰ</td>
<td>ŋů₅ʰ</td>
<td>ŋυ₅ʰ</td>
</tr>
<tr>
<td></td>
<td>ŋ₀₁ʰ ŋυ₅ʰ</td>
<td></td>
<td>(ŋι₃ʰ) ŋυ₅ʰ</td>
</tr>
<tr>
<td>nonemphatic</td>
<td>-h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inclusive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>specific</td>
<td></td>
<td>ŋ₀₁ʰ</td>
<td>ŋι₄ʰ</td>
</tr>
<tr>
<td></td>
<td>ŋ₀₁ʰ ŋι₄ʰ</td>
<td></td>
<td>(ŋι₃ʰ) ŋι₄ʰ</td>
</tr>
<tr>
<td>generalized</td>
<td>-h</td>
<td></td>
<td>ŋ²</td>
</tr>
<tr>
<td>second</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unmarked</td>
<td>ŋ₀₁ʰ</td>
<td>ŋ₀₁ʰ 3h</td>
<td>(ŋι₃ʰ) ŋ₀₃h</td>
</tr>
<tr>
<td>intimate</td>
<td>ŋι₁ʰ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>third</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>phrase-final</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gender specified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>masculine</td>
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<td>ŋ₀₁ʰ ŋ₀³ʰ</td>
<td>ŋι₃ʰ ŋ₀³ʰ</td>
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<tr>
<td>feminine</td>
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<td>ŋ₀₁ʰ ŋι₀³ʰ</td>
<td>ŋι₃ʰ ŋι₀³ʰ</td>
</tr>
<tr>
<td>animal</td>
<td>ŋι₀³ʰ</td>
<td>ŋ₀₁ʰ ŋι₀³ʰ</td>
<td>ŋι₃ʰ ŋι₀³ʰ</td>
</tr>
<tr>
<td>inanimate</td>
<td>ŋι₀³ʰ</td>
<td>ŋ₀₁ʰ ŋι₀³ʰ</td>
<td>ŋι₃ʰ ŋι₀³ʰ</td>
</tr>
<tr>
<td>gender unspecified</td>
<td>3sg ŋ₀₁³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(continued on following page)
<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>dual</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>definite, continued</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>third, continued</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-phrase-final</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>masculine</td>
<td>(zi^5)</td>
<td>(ro^1h) (zi^5)</td>
<td>(ni^3h) (zi^5)</td>
</tr>
<tr>
<td>feminine</td>
<td>(ni^5)</td>
<td>(ro^1h) (ni^5)</td>
<td>(ni^3h) (ni^5)</td>
</tr>
<tr>
<td>inanimate</td>
<td>(ze^{32!})</td>
<td>(ro^1h) (ze^{32!})</td>
<td>(ni^3h) (ze^{32!})</td>
</tr>
<tr>
<td>locative</td>
<td>(re^{32h})</td>
<td>(ro^1h) (re^{32h})</td>
<td>(ni^3h) (re^{32h})</td>
</tr>
<tr>
<td>indefinite</td>
<td>(ya^{32!})</td>
<td>(ro^1h) (ya^{32!})</td>
<td>(ni^3h) (ya^{32!})</td>
</tr>
</tbody>
</table>

* The regular form here would be \(ni^3\); presumably, it is not used because it would be homophonous with the indefinite pronoun \(ni^3\).
9.3 The Phonology and Morphology of Clitics

Even though Copala Trique clitic pronouns are true members of the category pronoun and each is a separate lexical entry, they are nevertheless highly aberrant in that they are invariably realized entirely by changes in the laryngeal tier representation of the preceding word. This section describes the processes that clitics undergo to produce the surface form. The first person singular and inclusive clitics are treated first; these two clitics can be described by positing a single underlying form for each and applying a set of regular rules.

9.3.1 The First Person Singular and Inclusive Clitics

As noted in Section 9.1, I posit -h as the underlying form of the first person singular clitic because all words that contain this clitic have h as the final element of their laryngeal tier representation; and I posit -? as the underlying form of the inclusive clitic because all words that contain this clitic have ? as the final element of their laryngeal tier representation. It is now necessary to defend this claim by showing that the forms words take when these two clitics are added to them can be explained by a plausible set of rules.

There are two facts about the basic form of a word that must be known in order to predict the form of the word with the clitic pronoun attached: its unassociated tone pattern and its nuclear laryngeal, if any. Tables 22-25 give all of the variant forms that words take when these two clitics are attached; each table shows tone along the vertical
axis and laryngeals along the horizontal axis. The cells of Tables 22 and 24 contain the tone-laryngeal combination found in words that have the first person singular and the inclusive clitics attached. The cells of Tables 23 and 25, on the other hand, contain actual examples. The first form in each cell is the basic form of the word, and the second form is the form with the clitic attached. In these tables and throughout this section, tone is written on all syllables because the cliticization process takes place following primary and secondary tone association (see Chapter 4, Section 4.3).

An examination of Tables 24 and 25 shows that the form a word takes when the inclusive clitic is attached to it is completely predictable from the basic form of the word. The form a word takes when the first person singular clitic is attached to it, however, is not entirely predictable, because there are two possible forms for stems with final \( ? \), as seen in Tables 22 and 23. Sometimes the forms contain an extra syllable, and sometimes the \( ? \) is simply replaced by \( h \). I delay consideration of the stems that add an extra syllable until after the regular cases have been discussed. To generate the regular form, three kinds of rules are needed: the cliticization process itself, a rule to account for the replacement of stem-final laryngeals, and various rules to account for the tone changes.

The cliticization process consists of the erasure of the word boundary between the stem and the clitic. This rule is phonologically conditioned: the boundary is erased preceding words that have no
Table 22. Changes That Realize the First Person Singular Clitic

<table>
<thead>
<tr>
<th></th>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1h</td>
<td>1h</td>
<td>1h</td>
<td>1h</td>
</tr>
<tr>
<td>2</td>
<td>2h</td>
<td>2h</td>
<td>2h</td>
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<td>3h</td>
<td>3h</td>
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<td>3h</td>
<td>3h</td>
<td>5h</td>
<td>3h</td>
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<tr>
<td>4</td>
<td>3h</td>
<td>R</td>
<td>X</td>
<td>3h</td>
</tr>
<tr>
<td>5</td>
<td>5h</td>
<td>R</td>
<td>5h</td>
<td>X</td>
</tr>
<tr>
<td>31</td>
<td>3h</td>
<td>X</td>
<td>R</td>
<td>X</td>
</tr>
<tr>
<td>32</td>
<td>32h</td>
<td>X</td>
<td>32h</td>
<td>32h</td>
</tr>
</tbody>
</table>

R = rare; no example found with clitic
X = does not occur in language
Table 23. Examples of the First Person Singular Clitic

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>2</th>
<th>h</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ka\textsuperscript{2}nu\textsuperscript{1}</td>
<td>na\textsuperscript{2}ri\textsuperscript{17}</td>
<td>ki\textsuperscript{2}n\textsuperscript{1}h</td>
</tr>
<tr>
<td>'will pop'</td>
<td>'will find'</td>
<td>'will wash'</td>
<td>'will grab'</td>
</tr>
<tr>
<td>ka\textsuperscript{2}nu\textsuperscript{1}h</td>
<td>na\textsuperscript{2}ri\textsuperscript{1}h</td>
<td>ki\textsuperscript{2}n\textsuperscript{1}h</td>
<td>ka\textsuperscript{2}no\textsuperscript{1}h</td>
</tr>
<tr>
<td>'I will pop'</td>
<td>na\textsuperscript{2}ri\textsuperscript{2}1\textsuperscript{h}</td>
<td>'I will wash'</td>
<td>'I will grab'</td>
</tr>
<tr>
<td>2</td>
<td>ka\textsuperscript{2}ka\textsuperscript{2}</td>
<td>sa\textsuperscript{2}</td>
<td>ku\textsuperscript{2}n\textsuperscript{2}h</td>
</tr>
<tr>
<td>'will burn'</td>
<td>'lover of'</td>
<td>'will run'</td>
<td>'will sow'</td>
</tr>
<tr>
<td>ka\textsuperscript{2}ka\textsuperscript{2}h</td>
<td>sa\textsuperscript{2}h</td>
<td>ku\textsuperscript{2}n\textsuperscript{2}h</td>
<td>ku\textsuperscript{2}no\textsuperscript{2}h</td>
</tr>
<tr>
<td>'I will burn'</td>
<td>'my lover'</td>
<td>'I will run'</td>
<td>'I will sow'</td>
</tr>
<tr>
<td>13</td>
<td>ka\textsuperscript{2}ra\textsuperscript{13}</td>
<td>ti\textsuperscript{2}ri\textsuperscript{13}</td>
<td>na\textsuperscript{2}wi\textsuperscript{13}h</td>
</tr>
<tr>
<td>'will fill'</td>
<td>'will spoil'</td>
<td>'will end'</td>
<td>'will hear'</td>
</tr>
<tr>
<td>ka\textsuperscript{2}ra\textsuperscript{13}h</td>
<td>ti\textsuperscript{2}ri\textsuperscript{13}h</td>
<td>na\textsuperscript{2}wi\textsuperscript{5}h</td>
<td>ku\textsuperscript{2}no\textsuperscript{13}h</td>
</tr>
<tr>
<td>'I will fill'</td>
<td>ti\textsuperscript{2}ri\textsuperscript{2}13\textsuperscript{h}</td>
<td>'I will end'</td>
<td>'I will hear'</td>
</tr>
<tr>
<td></td>
<td>'I will spoil'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ka\textsuperscript{3}ra\textsuperscript{3}</td>
<td>na\textsuperscript{3}ri\textsuperscript{3}</td>
<td>na\textsuperscript{3}wi\textsuperscript{3}h</td>
</tr>
<tr>
<td>'filled'</td>
<td>'found'</td>
<td>'ended'</td>
<td>'heard'</td>
</tr>
</tbody>
</table>

(continued on following page)
### Table 23, Continued

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ka₃ra₃h</td>
<td>n₃ri₃h or n₃wi₅h</td>
<td>ku₃no₃h</td>
<td></td>
</tr>
<tr>
<td>'I filled'</td>
<td>'I ended'</td>
<td>'I heard'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>'I found'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>do⁴</td>
<td>--</td>
<td>--</td>
<td>ka₃no⁴'</td>
</tr>
<tr>
<td>'basket of'</td>
<td>'grabbed'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>do₃h</td>
<td>ka₃no₃h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'my basket'</td>
<td>'I grabbed'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ki₃n₅¹</td>
<td>--</td>
<td>ku₃n₅h</td>
<td>--</td>
</tr>
<tr>
<td>'washed'</td>
<td>'ran'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ki₃n₅h</td>
<td>ku₃n₅h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'I washed'</td>
<td>'I ran'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ka₃nu₃¹</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>'popped'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ka₃nu₃h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'I popped'</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(continued on following page)
<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>ɪ</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>ka'ka³</td>
<td>ku³ču³2h</td>
<td>ku³no³2i</td>
</tr>
<tr>
<td>'burned'</td>
<td></td>
<td>'laid down'</td>
<td>'sowed'</td>
</tr>
<tr>
<td>ka³2h</td>
<td>ku³ču³2h</td>
<td>ku³no³2h</td>
<td></td>
</tr>
<tr>
<td>'I burned'</td>
<td></td>
<td>'I laid down'</td>
<td>'I sowed'</td>
</tr>
</tbody>
</table>
Table 24. Changes That Realize the Inclusive Clitic

<table>
<thead>
<tr>
<th></th>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1?</td>
<td>1?</td>
<td>1?</td>
<td>1?</td>
</tr>
<tr>
<td>2</td>
<td>2?</td>
<td>2?</td>
<td>2?</td>
<td>2?</td>
</tr>
<tr>
<td>13</td>
<td>4?</td>
<td>4?</td>
<td>4?</td>
<td>4?</td>
</tr>
<tr>
<td>3</td>
<td>4?</td>
<td>4?</td>
<td>4?</td>
<td>4?</td>
</tr>
<tr>
<td>4</td>
<td>4?</td>
<td>R</td>
<td>X</td>
<td>4?</td>
</tr>
<tr>
<td>5</td>
<td>4?</td>
<td>R</td>
<td>4?</td>
<td>X</td>
</tr>
<tr>
<td>31</td>
<td>4?</td>
<td>X</td>
<td>R</td>
<td>X</td>
</tr>
<tr>
<td>32</td>
<td>3?</td>
<td>X</td>
<td>3?</td>
<td>3?</td>
</tr>
</tbody>
</table>

R = rare; no example found with clitic
X = does not occur in language
Table 25. Examples of the Inclusive Clitic

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>2</th>
<th>h</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ka\textsubscript{nu}</td>
<td>na\textsubscript{ri}</td>
<td>ki\textsubscript{nā}</td>
<td>ka\textsubscript{no}</td>
</tr>
<tr>
<td>'will pop'</td>
<td>'will find'</td>
<td>'will wash'</td>
<td>'will grab'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>na\textsubscript{ri}</td>
<td>ki\textsubscript{nā}</td>
<td>ka\textsubscript{no}</td>
</tr>
<tr>
<td>'we will pop'</td>
<td>'we will find'</td>
<td>'we will wash'</td>
<td>'we will grab'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>sa</td>
<td>ku\textsubscript{nā}</td>
<td>ku\textsubscript{no}</td>
</tr>
<tr>
<td>'will burn'</td>
<td>'lover of'</td>
<td>'will run'</td>
<td>'will sow'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>sa</td>
<td>ku\textsubscript{nā}</td>
<td>ku\textsubscript{no}</td>
</tr>
<tr>
<td>'we will burn'</td>
<td>'our lover'</td>
<td>'we will run'</td>
<td>'we will sow'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>ti\textsubscript{ri}</td>
<td>na\textsubscript{wi}</td>
<td>ku\textsubscript{no}</td>
</tr>
<tr>
<td>'will fill'</td>
<td>'will spoil'</td>
<td>'will end'</td>
<td>'will hear'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>ti\textsubscript{ri}</td>
<td>na\textsubscript{wi}</td>
<td>ku\textsubscript{no}</td>
</tr>
<tr>
<td>'we will fill'</td>
<td>'we will spoil'</td>
<td>'we will end'</td>
<td>'we will hear'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>na\textsubscript{ri}</td>
<td>na\textsubscript{wi}</td>
<td>ku\textsubscript{no}</td>
</tr>
<tr>
<td>'filled'</td>
<td>'found'</td>
<td>'ended'</td>
<td>'heard'</td>
</tr>
<tr>
<td>ka\textsubscript{rā}</td>
<td>na\textsubscript{ri}</td>
<td>na\textsubscript{wi}</td>
<td>ku\textsubscript{no}</td>
</tr>
<tr>
<td>'we filled'</td>
<td>'we found'</td>
<td>'we ended'</td>
<td>'we heard'</td>
</tr>
</tbody>
</table>

(continued on following page)
Table 25, Continued

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>!</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>do⁴</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>'basket of'</td>
<td>'grabbed'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>do⁴?</td>
<td></td>
<td>ka³ no⁴?</td>
<td></td>
</tr>
<tr>
<td>'our basket'</td>
<td>'we grabbed'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ki³ nā⁵</td>
<td>—</td>
<td>ku³ nā⁵h</td>
</tr>
<tr>
<td>'washed'</td>
<td>'ran'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ki³ nā⁴?</td>
<td>ku³ nā⁴?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'we washed'</td>
<td>'we ran'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>ka³ nu³¹</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>'popped'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ka³ nu³?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'we popped'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>ka³ ka³²</td>
<td>—</td>
<td>ku³ cu³²h</td>
</tr>
<tr>
<td>'burned'</td>
<td>'laid down'</td>
<td>'sowed'</td>
<td></td>
</tr>
<tr>
<td>ka³ ka³?</td>
<td>ku³ cu³⁷</td>
<td>ku³ no³⁷</td>
<td></td>
</tr>
<tr>
<td>'we burned'</td>
<td>'we laid down'</td>
<td>'we sowed'</td>
<td></td>
</tr>
</tbody>
</table>
material in their segmental tier representation. This rule, which applies in all the forms, is:

(41) Cliticization

\[-\text{seg}\]

\[\# \rightarrow \emptyset / \_ \_ \_ \_ \emptyset\]

The laryngeal changes that take place when either of these clitics is attached can be accounted for by a single rule that follows Cliticization and simply deletes a laryngeal segment preceding another laryngeal segment. The second one is then associated with the segmental tier in place of the first one by the universal convention that association lines do not cross. This deletion rule is:

(42) Laryngeal Deletion

\[\text{[+GLOT]} \rightarrow \emptyset / \_ \_ \_ \_ \text{[+GLOT]}\]

This rule has the effect of replacing any stem-final laryngeal by the clitic laryngeal, as seen in the second, third, and fourth columns of Tables 23 and 25. Because Copala Trique has a very limited morphology that includes no true suffixes, and because laryngeals are limited to word-final syllables, there is no environment in the language to which rule (42) can apply except in the case of clitics: two laryngeals simply do not come together within a word under any other conditions. Rule (42) is, however, both phonetically plausible and without exception, and I therefore consider it to be a regular phonological rule.
My analysis of "length" as the ballistic laryngeal \( \dot{1} \) allows a simpler statement of Laryngeal Deletion than would otherwise be possible: rule (42) simply deletes \( \dot{1} \) along with \( \dot{?} \) and \( \dot{h} \) preceding another laryngeal, and a single rule is sufficient to account for the facts. If, however, I had treated the "short" vowels as simple vowels and the "long" vowels as geminate or long, another rule would be needed to degeminate or shorten the "long" vowels when a clitic is added. See the discussion in Chapter 5, Section 5.1.

The tone changes that accompany the attachment of clitics appear bewildering at first glance, but they can be accounted for quite simply by a combination of two factors. First, it is necessary to assume that the two tone sandhi rules described in Chapter 8 apply in the environment of the clitic pronouns \(-\dot{h}\) and \(-\dot{?}\), as well as in the case of three free pronouns. Second, all of the tone changes that the sandhi rules do not completely account for result from a set of three adjustment rules that replace a proscribed or rare tone-laryngeal combination by a permitted or common one.

The two tone sandhi rules presented in Chapter 8 must be revised to show all five of the sandhi-causing pronouns in the environment; these revised rules are:
In the case of the three free pronouns, these rules describe word-external processes, and so I assume that they precede Cliticization.

When the inclusive clitic follows a stem that has either underlying tone $\frac{5}{1}$ or a tone $\frac{5}{1}$ that results from the application of Tone Sandhi One, the resulting cliticized form has $\frac{4}{2}$, rather than the expected $\frac{5}{2}$, and so an adjustment rule is needed. It is not the case, however, that $\frac{5}{2}$ is an unpermitted combination in Copala Trique, because there are two words that have it: $\underline{e}5^7$ 'tiny' and $\underline{ru}5^7$ 'only'. (These words are almost certainly a recent development, perhaps involving sound symbolism.) In order to change the instances of $\frac{5}{2}$ that would arise from the clitic to $\frac{4}{2}$ without affecting the two stems that have $\frac{5}{2}$, the
adjustment rule must apply between Tone Sandhi One and Cliticization, and it must use the inclusive clitic as the environment. This rule is:

(45) Extreme Lowering

\[
\frac{2}{3} \quad \begin{cases} +\text{HIGH} \\ -\text{CENT} \\ +\text{EXTR} \end{cases} \rightarrow \left[ -\text{EXTR} \right] / \_ \_ \_ \_ ([\text{+GLOT}]) \# -? \]

Rule (45) is similar to the two sandhi rules in that it is a postlexical rule with an environment that refers to particular morphemes.

There are two cases in which the cliticization process produces tone-laryngeal combinations that are ruled out by the phonotactic constraints of the language. These combinations undergo adjustment rules in which the tone pattern is replaced by a similar one that results in a permitted tone-laryngeal combination. These rules are completely regular and apply after Cliticization and Laryngeal Deletion.

When the first person singular clitic is added to a stem, the resulting word always ends in ʰ. The tone-laryngeal combination *4ʰ is, however, not permitted. Words that have 4 as their stem tone, or that have their stem tone changed to 4 as a result of Tone Sandhi Two, therefore undergo a rule in which 4 is replaced by 3 before ʰ. This rule is:
(46) Lowering to Central

\[
\begin{array}{c}
\text{3}^4 \\
\text{+HIGH} \\
\text{-CENT} \\
\text{-EXTR}
\end{array} \rightarrow \begin{array}{c}
\text{3}^3 \\
\text{+CENT} \\
\text{-EXTR} \\
\text{+GLOT}
\end{array}
\]

When the inclusive clitic \(\sim\) is attached to words that have the \(32\) tone sequence, the resulting combination is not permitted and is simplified to \(37\). The rule that accomplishes this is:

(47) Downglide Simplification

\[
\begin{array}{c}
\text{1, 2} \\
\text{-HIGH}
\end{array} \rightarrow \emptyset \quad \begin{array}{c}
\text{3}^3 \\
\text{+HIGH} \\
\text{+CENT}
\end{array} \rightarrow \begin{array}{c}
\text{2} \\
\text{+GLOT} \\
\text{-SPR} \\
\text{-HSP}
\end{array}
\]

As I have written this rule, it will simplify both \(32\) and \(31\) before \(2\), because neither \(31^2\) nor \(32^2\) occurs. The \(31^2\) sequence does not arise as a result of the attachment of the inclusive clitic, however, because \(31\) is raised to \(4\) by the application of Tone Sandhi Two, and the one stem with \(31h\), 

Rules (46) and (47) are automatic rules. Like Laryngeal Deletion, the only conditions under which they can apply occur in the attachment of clitics. Nevertheless, they apply without exception, and it therefore seems fair to classify them as regular phonological rules.
There is only one problem that remains in accounting for all of the forms on Tables 22 and 23. A few common words in 12, 13, and 3 add an extra vowel when the first person singular clitic is added to them. Speakers differ somewhat as to just which words fall into this irregular class. Two possible mechanisms suggest themselves to handle this situation: a stem allomorph analysis, in which the form with the extra vowel is listed in the lexicon (as suggested by Lieber [1982]), or a minor rule analysis, in which the vowel is added by an epenthesis rule. I have chosen the allomorph analysis for the following reasons. First, it eliminates the need for a minor rule by placing the irregularity within the lexicon, which is supposed to be the repository of precisely such irregularity. Also, the basic form and the form with the extra vowel differ in a number of ways, as seen in the following examples:

(48) a. \textunderline{za}^{1}\textsuperscript{?} \hspace{1cm} 'good'

b. \textunderline{sa}^{a}\textsuperscript{1h} \hspace{1cm} good-1sg

'I am good.'

(49) a. \textunderline{nari}^{3}\textsuperscript{?} \hspace{1cm} 'finds'
In all of these examples, tone is associated with the word-final syllable, and stress invariably falls there. Furthermore, the contrastive nasalization in (50b) is there, and the initial lax sibilant in (48a) is neutralized to a tense one in a nonfinal syllable. Perhaps even more significant, however, is the fact that the nuclear laryngeal 2 of the basic forms is replaced by an onset laryngeal in the clitic forms. Even though it would be possible to write a series of rules that would follow a vowel epenethesis rule and would carry out all of these adjustments, such a solution means positing a great deal of theoretical apparatus to account for a very few forms. In the allomorph analysis, no adjustment rules are needed. Each allomorph is lexically listed, each obeys the phonotactic constraints of the language, and each passes through the tone association and stress rules. The lexical entry for 'good' will therefore contain both za1 and sa2a1, that for 'find' will contain
both nari[^3] and nari[^2], and that for 'head home' will contain both
nä[^3] and na[^2].

There is, however, a price to be paid for the allomorph analysis
in the case of a postlexical phenomenon, and this price is context-
sensitive lexical insertion. It is necessary to know whether the fol-
lowing word is the first person singular clitic or not in order to know
which allomorph to choose.

One further item is worthy of mention. Words that have the com-
binations 1h, 2h, 5h, and 32h in their basic forms show no change when
the first person singular clitic is added, and words that have the
combinations 17 and 27 in their basic forms show no change when the
inclusive clitic is added. It would be possible to approach this
neutralization by claiming that each clitic is subject to certain spe-
cific restrictions on its occurrence. It results in a far simpler anal-
ysis, however, to consider the neutralization to be a fortuitous and
structurally irrelevant result of the way the rules operate in different
tone-laryngeal combinations.

There is considerable support for this position provided by the
syntactic facts. In Section 9.1, I showed that clitics occur in posi-
tions where the head of a noun phrase is expected. Because Copala Tri-
que syntax shows a fairly rigid ordering, there is usually something in
the context that alerts the hearer to expect a noun phrase head. For
example, the presence of a preposition alerts the hearer to expect its
complement, and the presence of an article alerts the hearer to expect
a head noun. Therefore, in the cases where the clitic pronoun is neutralized, the absence of the expected noun head alerts the hearer to interpret the neutralized word as the word containing the clitic, rather than as the basic form alone.  

The rules presented in this section must follow primary and secondary tone association, but precede tertiary association. Within the block, the ordering is fairly tight. Tone Sandhi One must precede Extreme Lowering, both tone sandhi rules must precede Cliticization, Cliticization must precede Laryngeal Deletion, and Laryngeal Deletion must precede Lowering to Central and Downglide Simplification. The following derivations show these ordering relationships:

(51) Underlying Form

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>1</th>
<th>h</th>
<th>'heard 1sg'</th>
</tr>
</thead>
<tbody>
<tr>
<td>kuno</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Association</td>
<td>3</td>
<td>1</td>
<td>h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>kuno</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Association</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>kuno</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tone Sandhi One</td>
<td>does not apply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tone Sandhi Two</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>kuno</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Extreme Lowering  does not apply

Cliticization  \( \begin{array}{c} 3 & 4 \hline 1 \end{array} \kuno \)

Laryngeal Deletion  \( \begin{array}{c} 3 & 4 \hline 1 \end{array} \kuno \)

Lowering to Central  \( \begin{array}{c} 3 \hline 1 \end{array} \kuno \)

Downglide Simplification  does not apply

Tertiary Association  does not apply

(52) Underlying Form  \( \begin{array}{c} 1 & 3 & h \end{array} \)  \( \begin{array}{c} h \end{array} \)  \( \begin{array}{c} \text{'will end 1sg'} \end{array} \)

navi  \( \emptyset \)

Primary Association  \( \begin{array}{c} 1 & 3 \hline h \end{array} \)  \( \begin{array}{c} \text{navi} \end{array} \)

Secondary Association  \( \begin{array}{c} 2 & 1 & 3 \hline h \end{array} \)  \( \begin{array}{c} \text{navi} \end{array} \)

Tone Sandhi One  \( \begin{array}{c} 2 \hline 5 \hline \text{navi} \end{array} \)

Tone Sandhi Two  does not apply
Extreme Lowering does not apply

Cliticization $2\ 5\ h$

\[
\begin{array}{c|c}
\text{Laryngeal Deletion} & \text{does not apply} \\
\text{Lowering to Central} & \text{does not apply} \\
\text{Downglide Simplification} & \text{does not apply} \\
\text{Tertiary Association} & 2\ 3\ 5\ h \\
\end{array}
\]

Tertiary Association $2\ 3\ 5\ h$

\[
\begin{array}{c|c}
\text{Underlying Form} & 3\ 2\ h \ h \\
\text{Primary Association} & 3\ 2\ h \ h \\
\text{Secondary Association} & \text{does not apply} \\
\text{Tone Sandhi One} & \text{does not apply} \\
\text{Tone Sandhi Two} & \text{does not apply} \\
\text{Extreme Lowering} & \text{does not apply} \\
\end{array}
\]

(53) 'flower of 1sg'
Cliticization

Laryngeal Deletion

Lowering to Central
does not apply

Downglide Simplification
does not apply

Tertiary Association
does not apply

(54) Underlying Form
does not apply

Primary Association
does not apply

Secondary Association
does not apply

Tone Sandhi One
does not apply

Tone Sandhi Two
does not apply

Extreme Lowering
does not apply
Cliticization

Laryngeal Deletion
does not apply

Lowering to Central
does not apply

Downglide Simplification
does not apply

Tertiary Association

Tone Sandhi One
does not apply

Tone Sandhi Two
does not apply

Extreme Lowering
does not apply

Cliticization
Laryngeal Deletion does not apply
Lowering to Central does not apply
Downglide Simplification
\[
\begin{array}{c}
3 \ 3 \ 2 \\
! \ \|/ \\
kaka
\end{array}
\]
Tertiary Association does not apply

(56) Underlying Form

\[
\begin{array}{c}
1 \ 2 \ 2 'will obtain incl' \\
\kiri \ \emptyset
\end{array}
\]
Primary Association

\[
\begin{array}{c}
1 \ 2 \ 2 \\
! \ \|/ \\
kiri
\end{array}
\]
Secondary Association

\[
\begin{array}{c}
2 \ 1 \ 2 \ 2 \\
! \ \|/ \\
kiri
\end{array}
\]
Tone Sandhi One does not apply
Tone Sandhi Two does not apply
Extreme Lowering does not apply
Cliticization

\[
\begin{array}{c}
2 \ 1 \ 2 \ 2 \\
! \ \|/ \\
kiri
\end{array}
\]
Laryngeal Deletion

\[
\begin{array}{c}
2 \ 1 \ 2 \\
! \ \|/ \\
kiri
\end{array}
\]
Lowering to Central  
Downglide Simplification  
Tertiary Association  

(57) Underlying Form  

\[ \begin{array}{c}
1 & 3 & h & 2 \\
\text{nawi} & \emptyset
\end{array} \]

Primary Association  

\[ \begin{array}{c}
1 & 3 & h & 2 \\
\text{nawi}
\end{array} \]

Secondary Association  

\[ \begin{array}{c}
2 & 1 & 3 & h & 2 \\
\text{nawi}
\end{array} \]

Tone Sandhi One  

\[ \begin{array}{c}
2 & 5 & 2 \\
\text{nawi}
\end{array} \]

Tone Sandhi Two  

 does not apply

Extreme Lowering  

\[ \begin{array}{c}
2 & 4 & 2 \\
\text{nawi}
\end{array} \]

Cliticization  

\[ \begin{array}{c}
2 & 4 & 2 \\
\text{nawi}
\end{array} \]

Laryngeal Deletion  

 does not apply
Lowering to Central  does not apply
Downglide Simplification  does not apply
Tertiary Association  \[
\begin{array}{c}
2 \ 3 \ 4 \\
\mid \mid \\
nawi
\end{array}
\]

9.3.2 The Third Person Singular Clitic

When the third person singular clitic is attached to stems of various tone-laryngeal classes, the resulting forms are largely predictable. The ways in which they differ from the stem alone, however, are so varied that no underlying form can be posited that will plausibly account for them. It is necessary to describe them by a set of morphological rules, in which the morphosyntactic features of person and number, rather than any phonological form, serves as the environment for the rules. In this respect, the third person singular clitic is unlike the other two clitics, and is rather like the word-internal replacements described in Chapter 7. In spite of this similarity, however, the syntactic evidence presented in Section 9.1 shows that clitic pronouns are independent syntactic elements at the underlying level and must be attached to their hosts by a postlexical process. In the absence of any crucial ordering relationships, I place the rules that generate this clitic at the beginning of the postlexical rules. Because they precede primary and secondary tone association (see Chapter 4, Section 4.3), I include only underlying tones in the forms I cite in this section.
The variant forms that words take when the third person singular clitic is attached to them are shown in Tables 26 and 27. Table 26 shows the tone-laryngeal combinations found in clitic forms, and Table 27 contains actual examples. As in Tables 23 and 25, the first form in each cell is the basic form of the word, and the second form is the form with the clitic attached.

An examination of these tables shows that the tone pattern of words that contain the third person singular clitic is completely predictable from phonological information alone. It is 3 if the first unassociated tone of the stem is [+HIGH], and 13 if it is [−HIGH]. As in the case of the other clitics, lexically linked tones are unaffected by the attachment of clitics. The laryngeal, however, does not show such a simple pattern. Some of the forms have h, and others have no laryngeal. The conditions that govern the choice between these two forms are complex; they involve both phonological factors, including the laryngeal and tone of the stem, and arbitrary classes.

A number of stems with final -ʔ have an allomorph with an extra syllable when the third person singular clitic is attached. This is the same group of common stems that takes the extra syllable with the first person singular clitic. See the discussion in Section 9.3.1.

The first rule, which I call Feature Copy, has the effect of a cliticization rule: it transfers the morphosyntactic features of a lexical entry with no phonological content to the preceding word. This rule is:
Table 26. Changes That Realize the Third Person Singular Clitic

<table>
<thead>
<tr>
<th></th>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>!</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13h</td>
<td>13h</td>
<td>13</td>
<td>13h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>γν13h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>13h</td>
<td>13h</td>
<td>13</td>
<td>13h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>13h</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>γν13h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3h</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>γν3h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3h</td>
<td>R</td>
<td>X</td>
<td>3h</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>R</td>
<td>3</td>
<td>X</td>
</tr>
<tr>
<td>31</td>
<td>3h</td>
<td>X</td>
<td>R</td>
<td>X</td>
</tr>
<tr>
<td>32</td>
<td>3h</td>
<td>X</td>
<td>3</td>
<td>3h</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R = rare; no example found with clitic
X = does not occur in language
Table 27. Examples of the Third Person Singular Clitic

<table>
<thead>
<tr>
<th></th>
<th>no laryngeal</th>
<th>h</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>kanu¹</td>
<td>nari¹</td>
<td>kinā¹h</td>
</tr>
<tr>
<td></td>
<td>'will pop'</td>
<td>'will find'</td>
<td>'will wash'</td>
</tr>
<tr>
<td></td>
<td>kanu¹³h</td>
<td>nari¹³h or</td>
<td>kinā³</td>
</tr>
<tr>
<td></td>
<td>'he will pop'</td>
<td>'he will wash'</td>
<td>'he will grab'</td>
</tr>
<tr>
<td></td>
<td>kaka²</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'will burn'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>kaka¹³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'he will burn'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>kara¹³</td>
<td>tiri¹³⁷</td>
<td>nawi¹³h</td>
</tr>
<tr>
<td></td>
<td>'will fill'</td>
<td>'will spoil'</td>
<td>'will end'</td>
</tr>
</tbody>
</table>

(continued on following page)
Table 27, Continued

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>2</th>
<th>h</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>kara₁³</td>
<td>tiri₁³ʰ or nawi₁³</td>
<td>kuno₁³</td>
<td></td>
</tr>
<tr>
<td>'he will fill'</td>
<td>tiri₁³ʰ</td>
<td>'he will end'</td>
<td>'he will hear'</td>
</tr>
<tr>
<td>'he will spoil'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kara³</td>
<td>nari³ʰ</td>
<td>nawi³ʰ</td>
<td>kuno³¹</td>
</tr>
<tr>
<td>'filled'</td>
<td>'found'</td>
<td>'ended'</td>
<td>'heard'</td>
</tr>
<tr>
<td>kara³</td>
<td>nari³ʰ or nawi³</td>
<td>kuno³</td>
<td></td>
</tr>
<tr>
<td>'he filled'</td>
<td>nari³ʰ</td>
<td>'he ended'</td>
<td>'he heard'</td>
</tr>
<tr>
<td>'he found'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>do⁴</td>
<td>--</td>
<td>--</td>
<td>kano⁴¹</td>
</tr>
<tr>
<td>'basket of'</td>
<td></td>
<td></td>
<td>'grabbed'</td>
</tr>
<tr>
<td>do³ʰ</td>
<td>kano³ʰ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'his basket'</td>
<td></td>
<td>'he grabbed'</td>
<td></td>
</tr>
<tr>
<td>kina⁵</td>
<td>--</td>
<td>kunā⁵ʰ</td>
<td>--</td>
</tr>
<tr>
<td>'washed'</td>
<td></td>
<td>'ran'</td>
<td></td>
</tr>
<tr>
<td>kina³</td>
<td>kunā³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>'he washed'</td>
<td></td>
<td>'he ran'</td>
<td></td>
</tr>
</tbody>
</table>

(continued on following page)
Table 27, Continued

<table>
<thead>
<tr>
<th>no laryngeal</th>
<th>?</th>
<th>h</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>kanu\textsuperscript{31}</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>'popped'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>kanu\textsuperscript{3h}</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'he popped'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>nari\textsuperscript{32}</td>
<td>--</td>
<td>kuču\textsuperscript{32h}</td>
</tr>
<tr>
<td></td>
<td>'drew'</td>
<td></td>
<td>'laid down'</td>
</tr>
<tr>
<td></td>
<td>nari\textsuperscript{3h}</td>
<td>kuču\textsuperscript{3}</td>
<td>kuno\textsuperscript{3h}</td>
</tr>
<tr>
<td></td>
<td>'he drew'</td>
<td></td>
<td>'he laid down'</td>
</tr>
<tr>
<td></td>
<td>kaka\textsuperscript{32}</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'burned'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>kaka\textsuperscript{3}</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'he burned'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(58) Feature Copy

If a word lacks phonological content in both tiers, copy its morphosyntactic features onto the preceding word, and erase the original word.

The remaining rules use these copied features, which I abbreviate here simply as 3sg, as the morphological environment of the rule. I use a double vertical bar (||) to indicate such an environment. Such rules may also have a phonological environment because the distribution of the variant realizations is phonologically conditioned to a large extent. Because the underlying stem tone serves as part of the phonological environment that conditions the presence of \( h \) versus the absence of any laryngeal in the clitic form, it is necessary to write the rules that produce the correct laryngeal before the rules that merge the stem tones to \( \text{\text{\textbullet}} \) or \( \text{\text{\textbullet}} \). I therefore present the rules for the laryngeals first.

The first laryngeal rule deletes a stem-final \( h \), no matter what the stem tone, leaving a vowel unassociated with any laryngeal to mark the presence of the clitic. This rule is:

(59) Deletion of \( h \)

\[
\begin{align*}
\text{\text{\textbullet}} & \quad \text{\text{\textbullet}} \\
\text{\textbullet}^{+\text{CLOT}} & \quad \text{\textbullet}^{+\text{SPR}} \\
\rightarrow & \quad \emptyset \\
\end{align*}
\]

\( 3\text{sg} \)
This rule accounts for the absence of any laryngeal in all the forms in the third column of Tables 26 and 27.

The second rule replaces a stem-final 2 by h, no matter what the stem tone, leaving h to mark the presence of the clitic. This rule is:

(60) Replacement of 2 by h

\[
\begin{align*}
2 & \quad \text{[+GLOT]} \\
-\text{SPR} \quad \text{[+SPR]} & \quad \text{[+HSP]} \quad \text{[+3sg]} \\
\end{align*}
\]

This rule accounts for the final h in all of the forms in the second column of Tables 26 and 27 except for those that have a lexically listed allomorph with a final vowel.

The third rule deletes a stem-final 1 in stems with tone 3 as the last unassociated tone, leaving a vowel unassociated with any laryngeal to mark the presence of the clitic. This rule is:

(61) Deletion of 1

\[
\begin{align*}
1 & \quad \text{[+GLOT]} \quad \text{[+HSP]} \\
\end{align*}
\]

This rule accounts for the absence of any laryngeal in the clitic form of stems with 31 and 131. The remaining stems with final 1 undergo rule (62).

The fourth rule is considerably more complex than the first three. It applies in stems that have tone patterns 1, 2, 31, 32, and 4,
and either \( \_ \) or no laryngeal. It replaces the \( \_ \) by \( h \) or simply adds \( h \). This rule is:

\[
(62) \quad \text{Replacement of } \emptyset \text{ and } \_ \text{ by } h
\]

\[
\begin{align*}
\{ \emptyset \} & \rightarrow \{ \begin{array}{c}
h \\
+\text{GLOT} \\
+\text{SPR} \\
-\text{HSP} \\
\end{array} \} / \{ \begin{array}{c}
\_ \\
2 \\
-\text{HIGH} \\
-\text{CENT} \\
-\text{EXTR} \\
\end{array} \} \quad \# \quad \|
\end{align*}
\]

This rule accounts for the final \( h \) in all stems in \( 1' \), \( 2' \), \( 32' \), and \( 4' \), and also for the final \( h \) in all stems with no laryngeal and tones \( 1 \) or \( 4 \). Stems with no laryngeal and tone patterns \( 2 \) or \( 32 \), however, fall into two groups: those that take \( h \) to realize the third person singular clitic, and those that take no laryngeal. The first group is regular and undergoes rule (62). The second group must be lexically marked as exceptions to rule (62); these stems undergo no rule that affects their laryngeal.

There is another class of stems that undergo no rule that affects their laryngeal; these are the stems with no laryngeal in their basic form and tone patterns \( 13 \), \( 3 \), or \( 5 \).

All of the tone-laryngeal classes have now been accounted for except for the vowel-final allomorphs of certain stems with final \( ? \). These allomorphs always take \( h \) to realize the third person singular clitic, no matter what their tone pattern. In this they differ from
stems whose basic form has no laryngeal, which take \( h \) only if they have certain tone patterns. Rule (62) accounts for the \( h \) in allomorphs with tone 1, but for allomorphs with tone patterns 13 or 3, a new rule is needed to add \( h \). This rule is:

\[
(63) \quad \text{Epenthesis of } h \text{ Following } 3
\]

\[
\emptyset \rightarrow \left[ +\text{GLOT} \right] / \left[ +\text{HIGH} \right] / \left[ +\text{CENT} \right] \# \ - ! 3\text{sg (minor rule)}
\]

Each vowel-final allomorph with 13 or 3 must be lexically marked to undergo rule (63).

Because I adopted the abstract laryngeal analysis for the surface "length" contrast, the above rules refer only to the laryngeal tier. If I had adopted a gemination or vowel feature analysis, four of these five rules would have to be reformulated as cross-tier rules to show the effect of adding or deleting a laryngeal on vowel length. See the discussion in Chapter 5, Section 5.1.

I have set up these morphological rules so that only one of the rules in this block applies to a given stem. In other words, they are disjunctively ordered. If these rules were sequentially ordered, it would be possible to simplify rules (61) and (62) by having rule (61) delete all instances of \( i \), and rule (62) simply epenthesize \( h \). Also, rule (60) would have to follow rule (59) to prevent rule (59) from wrongly deleting the instances of \( h \) created by rule (60). Sequential ordering faces a serious problem, however, in the relationship between
rules (59) and (62), which is one of mutual feeding. No matter which order is adopted, at least part of the output of one rule will wrongly serve as the input to the other one. This is because they are partial exchange rules, a characteristic that is not uncommon in morphological rules such as these. Such exchange rules apparently do not occur as pure phonological rules; see the discussion in S. Anderson (1975:41) and Janda (1983). If this block of five rules were sequentially ordered, a condition would be needed on (59) or (62), whichever came second, to prevent it from applying to the output of the other one.

The rules that account for the tone changes associated with the third person singular clitic constitute a second block of rules through which each stem must pass. This block is sequentially ordered with respect to the laryngeal block, which must come first. It consists of two rules, unordered between them. The first one replaces tone patterns 1, 2, and 13 by 13; it is:

\[(64) \text{ Replacement by } 13\]

\[\begin{align*}
[-\text{HIGH}] \{[+\text{HIGH}]\} & \Rightarrow [-\text{CENT}] \begin{array}{c}
\frac{1}{2} \\
\text{h}
\end{array} \begin{array}{c}
[+\text{HIGH}] \\
[+\text{CENT}] \\
[+\text{SPR}] \\
[+\text{GLOT}]
\end{array} \\
\# & 11 \text{ 3sg}
\end{align*}\]

This rule accounts for the tone pattern of the first three rows of Tables 26 and 27. The second rule accounts for the tone pattern in the
remaining five rows; it replaces the tone patterns $2, 4, 5, 31,$ and $32$
by $3$. This rule is:

(65) Replacement by $3$

\[ [+\text{HIGH}] ([−\text{HIGH}]) \Rightarrow [+\text{CENT}] \emptyset / \begin{array}{c}
\begin{array}{c}
\text{h} \\
\text{CENT}
\end{array}
\end{array} \begin{array}{c}
\begin{array}{c}
\text{GLOT} \\
\text{SPR}
\end{array}
\end{array} # 1 \ 1 \begin{array}{c}
3sg
\end{array} \]

\[ 1 \ 2 \ 1 \ 2 \]

Stems with $13$ or $3$ in their basic form undergo vacuous application of
these rules.

Stems that have tone patterns $13$ or $3$ and no nuclear laryngeal
in their basic form show no change when the third person singular clitic
is added to them, as can be seen in Table 27. As I have argued in Sec-
tion 9.3.1 for neutralizations involving the other two clitics, this
neutralization is fortuitous; it simply results from the way the rules
operate and should not be considered to constitute any kind of struc-
tural zero at the syntactic or morphological level. There are also
neutralizations between words with the first person singular clitic and
words with the third person singular clitic. These occur in stems that
have $37, 41,$ and either $4$ or $31$ with no laryngeal, as can be seen by
comparing Tables 23 and 27.

To summarize, therefore, a word followed by the third person
singular clitic usually undergoes three rules: Feature Copy, one of
the five laryngeal replacement rules, and one of the two tone replace-
ment rules. Some words do not fit the structural description of any of
the five laryngeal replacement rules and so undergo only two rules.

The resulting form then undergoes primary tone association and the remaining regular rules of the language. The following partial derivations show this process:

\[
\begin{array}{|c|c|}
\hline
\text{(66)} & \text{Underlying Form} & 1 \text{ h} & 1 \text{ h} \\
& & \text{kinā} & \text{kinā} \\
& \text{Feature Copy} & \text{kinā} & [3\text{sg}] \\
& \text{Deletion of h} & 1 & \text{kinā} \\
& \text{Replacement by } 13 & 1 & \text{kinā} \\
& \text{Other Rules} & 2 & \text{kinā} \\
& & 1 & 1/ \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{(67)} & \text{Underlying Form} & 5 & \text{čē} \\
& & \{3\text{sg}\} & \{3\text{sg}\} \\
& \text{Other Rules} & 2 & \text{čē} \\
& & 1 & 1/ \\
\hline
\end{array}
\]

'will wash 3sg'

'walks 3sg'
Feature Copy

5

če

[3sg]

Laryngeal Replacement Rules do not apply

Replacement by 3

3

če

[3sg]

Other Rules

3

č

(68) Underlying Form

3 2 1

'owed 3sg'

kuno

Feature Copy

3 2 1

kuno

[3sg]

Replacement of Ø and i by h

3 2 h

kuno

[3sg]

Replacement by 3

3 h

kuno

[3sg]
9.4 Alternative Analyses

The word clitic calls to mind a variety of phenomena, many of which have little, if anything, in common with the Copala Trique phenomenon that I have been describing in this chapter.

Consider, for example, the object pronouns found in the Romance languages, which are attached to the verb either as proclitics or as enclitics. These pronouns are very different from Copala Trique clitics because the Romance forms represent specific grammatical functions,
because they occur in environments different from free objects, and because they sometimes double the free objects. Therefore, none of the analyses that have been proposed for these clitics, such as the movement analysis proposed by Kayne (1975:66) or the separate node solution suggested by Borer (1981), are relevant to Copala Trique.

Another phenomenon that often involves cliticization is the Aux node of a sentence, in which various combinations of small, closed classes, often including person-number marking for subject (and sometimes other argument positions), serve as a sentence-defining element, as described in Steele et al. (1981). It is clear, however, that Copala Trique clitics are not like Aux elements because Aux elements occur only once per sentence, and in a specified linear order, while Copala Trique clitics occur in any head of noun phrase position in the sentence, and two or more clitic pronouns, either the same one or different ones, can occur within the same sentence, as seen in examples (21), (22), and (35) above.

Still another use of the term clitic is for a reduced form that is synchronically relatable to a full word, but which sometimes loses its accent and is attached to another word. This is the simple clitic described by Zwicky (1977). I have already ruled out such an analysis of Copala Trique clitics by showing that there are no full forms to which the clitics may plausibly be related; see the discussion in Section 9.2. (Historically, of course, this reduction is probably the
main, if not the only, source of clitics, but diachrony should not force an implausible synchronic analysis.)

There is only one alternative to the analysis that I have chosen that merits serious consideration, namely, a morphological analysis in which the clitics are reanalyzed as inflectional affixes of some type. They would be attached to stems within the lexicon, after which the inflected word would be inserted into the tree as a single unit.

That there are advantages to such an analysis can hardly be denied. First, and most obviously, the clitics are invariably bound, and tightly so, to their hosts, which makes them look affixlike. If we say that they are affixes, their attachment is no longer a problem to be accounted for. Also, some of the rules that produce the surface forms of words that contain clitics are morphological rules or morphologically conditioned rules. If the clitics are reanalyzed as affixes, then they are attached in the lexicon, a component of the grammar where irregular rules of this type normally occur.

The syntactic price that must be paid for this phonological simplification is, however, very heavy. In the analysis presented in this study, the basic syntactic patterns of the language are fairly simple, as outlined in Chapter 6. In particular, all verbs subcategorized to take a subject must have one in every sentence, all prepositions must have a complement, and all possessed nouns must have a possessor. If, however, the clitics are reinterpreted as affixes, these three assertions about the distribution of noun phrases are no longer true. It
would instead be necessary to build a fairly complex disjunction into the syntax that requires these nodes to be filled only if the preceding verb phrase, preposition, or possessed noun occurs in a noninflected form, and that requires them to remain unfilled if the preceding verb phrase, preposition, or possessed noun is inflected. Further distributional statements are needed to place the subject inflection on the final word of the verb phrase, rather than on its verb head. In the above cases, in which a clitic constitutes the sole element in the noun phrase, the distributional statements for the morphological solution are complex, but not intolerably so. When, however, we consider the cases in which a clitic is attached to a quantifier or article within its own simple noun phrase, or the cases in which a clitic is a coordinate conjunct, the distributional statements that are needed increase considerably in complexity. Furthermore, in the case of a coordinate noun phrase, a word would be inflected for only one of the conjuncts, never for both of them. Even though it would be possible to state these restrictions, they are completely unmotivated in an inflection analysis, whereas the distributional facts fall out naturally from the analysis that I have proposed, in which clitics are heads of noun phrases at the underlying level.

I believe that the syntactic facts alone are significant enough to discredit the inflection analysis, but there are three other considerations that are also worthy of mention: the defective paradigm found
in clitics, the need for inflecting most lexical classes, and the post-lexical phonology involved in clitics.

The set of Copala Trique clitic pronouns contains only three members, and these do not constitute a complete person-number paradigm. For example, none of the clitics can refer to a second person singular referent. It is highly unusual to have an inflectional system that does not partition the person-number space exhaustively, even though it is common for such systems to make fewer distinctions than are made in the corresponding set of free pronouns. For example, in Spanish, the three pronouns él 'he', ella 'she', and usted 'you singular formal' all share the same inflectional category on verbs, traditionally called 'third person singular'.

If clitics were reanalyzed as inflectional affixes in Copala Trique, it would be necessary to claim that all major lexical categories are inflected, and many minor ones as well. It is characteristic of inflectional systems that they are limited to one or a few major lexical categories, rather than ranging over nearly the entire lexicon. Furthermore, it is extremely unusual to have inflection on such closed classes as articles (except for agreement) and conjunctions. I am not aware of any language that has such a phenomenon.

The final argument against an inflectional analysis is found in the fact that two of the clitics condition the application of the two tone sandhi rules, which, as I have shown in Chapter 8, Section 8.2, must be postlexical. Also, the tone sandhi rules, which precede the
attachment of these clitics, clearly take place after primary and secondary tone association, which means that clitics attach after these regular phonological processes too. If clitics were reanalyzed as inflectional affixes, they would attach in the lexicon before any of the regular phonological rules applied, and it would be necessary to complicate the analysis considerably to account for certain forms that fall out naturally under the clitic analysis.

9.5 Theoretical Implications

As I have shown above, there are strong reasons, both syntactic and phonological, for considering the Copala Trique elements under discussion in this chapter to be clitics. By this I mean that they are generated in the syntax as independent elements and then attached to their hosts by a set of processes that are postsyntactic, postlexical, and post-lexical-insertion. If this claim is correct, then linguistic theory must allow some morphological and morphologically conditioned rules to apply postlexically, because some rules of this type are needed to derive the correct surface forms of words with clitic pronouns attached to them. Furthermore, some of these rules must be allowed to follow some processes that are completely regular. The chief theoretical thrust of this chapter, therefore, is to reinforce the conclusions I drew in Chapter 8 by providing additional evidence for them.

As noted in Chapter 8, the current trend in linguistic theory is to eliminate all morphological and morphologically conditioned rules from postlexical phonology, either by having such rules apply within the
lexicon, as proposed by Kiparsky (1982) and Mohanan (1982), or by listing allomorphs in the lexicon, as suggested by Lieber (1982). I would like to urge a reconsideration of the view proposed by S. Anderson (1975), in which different types of rules are permitted to be ordered among each other.

Linguists who have worked specifically on clitics, rather than on morphology in general, have sometimes also taken the strict separation position. Klavans (1983), for example, makes a distinction between lexical clitics and postlexical clitics, using Kiparsky's criterion of absolute phonological regularity to separate the two. Postlexical clitics are generated in the syntax as independent elements and cliticized postlexically, but, in order to qualify as postlexical clitics, none of the rules affecting them can refer to morphological information. If any of the rules do, then they are lexical clitics, which are generated in the lexicon as the outermost layer of affixation and inserted together with their hosts into the syntactic tree. By this criterion, Copala Trique clitics would have to be lexical clitics because some of the rules that apply in their derivation require morphological information. The claim I am making in this study is that they are postlexical clitics in spite of this irregularity.

Zwicky and Pullum (1982) give a list of six criteria to distinguish clitics from affixes. Of the four criteria that are relevant for Copala Trique, the elements I have called clitic pronouns come down squarely on the clitic side with respect to three of them. Trique
clitics exhibit a low degree of selection with their hosts, show almost no arbitrary gaps in their combinations with hosts, and show no semantic idiosyncrasies. On the fourth criterion, morphophonological idiosyncrasy, however, Copala Trique clitics fall on the affix side.

There seems to be an unconscious assumption that criteria such as these will pattern together. Surely they tend to do so, and the development of phonological irregularity is likely to be accompanied by semantic irregularity, arbitrary gaps, and greater selectivity. These criteria need not always pattern together, however, as I have shown in Chapter 8. The clitics appear to provide a second instance in Copala Trique where semantic compositionality and regular application is preserved in spite of some degree of phonological irregularity.
NOTES FOR CHAPTER 9

1. The first person singular free pronoun ends in h, and the first person singular clitic pronoun causes the word to which it is attached to end in h. These facts make it appear that the clitic is a reduced form of the free pronoun. There are, however, good reasons for considering the free and clitic forms to be separate lexical entries in the grammar of Copala Trique. There are also superficial resemblances between the other clitics and certain semantically similar free pronouns, but in no case do I posit a reduction as either the historical or the synchronic source of the clitics. See the discussion in Section 9.2.

2. Perhaps because of an emerging written style, at least one speaker has developed another constraint that overrides this one. As described in Section 9.3.1 below, stems with certain tone-laryngeal combinations have a form with the clitic attached that is homophonous with the stem alone. Even though there is no real ambiguity within the context of the sentence, this speaker uses the free pronoun in place of the clitic in such instances, even if it results in a sentence with the free pronoun following the clitic pronoun.

3. See Note 2.
4. It is not quite true that no semantic idiosyncrasies occur. There are a few words that are, synchronically, simple lexical entries, but which, etymologically, consist of a clitic attached to some stem. Because these combinations have become semantically specialized, however, they merit separate lexical listing. The free inclusive pronouns ro\(^1\) and ni\(^4\) consist of the articles plus the inclusive clitic, for example, and the verb a\(^w\)e\(^3\) 'to be possible' consists of a\(^w\)e\(^2h\) 'to be willing' plus the third person singular clitic. I very much doubt, however, that native speakers are aware of the etymology of these words.
CHAPTER 10

CONCLUSIONS

In the preceding chapters I have presented both a phonological and a morphological analysis of the laryngeal tier in Copala Trique. To conclude this study, in the present chapter I evaluate the analysis developed in earlier chapters, summarize the implications of my findings for linguistic theory, and suggest some topics for future research.

I consider first four specific topics in phonology: the five-level analysis, the tone features, the decision to place nuclear laryngeals on the same tier as tone, and the analysis of the surface length contrast in terms of the abstract laryngeal \( l \). Under each of these topics I consider whether or not the analysis I have adopted facilitates the statement of morphological alternations. I next consider briefly the relation of autosegmental phonology to the typology of tone systems. Finally, I evaluate the two kinds of morphological analysis presented, word-internal and word-external.

In Chapter 4, Section 4.1, I presented phonetic evidence in support of a five-level tone system. While this evidence clearly demonstrates a surface contrast among five levels, it cannot rule out the possibility of an abstract analysis in which one, or even two, of the phonetic levels are considered to be merely surface realizations of an
underlying contrast that employs fewer levels of tone. One way in which such an abstract analysis could be carried out is to consider one or two of the levels to be variants of some other tone conditioned by some non-tonal phenomenon, such as a laryngeal.

An examination of Table 13 in Chapter 5, Section 5.4, which shows all of the possible tone-laryngeal combinations, reveals only five lacunae out of the thirty-two cells (331, 332, 4h, 31, and 31). Even though there are more than four lacunae, which is the minimum necessary to reduce the eight by four matrix to seven by four, it can be seen that the pattern of gaps does not lend itself readily to any abstract analysis. It would therefore be necessary to posit either a fourth laryngeal, or some other phonological unit, and all such analyses appear to be at least as complex as the five-level tone system they are designed to simplify.

A second kind of abstract analysis involves considering one or two of the levels to be underlying tone sequences. Such an approach is possible, but it faces two problems. The first is a rather severe departure from phonetic reality as soon as even one level is eliminated. If, for example, we eliminate level 5 and assign it the underlying representation 34, it is necessary to write a rule to account for the fact that the level 4 at the end of the 34 sequence has a much higher fundamental frequency than level 4 alone. (See Table 5 in Chapter 4, Section 4.1.) Also, 34 would be the only underlying sequence whose component levels agreed in their specification for the feature [HIGH]. The
second problem such an abstract analysis faces involves morphological alternations. An analysis of \( \frac{5}{34} \) as \( 34 \) would, for example, require changes in the statement of six of the fourteen rules that realize \( F_1 \) and \( F_2 \); in each case the changes would make them more complex. The \( 34 \) sequence would be the only underlying sequence that did not alternate with one of its component levels to realize \( F_1 \) and \( F_2 \), but which replaced both of its levels by a single lower tone. In no area of the phonology or morphology would the analysis be simplified by adopting this solution, as the reader can verify if he wishes to work out the details.

There are other possible abstract tonal analyses, but most of them involve positing an upglide beginning with level \( 2 \) as the underlying representation of what I have analyzed as levels \( 4 \) and/or \( 5 \). Any such analysis will encounter severe problems with the system of tone features because levels \( 4 \) and \( 5 \) are [+HIGH], and level \( 2 \) is [-HIGH]. The two high levels must be correctly specified with respect to this feature in order to handle either phonological rules like Tone Epenthesis (rule (34) in Chapter 4) or morphological rules like Replacement by \( \frac{2}{3} \) (rule (65) in Chapter 9), which produces the correct tone on words that contain the third person singular clitic.

The analysis of Copala Trique tone that I have presented employs five tone levels. Though it is far from simple, I believe it is coherent. The complexity appears to lie in the data, rather than in some defect of analysis. The burden of proof now lies with those who reject
five-level tone systems to show that they can produce a more coherent analysis that employs fewer tone levels.

It seems to be necessary, therefore, for linguistic theory to recognize the existence of five-level tone systems. Further research on other tone systems that are reported to have five levels (see Note 1 of Chapter 4) would be desirable to see if the number of levels can be reduced in any of them by a coherent abstract analysis.

I turn now to an evaluation of the feature system I have proposed. First of all, the basic division between levels 1 and 2, which are [-HIGH], and levels 3, 4, and 5, which are [+HIGH], has proven so useful for the statement of both phonological and morphological rules that it is difficult to imagine how any feature system that failed to recognize it could describe Copala Trique at all. This constitutes fairly strong evidence against most of the feature systems that have been proposed, because they do not allow the assignment of the value [+HIGH] to the three highest levels.

The remaining two features, [CENTRAL] and [EXTREME], are very useful in writing phonological rules that account for surface tones. They do not, however, show such a pervasive utility in the morphology, perhaps because the morphological rules are not natural processes. These two features are, however, quite adequate for writing the necessary rules and do not appear to complicate them in any way.

It appears, therefore, that at least these three features must be provided by phonological theory in order to describe the tone systems
found in natural languages. Research on other languages carried out by Yip (1980) and Clements (1981b) indicates that a feature \([\text{HIGH}_2]\) is also needed, and research by Woo (1969) suggests the need for the feature \([\text{LOW}]\) as well. Further research is needed to apply these features to a wide variety of tone languages with different numbers of levels, and with different areal, genetic, and typological affiliations, to determine whether all five of these features are needed, or whether linguistic theory should provide fewer features, and if so, which ones.

Further research is also needed to determine the proper way to define the tone features, i.e., the relative weight of phonetic versus phonological criteria.

I turn now to the question of a laryngeal tier, as opposed to a merely tonal tier. The decision to place nuclear laryngeals on the same tier as tone has been amply justified by the way in which it simplifies a large number of morphological rules, which would otherwise need to be written as more highly marked cross-tier rules. Furthermore, these laryngeals are never in the way, though sometimes it is necessary to include an optional laryngeal in the environment. If, however, I had analyzed the onset laryngeals as part of the laryngeal tier, they would in some instances be in the way, in addition to the fact that they neither undergo nor condition any of the rules that affect tone or nuclear laryngeals.

Further research on a variety of languages is needed to test Yip's proposal about placing laryngeal phenomena on the same tier as
tone (1982). This proposal predicts that word-medial laryngeals should constitute a barrier to tone movement. Unfortunately, however, Yip's article included no data about medial laryngeals, only initial and final ones. In Copala Trique, however, there is no evidence that word-medial laryngeals constitute a barrier to tone movement. In this language it has proven fruitful to place nuclear, specifically word-final, laryngeals on the same tier as tone, but not onset laryngeals, and not other laryngeal phenomena, such as voicing.

Because tone and laryngeals are so important in the Otomanguean stock, Otomanguean languages are likely candidates for exploring the validity of the laryngeal tier proposal. There is some preliminary evidence in favor of a laryngeal tier in some languages of this stock. For example, a close relationship among tone, stress, and laryngeals is seen in Cajonos Zapotec (Nellis and Hollenbach 1980:97-103) and also in Isthmus Zapotec (Mock 1980). In Mock (1983), which gives an autosegmental account of tone sandhi in Isthmus Zapotec, word-final ʔ is shown to affect the application of various rules (p. 106); specifically, it blocks spreading of a high tone to the following word (p. 110). It seems likely that the composition of a laryngeal tier will have to be established for each language according to phonological function, rather than being defined universally by some absolute phonetic standard. A corollary of this is that the composition of the laryngeal tier can change over time, and that a skewed synchronic analysis may reflect an incomplete change.
The analysis of the surface length contrast as an abstract ballistic laryngeal is perhaps the proposal with the least potential for cross-linguistic utility of any in this study. The decision to posit this laryngeal is, admittedly, highly language-particular, and yet it has resulted in a considerable simplification of many rules and constraints in Copala Trique. It therefore seems necessary to provide some way to handle such an element in a system of universal features. Further research is clearly needed on the ballistic contrast in a variety of languages in order to determine whether it has a unified articulatory basis and how it functions phonologically. Preliminary published evidence shows some differences in the distribution of a ballistic element in different languages. In Copala Trique, vowel length is the primary manifestation of the ballistic contrast, whereas in Lalana Chinantec (Rensch and Rensch 1966:456-57, 462-63 and Mugele 1982:12-13), vowel length and the ballistic contrast are independent parameters. Also, in Copala Trique, the ballistic contrast does not occur with postvocalic ʔ, whereas in Amuzgo (Bauernschmidt 1965:471), checking by ʔ and the ballistic contrast are independent parameters. In spite of these differences, however, there does appear to be a unitary phonetic phenomenon involved, namely, a raising of subglottal pressure (Mugele 1982:14), and phonological theory must therefore provide a feature specification for it. Mugele (1982:105) has suggested a vowel feature [ballistic syllable], and I have suggested an adaptation of Chomsky and Halle's
feature [heightened subglottal pressure] (1968:326), but I have applied it to a laryngeal, rather than to a vowel.

A more general question raised by this study concerns the typology of tone systems and the applicability of autosegmental phonology to various types of systems. It is clear from the work of Haraguchi (1977) that autosegmental theory can be applied to a pitch-accent system like Japanese, as well as to true tone languages. In certain respects, however, autosegmental phonology fails to provide an insightful description of Copala Trique. In particular, it does not account for the way that tone is assigned to syllables that do not bear contrastive tone. Should autosegmental theory be modified in some way to take cases like this into account, or is it a theory that applies only to some tone languages. Further research on languages from a variety of areal, typological, and genetic affiliations is needed to answer this question.

Another way to view the question of tone typology has to do with the issue of maximal complexity. Given the limitations of the human language-processing mechanism and the need to maintain communication under conditions that are less than ideal, there must be some maximal degree of complexity that languages can tolerate in their phonological systems, including their use of pitch phenomena. One way to reduce complexity is via paradigmatic limitations, i.e., permitting only a specified number of contrasts in a given position. A second way is via syntagmatic limitations, i.e., permitting contrasts to occur in fewer possible positions. In practice, of course, many systems have some
limitations of each type. Copala Trique seems to be near one extreme: it has the maximum number of levels attested, but restricts their occurrence to only two possible locations: the final syllable of the word, or a lexically specified earlier syllable. Another language in the Mixtecan family of Otomanguean, San Miguel El Grande Mixtec, is near the other extreme: it has only three levels, but every syllable carries one (and only one) contrastive tone (Pike 1948:77-94). Chicahuaxtla Trique, on the other hand, occupies an intermediate position: contrastive tone occurs on all syllables, but more contrasts are found on final syllables than on others (Longacre 1952). The Trique system apparently arose historically from a syllable-tone system by a process of tone shifting to the right (Longacre 1957:100-101, 103-110). This shift has progressed farther in Copala Trique than in Chicahuaxtla Trique. Further research is needed to determine the maximum degree of complexity that can be tolerated, the ways in which it can be distributed paradigmatically and syntagmatically, and the ways in which languages can change this distribution over time.

I turn now to word-internal morphology. The laryngeal tier changes described in Chapter 7 place certain requirements on a general theory of morphology. I summarize some of the most important ones here. First, the theory must provide for three separate levels of structure: morphosyntactic categories, formatives, and morphological rules. Any theory which requires morphosyntactic categories to be realized directly by phonological material, without the intermediate formative level, will
result in an unnecessary complication of the grammar of Copala Trique. Also, the theory must allow deletions and replacements to be handled as easily as regular affixation; the approach taken by S. Anderson (1982: 591-96) seems well suited to the description of such processes. Third, morphological rules must be permitted to have a complex form, such as that provided by a transformational notation. McCarthy (1981:405) claims that a proper use of autosegmental tiers obviates the need for rules of this type, but his claim appears to be incorrect for Copala Trique. It also seems likely that any theory of morphology that posits a rigid distinction between derivation and inflection, or between regular and irregular morphology, will unnecessarily complicate the grammar of Copala Trique.

In the area of word-external morphology, the most important implication of the Copala Trique data on sandhi and clitics is that the tenets of lexical phonology, developed by Kiparsky (1982), simply do not hold universally. Grammatical theory must allow rules that require access to morphological information to apply postlexically.
APPENDIX

SUMMARY OF RULES

All of the rules posited in this study as part of the grammar of Copala Trique are listed below, each with its name, the number of the chapter in which it is presented, its example number, and the page on which it is found. These rules are grouped into seven blocks according to the type of rule and the order in which they apply. The first two blocks of rules apply within the lexicon, and the remaining five apply after lexical insertion.

The first two blocks of rules are unordered morphological rules that are confined to the laryngeal tier. They are not ordered between the two blocks, but are separated only for convenience. The first block comprises seven parsing rules that account for the relationship between the basic form of quantifiers and their additive form, which is created by the addition of $F_3$. These rules are all presented in Chapter 7, Section 7.5; they are:

- Deletion of Tone $\underline{\_} \rightarrow \underline{7}$, (130), p. 250
- Replacement of $\underline{\_}$ by $\underline{3} \rightarrow \underline{7}$, (131), p. 250
- Replacement of $\underline{\_}$ by $\underline{4} \rightarrow \underline{7}$, (132), p. 250
- Replacement of $\underline{1h}$ by $\underline{5} \rightarrow \underline{7}$, (133), p. 251
- Replacement of $\underline{\_}$ by $\underline{5}$ Before $\underline{h} \rightarrow \underline{7}$, (134), p. 251
Replacement of 2 by 5 — 7, (135), p. 252
Replacement of 2 by 4 — 7, (136), p. 252

The second block comprises fourteen rules that account for the alternations between the basic form of words and the form with lowered tone that realizes $F_1$ and $F_2$. Unlike the rules in block one, these rules are at least partly generative. These rules are all presented in Chapter 7, Sections 7.3 and 7.4. In the case of rules that were revised after being presented, the revised form is listed first. These rules are:

Deletion of Tone 3 — 7, (70), p. 231 (also 7, (22), p. 215)
Epenthesis of Tone 1 — 7, (77), p. 232 (also 7, (28), p. 217)
Replacement of 3 by 2 (minor) — 7, (78), p. 232
Replacement of 4 by 1 — 7, (83), p. 233 (also 7, (32), p. 218)
Replacement of 4 by 2 (minor) — 7, (33), p. 218
Replacement of 5 by 2 Before h — 7, (36), p. 219
Replacement of 5h by 2 (minor) — 7, (37), p. 219
Replacement of 5 by 1 Before h — 7, (85), p. 234
Replacement of 5 by 1h — 7, (87), p. 235 (also 7, (40), p. 220)
Replacement of 5 by 2 (minor) — 7, (41), p. 220
Epenthesis of Tone 2 (minor) — 7, (50), p. 223
High Tone Lowering — 7, (91), p. 237 (also 7, (57), p. 225)
Epenthesis of 2 with Movement of 3 (minor) — 7, (62), p. 227
The third block of rules is morphological, but postlexical. It comprises eight rules that account for the forms that stems take when the third person singular clitic is attached to them. These rules fall into three ordered subgroups. The rules within each subgroup are, however, unordered. All of these rules except Feature Copy are limited to the laryngeal tier. These rules are all presented in Chapter 9, Section 9.3.2. The first subgroup comprises only a single rule:

Feature Copy — 9, (58), p. 362

The second subgroup comprises five rules:

Deletion of $\bar{h}$ — 9, (59), p. 362
Replacement of $\bar{z}$ by $\bar{h}$ — 9, (60), p. 363
Deletion of $\bar{\imath}$ — 9, (61), p. 363
Replacement of $\bar{\emptyset}$ and $\bar{\imath}$ by $\bar{h}$ — 9, (62), p. 364
Epenthesis of $\bar{h}$ Following $\bar{\imath}$ (minor) — 9, (63), p. 365

The third subgroup comprises two rules:

Replacement by $\bar{13}$ — 9, (64), p. 366
Replacement by $\bar{3}$ — 9, (65), p. 367

The fourth block consists of certain regular phonological rules. Most of them are restricted to the laryngeal tier, like the morphological rules already listed, but one, Nasal Spreading, is segmental, and the two stress rules refer to both tiers. These rules are tightly ordered among themselves, except that No Crossing, which is a universal convention, may apply more than once in a derivation to associate laryngeal tier material. These rules are presented in Chapter 3, Section
3.1, and Chapter 4, Section 4.3; they are:

Nasal Spreading — 3, (26), p. 54
Initial Tone Association — 4, (26), p. 104
No Crossing (universal) — 4, (28), p. 105
Primary Stress Placement — 4, (40), p. 112
Secondary Stress Placement — 4, (41), p. 112
Tone Epenthesis — 4, (34), p. 109

The fifth block of rules accounts for the changes that are involved in tone sandhi and the attachment of the first person singular and inclusive clitics. These rules are confined to the laryngeal tier. Even though some of the rules in this block are morphologically conditioned, it comes between blocks four and six, both of which comprise only regular phonological rules. The rules within block five are ordered fairly tightly. They are presented in Chapter 8, Section 8.2, and in Chapter 9, Section 9.3.1. These rules are:

Tone Sandhi One — 9, (43), p. 343 (also 8, (19), p. 278)
Tone Sandhi Two — 9, (44), p. 343 (also 8, (20), p. 279)
Extreme Lowering — 9, (45), p. 344
Cliticization — 9, (41), p. 341
Laryngeal Deletion — 9, (42), p. 341
Lowering to Central — 9, (46), p. 345
Downglide Simplification — 9, (47), p. 345
Rule blocks six and seven consist entirely of regular phonological rules. Block six contains laryngeal tier rules, and block seven contains segmental tier and cross-tier rules. The two blocks are not crucially ordered with respect to each other; they are separated mainly for convenience. Block six must, however, follow block five. The rules within each block are not internally ordered. The rules in block six are presented in Chapter 4, Section 4.3; they are:

- Upglide Insertion -- 4, (45), p. 115 (also 5, (34), p. 156)
- Downglide Insertion -- 4, (46), p. 115 (also 5, (35), p. 156)
- Association to Right -- 4, (48), p. 117

The rules in block seven are presented in Chapter 3; they are:

- Progressive Nasalization -- 3, (20), p. 51
- Vowel Lengthening -- 3, (22), p. 52
- Mid Vowel Laxing -- 3, (24), p. 53
- Low Vowel Raising -- 3, (27), p. 54
- Lax Stop Lenition -- 3, (47), p. 64
- Labiovelar Glide Spirantization -- 3, (49), p. 65
- Sonorant Lengthening -- 3, (51), p. 65
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