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John Alderete

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An Effort Based Approach to Consonant Lenition
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Morphologically Governed Accent in Optimality Theory

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Preface

This book is a revised version of my doctoral dissertation from UMass-Amherst. It subsumes manuscripts circulated in August 1998 and March 1999 (the version sent out on the latter date was uploaded on the Rutgers Optimality Archive as ROA-309-0399) and the draft submitted to the graduate school in May of 1999. In the present version, I have corrected most of the obvious errors of the previous work and added an index and a conclusion chapter. This version also makes an attempt to harmonize the discussions in chapters 2, 4, and 5 with my more recent views, which are treated somewhat less comprehensively in two forthcoming articles:

2001. Root-Controlled Accent in Cupeño. *Natural Language and Linguistic Theory* 19.3.

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I would also like to express my gratitude to all those who have contributed over the years to my professional and intellectual development. There is a long road between putting together a good homework solution and writing a dissertation, and the support I received from my committee and the larger faculty at UMass was essential to my arriving at where I am today. Many others aside from the committee have helped me come to understand myself as a linguist, but those at the forefront of my mind include Emmon Bach, Roger Higgins, Angelika Kratzer, and Ellen Woolford, and also my teachers and advisors at UC Santa Cruz, Junko Itô, Sandra Chung, and Bill Ladusaw.

The idea that served as the point of departure for this thesis, namely that the accentual properties of roots play a major role in governing word accent, was first hit upon in the summer of 1995 in the weekly brown bag meetings of John McCarthy's National Science Foundation grant (SBE-9904360). I am grateful to John for providing that environment, and for the creative input and expert advice of the participants of those meetings, including Jill Beckman, Laura Benua, Amalia Gnanadesikan, Suzanne Urbanczyk, and in later years, Toni Borowsky, Patrik Bye, Katy Carlson, Paul De Lacy, Mark Harvey, Anna Lubowicz, Caroline Jones, Jennifer Smith, and Rachel Walker. Other opportunities for presenting my research contributed greatly to the preparation of this thesis, including a series of informal meetings at Rutgers and MIT, and invited talks at Cornell University, Johns Hopkins University, SUNY Stoney Brook, University of Alberta, University of British Columbia, University of Calgary, University of California at San Diego, University of Texas at Austin, University of Victoria, and University of Wisconsin at Madison. Thanks to the audiences of these gatherings for their helpful comments and questions.

Like most dissertations in linguistics, the argumentation developed in this one revolves around the presentation of evidence, and I would like to thank the language experts who helped in the collection, organization, and interpretation of this evidence. I am especially indebted to Jane Hill for carefully answering my questions about Cupeño and for making available to me her unpublished fieldnotes and a tape of Cupeño speech. I also owe a great deal to Bob Rothstein for explaining many aspects of Russian morphology and phonology to me. Thanks also to Keren Rice and Ed Cook for their advice on linguistic structures in Tahltan, and for helping me clarify a set of problems for after the dissertation. I am also glad to have had the opportunity to converse with Ben Hermans about all aspects of phonology, but especially to get his input on Limburg Dutch, which greatly improved the case study of this language. Thanks is also due to David Payne, who helped me gain a better understanding of accent in Aguaruna, in addition to several other aspects of the language. A special commendation is in order for my Japanese consultants, Ikuyo Kaneko, Kiyomi Kusumoto, Junko Shimoyama, Mariko Sugahara, and Hisao Tokizaki, both for helping me find examples and providing a background for classifying and analyzing them.

I have learned a great deal through conversations and correspondence with a number of other linguists. Thanks to the following for their input and critical perspective during the development of the ideas in this thesis: Akinbiyi Akinlabi, Brett Baker, Eric Baković, Lee Bickmore, Abdelaziz Boudlal, Ellen Broselow, Guy Carden, Ioana Chitoran, Abigail Cohn, Megan Crowhurst, Ewa Czaykowska-Higgins, Diamandis Gafos, Dale Hartkemeyer, Bruce Hayes, Paul Hopkins, José Ignacio Hualde, Abdelkrim Jebbour, René Kager, Yoonjung Kang, Motoko Katayama, Ed Keer, Michael Kenstowicz, Armin Mester, Scott Myers, Marc van Oostendorp, Jaye Padgett, Steve Parker, Joseph Pater, Douglas Pulleyblank, Eric Raimy, Anthi Revithiadou, Patricia Shaw, Bruce Tesar, Ayako Tsuchida, Hubert Truckenbrodt, Charles Ulrich, Draga Zec, and Cheryl Zoll. A special thanks is also due to Leora Bar-el, Henrike Blumenfeld, David January, Kyra Jucovy, and Brent Whitted for proof-reading the manuscripts and giving helpful stylistic advice.

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With love and gratitude, this dissertation is dedicated to my parents.

Abstract

This dissertation examines the influence of morphological factors on stress and pitch accent. Two basic types are recognized. In root-controlled accent, inherent accent in a root overrides inherent affix accent; as a result, affixal accent is only realized in words with unaccented roots. In affix-controlled accent, the presence of a particular affix triggers one of several accentual mutations in the stem: deletion of accent (or a "dominance effect"), insertion of an accent (often known as pre- or post-accentuation), and accent shift or "flop".

I argue that these two types of accentual behavior, despite important differences, are united under the rubric of faithfulness constraints in Optimality Theory. Root-controlled accent is a consequence of the privileged faithfulness status of roots over affixes, as has been shown in other empirical domains such as vowel harmony. Affix-controlled accent is due to a novel type of constraint, anti-faithfulness, which evaluates a pair of morphologically related words and requires an alternation in the shared stem.

The principal case of root-controlled accent studied in this dissertation is the Uto-Aztecan language Cupeño. In addition, I show how the accentual systems of Japanese and Russian fall within the scope of root faithfulness constraints. The study of these cases leads to a substantive restriction on the range of edge effects in accent systems, and clarifies a role for root accentedness in blocking morpho-accentual processes.

A number of properties of affix-controlled accentual processes are identified and shown to follow from the anti-faithfulness thesis. Affix-controlled accent is (I) morphologically triggered, (II) stem-mutating, and (III) grammar dependent. (I-II) follow from the assumption that anti-faithfulness operates on related words: forcing an alternation in a pair of words ensures that affix-controlled accent is morphological because it contrasts two word classes. Furthermore, as a relation between words, anti-faithfulness only affects the interval of a word which occurs throughout a paradigm, namely the stem (II). Finally, anti-faithfulness does not fully specify how a pair of words should differ accentually; its specific effects therefore depend on the larger grammar in which it is embedded (III).

Affix-controlled accent in Russian, Japanese, Cupeño, Limburg Dutch, and Aguaruna (Jivaroan) is investigated in a series of case studies. I argue that anti-faithfulness constitutes an integrated theory of the diverse morpho-accentual phenomena found in these languages, explains the important differences between the accentual properties of roots and affixes, and establishes parallels with non-accentual affix-controlled phenomena.

Table of Contents

CHAPTER 1

Introduction

1.1 Morphologically Governed Accent in Optimality Theory

This dissertation is about accent systems in which word structure has an important role in the characterization of accentual processes. These processes affect phonological categories like stress and tone, but importantly, they cannot be described with reference to sound structure alone. Morphological factors like the accentual properties of roots and certain diacritically marked affixes must also be recognized. As many accent systems studied here have a strict limitation of one accent per word, one major accentual process examined in this thesis is Accent Resolution, the deletion of accent in words with more than one inherently accented morpheme. This pattern of deletion often shows a preference for retention of accent in the root, which underscores one important function of morphological structure. Other morpho-accentual phenomena examined here include morphologically triggered de-accentuation (or 'dominance effects'), accent insertion (often known as pre- and post-accentuation), and certain accentual shifts. The occurrence of these processes is, in many cases, directly tied to affixation, and so they too are inherently morphological. The focus here is almost exclusively on word accent, as the accentual processes under examination are mostly word-level phenomena, but some parallels with other levels of structure are made throughout this thesis.

1.1.1 Goals

This thesis has two basic goals. The first goal is more or less a descriptive one and involves arguing for the existence of two distinct types of morpho-accentual processes (1). The first type is an analogue to a well-known type of vowel harmony system where the features of root vowels have the effect of 'overriding' the featural specifications in prefixes and suffixes. In many accent systems, the presence of an accent in the root likewise overrides accent in affixes, hence the term 'root-controlled accent'. The second type is fundamentally different from the first. Generally linked to affixation, 'affix-controlled' accentual processes require a change in the accentuation of the base, which is usually the root or the stem.

(1) a. Root-Controlled Accent (RCA): inherent accent in the root precludes the realization of accent elsewhere in the word.

b. Affix-Controlled Accent (ACA): the attachment of an affix correlates with a mutation of the accent in the base of affixation.

The second goal, related to the first, is to argue for a specific theoretical model that accounts for these two types of morpho-accentual processes in an explanatory way.

To my knowledge, the first characterization of an accent system in terms of root-control is given in Hill & Hill 1968, which describes stress-accent in the Uto-Aztecan language Cupeño. In this language, both roots and affixes have an accented/unaccented contrast, but when an inherently accented root combines with an accented affix, the root accent 'wins', as exemplified below with some characteristic examples (the roots are underlined).

(2) Root-Controlled Accent in Cupeño (Hill & Hill 1968)

a.	/pé + yax/	→	pé-yax	'He says'
	/pé + yax + qál/	→	pe-ya-qál	'He was saying'
b.	/pé + ʔáyu + qál/	→	pe-ʔáyu-qal	'S/he was wanting'
	/pé + pulín + qál/	→	pe-pulín-qal	'She gave birth'

Part of the descriptive aim of this thesis is to extend this idea to other, better-known accent systems like Russian and Japanese. In the analyses of these systems, root-controlled accent has a very similar role, causing the deletion of an accent outside of the root. The parallels between these systems run deeper than this, however, which can be seen by examining a second pattern of RCA.

RCA has an equally important role in blocking the application of other accentual processes. For example, Cupeño has a set of suffixes which place an accent on the root-final syllable (3a), but this process is blocked in words with accented roots because such an insertion would preclude the realization of a root accent (3b).

(3) Blocking Effect of RCA in Cupeño

a.	/wena + nuk_{pre}/	→	wená-nuk	'having put in'
	/né + ma + $či_{pre}$/	→	ne-má-či	'with my hand(s)'
b.	/méme + yke_{pre}/	→	méme-yke	'to the ocean'
	/tívii?e + maa_{pre} + le/	→	tívi?-me-l	'small round basket'

Likewise, in Russian and Tokyo Japanese, certain patterns of pre-accentuation are only found in words with unaccented roots, an observation which extends to other morpho-accentual processes. In sum, RCA has the effect of privileging

roots in the realization of inherent accent, both in the concatenation of more than one inherently accented morpheme and in the application of morpho-accentual processes.

In the second type of morpho-accentual process, affix-controlled accent, affixes are in charge accentually. However, this process is not simply the symmetric counterpart to RCA; it shows a different kind of behavior altogether. The main characteristic of ACA that sets it apart from RCA is that ACA demands a change in the accentuation of the base to which the affix is attached. Thus, affix-controlled processes run counter to the underlying force behind RCA because they demand a change in the prosody of the base, which typically contains the root. Three affix-controlled processes examined in detail here are illustrated below with some examples from Tokyo Japanese.

(4) Affix-Controlled Accent in Tokyo Japanese (Poser 1984, McCawley 1968)

a. Dominance effects require a deletion of base prosody

/edo + kko/	→	edo-kko	'native of Tokyo'
/kóobe + kko/	→	koobe-kko	'native of Kobe'

b. Pre-accentuation requires an insertion of accent into the base

/yosida + ke/	→	yosidá-ke	'the Yoshida family'
/nisímura + ke/	→	nisimurá-ke	'the Nishimura family'

c. Accent shifts require a shift of base prosody

/kúzu + ya/	→	kuzú-ya	'junkman'
/toma + ya/	→	toma-ya	'mat seller'

A common type of affix-controlled process, exemplified in (4a) with the suffix *-kko*, is deletion of the prosody of the base to which the affix is attached. It is clear why this type of deletion, sometimes called a 'dominance effect', is antagonistic to RCA: RCA strives to preserve the accent of the root, while *-kko* demands deletion of the root accent. Another type of affix-controlled process is pre-accentuation (or post-accentuation for prefixes), which causes insertion of an accent somewhere in the base, as shown in (4b). Pre-accentuation may also run counter to the imperative to realize root accent in this system because, as is typical, there is one accent per word in Japanese; the insertion of an accent thus entails the deletion of the base accent, as in *nisimurá-ke*. A final type of ACA involves accent shift or 'flop', exemplified in (4c) with the suffix *-ya*. While not in direct conflict with RCA, accent shifts of this kind resemble the other types of ACA in that they mutate the accent of the base. The accentual change demanded by *-ya* is a shift of the prosody of the base, as observed in words with accented stems like *kuzú-ya*. To summarize, affix-controlled accent is an obligatory change in the accentuation of the base of affixation; because of this change of base accent, ACA may be in conflict with root-controlled accent.

The identification of these two morpho-accentual processes raises the following two questions for the theory of morphologically governed accent.

1. How are the differences between RCA and ACA to be described and explained?

2. How is the conflict between RCA and ACA to be resolved?

The observation that RCA and ACA are fundamentally different poses the formal question of how to distinguish them as separate classes of morpho-accentual phenomena. Furthermore, the inherent difference between RCA and ACA leads to situations of conflict where RCA demands preservation of a root accent, while ACA requires a change of the root accent, even the deletion of it. Moreover, the negotiation of this conflict is a subtle matter. In some contexts RCA wins, as found in pre-accentuation in Cupeño. In the case of Japanese, however, ACA wins, as the pre-accenting suffix *-ke* induces an insertion of accent across the board, even in words with accented roots. How then is the conflict between these morpho-accentual phenomena to be modelled in a way that accounts for the observed cross-linguistic differences?

There is also a larger theoretical issue to be addressed in the analysis of these morpho-accentual processes. Both RCA and ACA have clear parallels in other morpho-phonological alternations and these parallels require explanation. As alluded to above, RCA is like root-controlled vowel harmony in that the phonological patterns observed in words are determined by the roots contained in these words. Affix-controlled accentual processes also have well-established parallels with non-accentual processes. Pre-accentuation, for example, can be compared to the length alternations induced by certain affixes, like pre-lengthening suffixes found in many languages (e.g., Yidiñ, Dixon 1977): both pre-accenting and pre-lengthening suffixes trigger a change of the phonological make-up of their bases. These considerations lead to a third important question, which has both descriptive and theoretical implications.

3. What accounts for the parallels to RCA and ACA found in other areas of phonology?

If the parallels pointed to above are valid, then it would be a significant liability if the ultimate theory of RCA and ACA did not make these connections. A major goal of this thesis, therefore, is to account for the properties of ACA and RCA with principles that are generally available in linguistic theory. The correct theory, by this desideratum, should account for the range of accentual processes with theoretical constructs that are not specific to a theory of accent, but rather, sufficiently general to extend to other morphologically governed phonological patterns.

1.1.2 Synopsis of Theoretical Arguments

In this dissertation, I argue that RCA and ACA, despite important differences, are united under the rubric of Faithfulness in Optimality Theory (Prince & Smolensky 1991, 1993, McCarthy & Prince 1993b). In particular, RCA is a consequence of the privileged faithfulness status for roots, as has been shown in other empirical domains, such as vowel harmony and dissimilation (see especially Beckman 1997 [1998]). The patterns of root retention in Cupeño and other languages are a consequence of root-specific Faithfulness constraints, a result that relates RCA to other root-controlled phenomena.

Affix-controlled accent, on the other hand, is modelled as an obligatory violation of Faithfulness, compelled by a new type of constraint, Anti-Faithfulness. Anti-Faithfulness constraints evaluate a pair of morphologically related words and trigger an alternation by forcing a violation of Faithfulness. Consistent with the desideratum 3 given above, the second half of this dissertation argues that Anti-Faithfulness constraints are indeed crucial to the analysis of morpho-phonological operations instantiated by affixes, of both accentual and non-accentual types. Anti-faithfulness constraints are thus not specific to a theory of accentual systems; they have a much more general role in linguistic theory.

To understand these theories, it is first necessary to understand the role of Faithfulness in Optimality Theory (OT).[1] Fundamentally, Faithfulness regulates identity relations between strings. As such, Faithfulness constraints have many important functions in OT grammars, including the resistance to phonological processes in lexical-to-surface mappings (IO-Faithfulness), the imperative to copy structures between base and reduplicant (BR-Faithfulness), and the enforcement of identity requirements between morphologically related words (OO-Faithfulness). Faithfulness is also implicated in one of the most basic aspects of a grammar, namely the characterization of the inventory of structures that form the building blocks of language. For example, Faithfulness constraints are responsible for licensing the phonological structures that bring about contrast in a language. Faithfulness regulates identity between lexical and surface forms, and as a result, it strives to maintain lexical contrasts in the output. Because of this, Faithfulness constraints enter into conflict with another type of constraint, the so-called Markedness constraints. Markedness regulates various forms of surface well-formedness by prohibiting specific structures. There is a basic tension between Markedness and Faithfulness: Markedness constraints push a lexical form towards unmarked structure, but Faithfulness pushes back, requiring the realization of marked lexical structure. In this way,

[1] For an introduction to the technical aspects of Optimality Theory, e.g., the generation and evaluation of candidate forms, see the references cited above, in addition to McCarthy & Prince 1994a, 1995, Beckman 1997 [1998], and Benua 1997 [1998].

language particular rankings of Markedness and Faithfulness define structural inventories.

This reasoning applies with equal force when accentual features like stress and tone figure in a phonological inventory. If Faithfulness to a particular prosodic structure is high ranking, specifically outranking the constraints that prohibit it, then this structure is present in the inventory and can potentially give rise to contrast. Conversely, the reverse ranking describes a system in which said prosodic structure is not a part of the inventory.

The approach to accentual contrast as the satisfaction of Faithfulness leads to a principled analysis of the first type of morpho-accentual process, root-controlled accent. Converging sources of evidence have surfaced recently that lead to the conclusion that there are distinct Faithfulness constraints for roots and affixes. A direct source of evidence derives from psycho-linguistic studies showing the privileged role of roots in lexical access and storage (see Beckman 1997 [1998] for a review). In addition, the distinction between Root and Affix Faithfulness is motivated on purely linguistic grounds (as argued in McCarthy & Prince 1995, Selkirk 1995a,b, Urbanczyk 1996, and Beckman 1997 [1998]). Cross-linguistically, roots have a privileged status in that they tend to permit a wider range of contrasts than affixes, and they often resist regular phonological processes that apply elsewhere. This evidence has led to the proposal that roots and affixes are governed by distinct Faithfulness constraints and that they are ordered universally as follows.

(5) Morphologically-Dispersed Faithfulness (McCarthy & Prince 1995)

Root Faith >> Affix Faith

These assumptions provide a basis for the analysis of root-controlled accent. Returning to the case of RCA in Cupeño, words may only have a single accent, so, in words with more than one inherently accented morpheme, all but one is deleted. If the word contains an accented root and one or more accented affixes, satisfaction of Root Faithfulness has the effect of precluding the realization of affix accent, as shown below.

(6) Root-Controlled Accent in Cupeño as Root Faithfulness

/pé + ʔáyu + qál/	FAITH(Accent)$_{Root}$	FAITH(Accent)$_{Affix}$
a. pé-ʔayu-qal	*!	*
b. → pe-ʔáyu-qal		**

This analysis explains the pattern of root retention in terms of the same constraint ranking used in the analysis of non-accentual phenomena like vowel

harmony, establishing a parallel between these two systems in a formal way. In addition to this result, there are two important consequences that this approach to RCA has for accentual systems.

The first consequence is that the role of directionality in accent systems is significantly reduced. The fixed ranking Root Faith >> Affix Faith predicts that root accent generally takes precedence over affix accent. This prediction is interesting because it attributes a role for the morphological structure in Accent Resolution (AR) that has been previously treated in terms of phonological directionality. For example, the retention of stem accent in many Indo-European languages is argued in Kiparsky & Halle 1977 to be due to a principle that assigns a word level accent to the first inherently accented morpheme of a word. Likewise, Poser 1984 employs a principle of directional AR that favors deletion of all but the first lexical accent in Japanese minor phrases. These accounts, however, lack the crucial evidence from prefix + root sequences showing that AR must be governed by directionality. The absence of a class of prefixes that 'win out' over a following stem accent invites a re-analysis of these phonological accounts in terms of root-controlled accent, and chapter 3 investigates this analysis in some detail in both Russian and Japanese. The findings from these case studies show that two additional accent systems, which have been analyzed previously in a different way, also fall within the scope of Root Faithfulness.

The theory of RCA developed here does not deny a role for directionality altogether. Rather, the RCA hypothesis predicts a specific type of interaction whereby root-controlled AR is primary, and, when Faithfulness is indecisive, directionality may take effect. Faithfulness is indecisive when it is crucially dominated. Thus, when a constraint that requires accent to appear at a designated edge dominates Faithfulness to lexical prosody, a directional pattern of AR may emerge. Also, Faithfulness is not decisive in word types where inherently accented morphemes are of equal status. For example, in Cupeño, words with an unaccented root and more than one accented affix show a preference for realizing rightmost affix accent. In such a scenario, rightmost accent surfaces when the grammar does not require faithful treatment of a root accent. To summarize, root-controlled AR is primary, applying to all cases where Root and Affix Faithfulness is not decisive.

A second important consequence of the RCA hypothesis is that it clarifies significant differences between root-controlled accent and affix-triggered processes like those illustrated for Japanese above. First, the Faithfulness-based analysis of RCA reveals patterns of phonological activity in distinct morphological domains. RCA assigns special Faithfulness for roots, thereby forcing accentual alternations in affixes. ACA, on the other hand, specifically mutates the prosody of the base, leaving the affixes themselves unaffected. Second, the underlying motivations for RCA and ACA are completely different. In the analysis of RCA developed here, the motivation for

root-controlled de-accenting is a set of phonological constraints requiring culminative accent, i.e., constraints prohibiting more than one accent per word. The role of Root and Affix Faithfulness is therefore not to trigger accent deletion but a way of predicting which accent is retained. The motivation for ACA is rather different because it is not driven by culminativity requirements. This is shown, for example, by the fact that accent-deleting morphemes may be unaccented, and yet they still trigger a deletion, e.g., /kóobe + kko_{Dom}/ → *koobe-kko* 'Native of Kobe'. The force behind affix-controlled accent deletion is not due to the pressure to limit the number of accents to one. Rather, deletion is morphologically motivated, required by a need to enhance morphological contrast. In summary, the Faithfulness-based analysis of RCA establishes that RCA and ACA are different animals altogether.

These systematic differences show that the analysis of ACA is not simply a matter of boosting the Faithfulness properties of affixes; ACA is not simply a symmetric counterpart to RCA created by reversing the rank order of Root and Affix Faithfulness. Such an analysis is confounded immediately by the cross-linguistic evidence from inventories showing that roots license a wider range of contrasts than affixes. Furthermore, it is insufficient because it cannot account for many affix-controlled phenomena. For example, assigning a privileged faithfulness status for affixes will not help in any way with dominant unaccented affixes like *-kko*: the deletion observed in mappings like /kóobe + kko_{Dom}/ → *koobe-kko* is not motivated by Faithfulness to the suffix here, because it is itself unaccented, and so it is not 'in competition' with the root.

Avoiding this false step, the analysis of ACA starts by recognizing that it is morphological in nature, and that it is really just a special case of a more general pattern where the introduction of a morphological category is accompanied by a phonological process in the stem. These morpho-phonological operations (MPOs), sometimes called 'stem-formation rules', may take a variety of forms, involving the same kinds of phonological changes found in ACA. Compare the non-accentual MPOs listed below with the accentual ones from Japanese.

(7) Morpho-Phonological Operations: Accentual and Non-Accentual

a. Insertion: pre-lengthening suffixes in Slovak (Rubach 1993) and Yidiñ (Dixon 1977); verbs with objects (third person singular accusative) in Chaha are distinguished from other verbs by insertion of [labial] in the stem (McCarthy 1983, Rose 1997); cf. pre-accenting suffixes like *-ke* in Japanese

b. Deletion: pre-shortening suffixes in Slovak (Rubach 1993); subtractive morphology, i.e., deletion of a segment for morphological reasons (Martin 1988, Horwood 2000); cf. accent-deleting affixes, like *-kko* in Japanese

c. Shifts and Spreading: [+nasal] spread as a marker of first person singular in Terena (Bendor-Samuel 1960); tone spread with masculine and diminuative suffixes in Iñapari (Parker 1999); cf. accent-shifting suffixes like *-ya* in Japanese

Indeed, it seems that languages may call upon any phonological feature and any phonological process to mark a morphological distinction (Spencer 1998).

Properly understood as a morpho-phonological operation, the theory of ACA is required to have the descriptive content to describe both accentual and non-accentual MPOs. In addition, the theory behind ACA must address the formal problems posed by morphologically motivated phonology. It turns out that MPOs lead to various ranking problems, because they may create structure that is generally avoided in the language (i.e., they may be 'non-structure preserving'). For example, elatives in Javanese are formed by raising the rightmost vowel of a plain adjective, e.g., *alus*, cf. *alus* 'refined, smooth (elative/plain adjective)'. The problem with this case is that it is not straightforwardly handled as the lexical specification of [+high], because elatives produce exceptions to the otherwise general constraint against tense vowels in closed syllables (Dudas 1975). Why is this general phonotactic constraint suspended just in elatives?

A more general problem is that morphologically motivated phonology is lexically idiosyncratic, and yet its properties do not reduce to a lexical specification for phonological structure. Dominance effects, and morpho-phonological deletions more generally, are a case in point. The contrast between dominant (=accent-deleting) affixes and recessive affixes must be lexically listed. But the dominant/recessive distinction is orthogonal to the specification of accentual features, since languages like Japanese have both accented and unaccented dominant morphemes. In sum, the analysis of the phonological activity observed in MPOs is not simply a matter of specifying phonological structure in the traditional underlying representation.

These problems essentially reduce to ranking problems in Optimality Theory (though they are not specific to OT). For example, non-structure preserving MPOs require a ranking of Faithfulness and Markedness constraints which is at odds with the structural inventory of the rest of the language. In Javanese, a constraint that prohibits tense vowels in closed syllables must be high-ranking to account for this basic phonotactic fact, but it is systematically violated in elatives, which calls for a different ranking of Markedness and

Faithfulness. The failure of lexical specification analyses implied by morpho-phonological deletion also poses a ranking problem. For example, in Japanese, the language as a whole has a contrast between accented and unaccented stems, requiring Accentual Faithfulness to dominate Markedness. But dominant affixes neutralize this contrast, which necessitates the domination of Faithfulness.

An additional problem is that some MPOs pose ranking paradoxes that derive from the properties intrinsic to the operations themselves. In Luo, for example, singular and plural pairs show an exchange in the [voice] specification for the stem-final obstruent.

(8) Voicing Exchange in Luo (Gregerson 1972, Okoth-Okombo 1982)

	Singular	Plural	
a.	bat	bed-e	'arm'
	reč	rej-e	'fish'
b.	čogo	čok-e	'bone'
	luedo	luet-e	'hand'

As Moreton 1996 makes clear, exchange processes such as these cannot be described in terms of rankings of Faithfulness and Markedness alone. Roughly speaking, if a grammar is a ranking of just these constraints, input-output mappings will either be faithful to the input or improve on Markedness. Exchanges like that found in Luo, however, are neither fully faithful nor an improvement in Markedness. They do not improve on Markedness because they involve at least two parts, and the circular nature of the exchange precludes such an improvement. Concretely, any ranking of constraints that changes one obstruent class *A* to another *B* entails a markedness scale where *B* is less marked than *A*. In such a system, it is impossible to also produce a mapping in which *B* also goes to *A* in the same context, since *B* does better on Markedness than *A*.

The conclusion that is drawn from these observations is that morphologically motivated phonology involves more than just Markedness and Faithfulness interactions. In particular, a set of Anti-Faithfulness constraints is proposed as a way of motivating alternations in morphologically defined contexts. Anti-Faithfulness is defined simply as the wide-scope negation of Faithfulness.

(9) Anti-Faithfulness

For every Faithfulness constraint $\mathcal{F}$, there is a corresponding Anti-Faithfulness constraint $\neg\mathcal{F}$ that is satisfied in a string *S* iff *S* has at least one violation of $\mathcal{F}$.

Anti-Faithfulness constraints trigger alternations by requiring a violation of the corresponding Faithfulness constraint. This approach to morpho-phonology directly addresses the three problems outlined above. Non-structure preserving

MPOs are no longer a problem, because, if the constraint driving them is an Anti-Faithfulness constraint, this constraint may dominate the constraints responsible for phonotactic requirements, producing violations of structure preservation. Furthermore, since morpho-phonological alternations are triggered by constraints, MPOs are no longer predicated on the realization of lexically specified structure. Morphological deletions like dominance effects and subtractive morphology follow naturally as forced violations of constraints which prohibit deletion, i.e., the family of MAX constraints from McCarthy & Prince 1995, 1999. Finally, Anti-Faithfulness provides a tractable line of analysis for exchange processes. The two-sided nature of the exchange follows as the logical negation of IDENT-type constraints, which are themselves two-sided constraints, as illustrated below.

(10) Faithfulness and Anti-Faithfulness for [voice]

a. IDENT(voice): Corresponding segments agree in the feature [voice].

b ¬IDENT(voice): It is not the case that corresponding segments agree in the feature [voice].

(11) Voicing Exchange in Luo as Anti-Faithfulness

Input		Output	¬IDENT(voice)	IDENT(voice)
a. /bat/	→	be[d]-e		*
		*be[t]-e	*!	
b. /čogo/	→	čo[k]-e		*
		*čo[g]-e	*!	

The Anti-Faithfulness constraint motivates both parts of the exchange, solving the ranking problem intrinsic to exchange processes.

A host of properties of morpho-phonological operations, and ACA in particular, are identified and shown to follow from the Anti-Faithfulness thesis when this constraint type is applied to OO-Correspondence (Benua 1997 [1998], Burzio 1994 et seq., and Kenstowicz 1996). OO-Anti-Faithfulness, or Transderivational Anti-Faithfulness (TAF), therefore explains the properties of MPOs with assumptions that are generally available in phonological theory. First, MPOs are morphological in the sense that they induce an opposition between a base and a derived form. As a relation between words, TAF forces an alternation in the paradigm that has the effect of re-enforcing salient morphological distinctions. Second, MPOs are always base-mutating, meaning that they always affect the base of affixation. This observation also follows from the transderivational implementation: Anti-Faithfulness only affects the subconstituent of the word that occurs throughout a paradigm, namely the base. Third, MPOs are 'grammar dependent', which means that their output is constrained by independently motivated phonological restrictions. TAF theory

explains grammar dependence because it does not fully specify the ways in which two words must differ phonologically; it asserts that they must be different, and the rest of the grammar predicts how this difference is realized (a point returned to below).

In a sense, the approach to ACA as Transderivational Anti-Faithfulness is an explicit formal statement of the insights that underlie many traditional analyses of diacritic properties of affixes (see especially Garde 1968 et seq. on Slavonic languages, Fudge 1984 on English, and Carlson 1976, 1989 on Interior Salish). These analyses differentiate morpheme classes with various accentual diacritics, e.g., 'pre-stressing' or 'accent-deleting', etc., and assign language particular prioritizations to these diacritic properties in order to determine the outcome in words that are marked for more than one diacritic (see Carlson 1976 et seq. for a particularly elaborate hierarchical ordering). The formalization proposed here, however, establishes the basis of a highly restrictive theory of morpho-accentual processes. First, TAF theory establishes substantive limitations on the range of affix-controlled processes. Since ACA is derived as Faithfulness reversals, the range of affix-controlled accentual processes must be described in terms of violations of existing Faithfulness constraints. Thus, the theory of Accentual Faithfulness defines a set of constraints that govern the realization and distribution of accent (12a). These Accentual Faithfulness constraints have corresponding Anti-Faithfulness constraints (12b), which effectively predict the range of possible affix-controlled accentual processes.

(12) Faithfulness and Anti-Faithfulness for Accent

a.		b.	
	MAX-ACCENT: no accent deletion		¬MAX-ACCENT: accent deletion
	DEP-ACCENT: no accent insertion		¬DEP-ACCENT: accent insertion
	NO-FLOP-ACCENT: no accent shift		¬NO-FLOP-ACCENT: accent shift

The fundamental notion of Faithfulness in OT thus has a role in the analysis of ACA too, through the negation of the independently needed Accentual Faithfulness constraints. Constraints that are essential to the analysis of phonemic accent have corresponding Anti-Faithfulness constraints, which in turn characterize a restrictive typology of affix-controlled morpho-accentual processes.

The TAF theory of affix-controlled accent is also constrained by the larger grammar in which Anti-Faithfulness is employed. Succinctly, a TAF constraint requires a change in the base of affixation, but the realization of this change is predicted by the independently motivated grammar of accent. If we apply this reasoning to dominance effects in Japanese, the suffix *-kko* requires a deletion of base prosody by activation of the TAF constraint ¬MAX-ACCENT. It is the rest of the grammar, however, which determines the result of this deletion process. Since unaccented words are left unaccented by default in Japanese, as shown by *miyako* 'city', so too are forms that result from de-accentuation.

(13) Grammar Dependent ACA: Dominance Effects in Japanese

/kóobe + kko/	/miyako/	INPUT
↓	↓	
[koobe-kko]	[miyako]	OUTPUT

As obligatory violations of Faithfulness, TAF makes the prediction that the output of affix-controlled accentual processes is intimately tied to the default accentual structures found elsewhere in the system. The finding that all of these processes exhibit some form of grammar dependence is therefore strong support for the proposed theory.

Returning to the observed conflict between RCA and ACA, OT provides the right tools for modelling this antagonism as well. Recall that certain suffixes in Cupeño trigger the insertion of an accent in the base. This observation is accounted for in (14a) as an effect of the Anti-Faithfulness constraint, ¬DEP-ACCENT, which calls for an insertion of accent. The loser fails to insert an accent and, as a result, incurs a fatal violation of ¬DEP-ACCENT. However, accented roots block pre-accentuation, which is explained by ranking the Root Faithfulness constraint demanding the realization of accent, namely MAX-ACCENT$_{Root}$, above the Anti-Faithfulness constraint, as shown in (14b).

(14) Pre-Accentuation with Blocking Effects in Cupeño

Input		Output	MAX-ACCENT$_{Root}$	¬DEP-ACCENT
a. /wena + nuk$_{pre}$/	→	wená-nuk		
		*wena-nuk		*!
b. /méme + yke$_{pre}$/	→	méme-yke		*
		*memé-yke	*!	

The conflict between these two competing forces is described with one of the fundamental assumptions of OT, namely that the constraints are ordered with respect to each other in a constraint hierarchy. Furthermore, this ranking is established on a language particular basis. In one language, Root Faithfulness may be ranked above the Anti-Faithfulness constraint ¬DEP-ACCENT, which accounts for the blocking effects like those in Cupeño. However, another language may have the reverse ranking, yielding pre-accentuation across the board, as exemplified above for *-ke* in Japanese. In sum, this variation is treated as a language-internal prioritization of universal constraints.

To summarize the main ideas, two lines of development in the characterization of Faithfulness in Optimality Theory define a theory of morphologically governed accent. A set of Accentual Faithfulness constraints is employed in the analysis of phonemic accent. A relatively straightforward

modification of these constraints, namely their division into the morphological categories root and affix, leads to a principled explanation of root-controlled accent. With morphologically-dispersed Faithfulness, predominant root accent is a consequence of the privileged Faithfulness properties of roots, as has been shown in other empirical domains. Affix-controlled accent, on the other hand, is due to a new constraint type, Anti-Faithfulness, which models this type of morpho-accentual process as a Faithfulness reversal. Applied between a base and derivative, Anti-Faithfulness explains the fact that affix-controlled accentual processes are inherently morphological and base-mutating. Furthermore, the Anti-Faithfulness thesis leads to a restrictive typology of morpho-accentual processes: these processes are limited to operations that can be described by obligatory violations of Faithfulness constraints and that result in language particular default patterns for accent.

As to the larger theoretical implications, the theory of morphologically governed accent proposed in this dissertation employs principles that have very general applications in phonology. The notion of Faithfulness crucial to the analysis of phonemic accent is no less crucial in the analysis of other types of phonemic contrast. Furthermore, the privileged Faithfulness status for roots found in accent systems is also characteristic of non-accentual phonological systems, and thus the ordering of Root and Affix Faithfulness extends to both types of systems. Lastly, the approach to affix-controlled accent as obligatory violations of Faithfulness constraints also has some currency outside of accent systems. It is critical to the analysis of exchange processes and it forms the basis of a general theory of morpho-phonological alternations. These descriptive and analytical assumptions therefore lead to the conclusion that root-controlled accent is a special case of a cross-linguistic trend favoring retention of information in the root, and, likewise, that affix-controlled accent is just a special type of phonological alternation instantiating a morphological contrast.

1.1.3 Overview of the Dissertation

The next section of this chapter provides an introduction to the properties of the accent systems examined in this thesis and the theoretical background in autosegmental and metrical theory relevant for these systems. A theory of Prosodic Faithfulness is then proposed, and the constraints responsible for phonemic accent are defined and applied to a concrete example. The rest of the thesis is summarized below as an overview of what is to come in later chapters.

§2. Root-Controlled Accent in Cupeño. This chapter is a detailed case study of stress-accent in Cupeño. After a close look at stress in isolated roots, the interaction between root and affix stress is examined, and morphologically-dispersed Faithfulness constraints are employed in the analysis of the basic fact that root accent overrides affix accent. The root-controlled analysis of Cupeño stress-accent is contrasted with some plausible alternatives, and a host of predictions of the analysis are summarized.

§3. Restricted Edge Effects in Root-Controlled Accent Systems. This chapter studies the implications of the analysis of root-controlled accent in Cupeño for other languages. The consequences of the universal ordering Root Faith >> Affix Faith are studied, and a prediction is clarified that posits a significant restriction on the scope of directionality in accent systems. This prediction is then examined in detail in two languages, Russian and Japanese. In close formal analyses of the regular and productive accentual patterns found in these languages, it is shown that these languages do in fact conform to the restrictive theory of edge effects stemming from morphologically-segregated Faithfulness.

§4. Transderivational Faithfulness and Anti-Faithfulness. This chapter provides the necessary background for analyzing affix-controlled accent in a general theory of morpho-phonological alternations. As the theory of Anti-Faithfulness is developed in Transderivational Correspondence Theory (Benua 1997 [1998]), a review of the basic concepts of this theory is given in the context of a discussion of stress-neutral affixation in English. Next, the theory of Anti-Faithfulness is motivated and applied to the case of voicing exchange in Luo. The implications of this theory are also studied and a set of predictions for affix-controlled accentual processes are clarified.

§5. The Role of Transderivational Anti-Faithfulness in Morpho-Accentual Phenomena. This chapter applies the theory of Transderivational Anti-Faithfulness to affix-controlled accent, arguing that this theory establishes the observed parallels between morpho-accentual processes and morpho-phonological alternations in general. It begins by discussing the properties that distinguish affix-controlled accent from root-controlled accent and the underlying functions of these distinct accentual processes in the larger architecture of the grammar. Subsequently, each affix-controlled process is examined in the context of a series of case studies. It is shown that the Transderivational Anti-Faithfulness theory of affix-controlled processes provides an explanatory account of the properties that characterize ACA and distinguishes this approach from several previous analyses. The resulting theory is an integrated whole, accounting for a heterogeneous body of accentual patterns as forced violations of existing Faithfulness constraints.

1.2 Lexical Accent and Prosodic Faithfulness

The proposal to study accent systems is in some ways problematic because the term 'accent' has been used in so many different ways and applied to a wide range of phonological phenomena. For some, the term accent is often equated with 'pitch accent' in systems like Japanese, and as accent is realized tonally in this system, accent would appear to be restricted to just those systems with linguistic uses of f0 (fundamental frequency). In practice, however, lexical stress systems like Russian are dubbed pitch accent systems too, either because the system under analysis developed from a true pitch accent system, as with Russian, or simply to emphasize the phonological similarities between stress-accent in one language and non-stress accent languages like Japanese. The latter case is exemplified by the stress-accent language Cupeño (Uto-Aztecan), where the ancestor language was clearly a stress language (Munro 1977, see Kiparsky & Halle 1977 on a comparison between Cupeño and other Indo-European languages like Russian).[2]

Accent systems are also sometimes called 'restricted tone systems' to clarify the differences between accent and tone. While differentiating accent and tone is not always a straightforward matter, accent systems typically differ from tonal systems in the nature of the accentual contrasts and the types of accentual processes they possess. These properties will be examined in detail below, but an important point is that, in some theories, accent simply involves a type of tone system where tonal contrasts are more restricted and processes involving tone can operate over long distances. Any characterization of the notion accent will have to account for these differences, and furthermore, it should formalize the intuition shared by many that there is a notion of accent that is independent of the phonetic realization of accent. That is, an adequate characterization should account for the striking similarities between languages like Russian and Japanese (an observation first made in Jakobson 1963, 1965 I believe), despite the obvious fact that accent in these two systems has different phonetic correlates.

In the next subsection, I list the properties that characterize the accent systems studied throughout this thesis. I also identify some different theoretical approaches to accent, including various autosegmental and metrical theories, and I justify choosing a metrical theory of accent. Then, in §1.2.2, I propose a formal theory of lexical accent in terms of Faithfulness to underlying prosody, discuss its advantages over previous approaches to accent systems, and clarify how it is used in the individual case studies that follow.

[2]Distinctive tone in a related Uto-Aztecan language, Northern Tepehuan, is probably an innovation brought about by the loss of certain laryngeals (see Bascom 1965 for details).

1.2.1 Remarks on the Notion 'Accent'

1.2.1.1 Observations

To start with a relatively theory-neutral characterization, accent is often a cover term for systems with suprasegmental features like stress and tone, which have the following phonological properties.

(15) General Properties of Accent Systems[3]

a. Contrastiveness: accent is unpredictable and may therefore bring about contrast in otherwise identical words.

b. Edge Effects: accent is often assigned or attracted to a designated edge of a word or phrase (cf. 'delimitative accent' from Trubetzkoy 1939).

c. Culminativity and Accent Resolution: there can be at most one accent per word; in words with more than one inherently accented morpheme, all but one is deleted.

d. Accentual Processes: accentual processes are limited to deletion, insertion, and shift of accent; these processes may take place over long distances.

The distribution of suprasegmentals is, in part, unpredictable in accent systems, and they may therefore lead to a surface contrast in otherwise identical words. For example, stress-accent in Russian is unpredictable and brings about a contrast in words such as *bágrit'* 'to spear fish' and *bagrít'* 'to paint crimson'. Accent in Japanese, though realized as a tonal event, is likewise contrastive and also yields a surface contrast, e.g., *hási* 'chopsticks', *hasí* 'bridge', and *hasi* 'edge'. Accentual contrasts such as these differ from those found in so-called 'free tone' systems, such as Yoruba, in that the contrast is not paradigmatic; that is, it is not due to an opposition among an inventory of accentual or tonal units, e.g., a high versus low tone contrast in a single tone-bearing unit. Rather, the contrast is only in the location of accent in the surface form or the presence or absence of accent, as in the case of Tokyo Japanese. Concretely, the total number of contrasts possible in an accent system is $n + 1$, where n stands for the number of sponsors for accent in a given word and an additional contrast (the '+1' part) allows for the absence of accent in a form. On the other hand, a

[3]This set of properties is based on the characterizations of accent given in Hyman 1977, 1978, McCawley 1978, Clements & Goldsmith 1984, Beckman 1986, van der Hulst & Smith 1988, Odden 1995 and references therein.

system with a paradigmatic contrast may admit as many contrasts as there are sponsors in a form, multiplied by the number of accentual or tonal types in the language, which is clearly less restricted. In sum, languages such as Russian and Japanese have in common that accent is unpredictable and therefore has a contrastive function,[4] but this accentual contrast is more restricted than the range of contrasts observed in tonal systems.

Another unifying property of accent is that accent is often attracted to the edge of a prosodic or morphological unit. Thus, various contexts may require accent to appear at a designated edge, or alternatively, may privilege realization of an accent which is closer to a given edge constituent. These two types of edge effects may be distinguished as EDGE TROPISM versus EDGE ORIENTATION, respectively. The former accounts for the Trubezkovian notion of delimitative accent, where accent is co-extensive with an edge. Edge tropism is observed in Cupeño in words that are composed exclusively of unaccented morphemes. In such forms, accent is tropic to the first syllable of the word, as in /yax + em/ → *yáx-em* 'say! (second person plural)'. Cupeño also exemplifies the other type of edge effect, edge orientation. In words with more than one inherently accented morpheme, the rightmost accent is realized in the surface form, e.g., /pé + yax + qál/ → *pe-ya-qál* 'he was saying', cf. /pé + yax/ → *pé-yax* 'he says'. This pair shows that Cupeño has a bias towards realizing inherent accent as close as possible to the right edge of the word, though non-final accent is still found in the system. Edge effects such as these are not unique to accent systems as autosegmental tone may also show the same patterns of edge tropism and orientation. But this property of accent systems distinguishes accent from other phonological features that are not mobile in the same sense as accent and will be important in the characterization of Faithfulness to underlying accent in §1.2.2.

A third important property observed in accent systems is that there may be an over-arching constraint in the system that has the effect of requiring a single accent in a given domain, often the lexical word. When an accent system is subject to this constraint, accent is said to be CULMINATIVE.[5] In Russian, for

[4]Beckman 1986 observes that accent typically does not carry the same distinctive load as other segmental features, a point supported by psycholinguistic research leading to the conclusion that lexical stress is not directly used in lexical access strategies (see Cutler & Clifton 1984 and Cutler 1986). Whatever the reason for this observation concerning the function of accent, the distribution of accent is nonetheless phonologically unpredictable, and this requires a linguistic analysis on a par with segmental features which are also unpredictable.

[5]The term 'culminative' has been used differently in different contexts: Trubetzkoy 1939 defines culminative features as features which make an appearance exactly one time in a given domain, while Liberman & Prince 1977 and Hyman 1977 use the term differently for stress systems to mean essentially that there is always a stress peak which is more prominent than all others in the word. For the purposes of the case studies presented here, both uses of the term are appropriate, though in the next

example, there is a single rise and fall in intensity per word. Likewise in Japanese, minor phrases may have at most one fall in pitch. Culminativity in these systems leads to a characteristic type of morpho-accentual process, Accent Resolution. When a word is composed of more than one inherently accented morpheme, only one may realize its accent because accent is culminative. Therefore, in multiply accented lexical forms, the mapping from input to output may be viewed as a type of competition for a unique surface accent. In this way, accent systems may be contrasted from other types of tonal systems and stress systems where there is no 'uniqueness requirement' on accent. Thus, tone languages like Yoruba do not limit the number of tones in a form to exactly one, and consequently, there is no loss of all but one lexical tone.

Finally, accent systems may be characterized by the types of processes that operate on accent. Accent systems often have only three types of processes: deletion, insertion, and shift of accent. Deletion of accent has already been mentioned as a culminativity effect: in words with more than one accented morpheme, only one accent can be realized, which in turn results in the deletion of all other lexical accents. Insertion of accent may also be modelled as an effect of culminativity: if the underlying representation of a form does not have a lexically specified accent, an accent is inserted to satisfy an existence requirement for accent embodied in culminativity. While deletion and insertion of accent may be due to other factors, both phonological and morphological, culminativity plays a major role in deriving these two processes in the cases studies presented here. Finally, an accent may also shift from its lexical sponsor in the mapping from lexical to surface forms. For example, if the vowel that is associated with an accent is deleted, the lexical accent may shift to another position in the surface form, as with syncopated vowels in the Jivaroan language Aguaruna (§5.4.4). One common way of contrasting these accentual processes with those found in tone systems is that processes of tone assimilation and dissimilation are typically subject to stricter locality conditions, essentially requiring that the target and trigger be in adjacent syllables or moras (see Odden 1995 and references therein). The accentual processes outlined above, however, may take place over long distances and are typically not subject to the same locality conditions. For example, Accent Resolution in Russian and Japanese does not require accent on two adjacent syllables in order to trigger the deletion of accent; this accentual process simply deletes all lexical accents but one, whether they are local or not. To summarize, accent systems may have three types of processes, accent deletion, accent insertion, and accent shift, and these processes may operate over long distances.

While accent systems share a host of phonological properties, it is important to note that the phonetic correlates to accent may be significantly

subsection, some remarks are made as far as how to distinguish these different observations in terms of the bracketed grid structures commonly assumed in metrical stress theory.

different. That is, accent systems have similar phonological properties, but the phonetic attributes of accent may differ from language to language. Thus, stressed syllables in Russian have an intensity peak and are perceived as louder than unstressed syllables (Jones & Ward 1969). In Japanese, on the other hand, the primary cue for accent is the fall in f0 directly following the accented syllable (see Beckman 1986 and references therein). While some early work on stress and accent has suggested that f0 is a major factor in cueing stress as well as tone (Hyman 1977, 1978, based on Fry 1955, 1958), it seems clear that there is no universal phonetic correlate to accent as I have characterized it. For example, Beckman 1986 provides experimental evidence supporting a distinction between stress-accent and non-stress accent, the latter being represented in Tokyo Japanese where f0 is the primary correlate to accent. In stress-accent systems, as exemplified by English in Beckman's study, phonetic cues other than pitch are used, including intensity, length, and possibly other phonetic properties, such as phonation type and vowel quality. Jones & Ward's 1969 characterization of stress in Russian shows a clear role for amplitude and duration of stressed syllables, even in post-focus environments, which effectively classifies Russian as a stress-accent language. Thus, while accent in Russian and Japanese behaves similarly in the phonology, the phonetics of accent is quite different in these languages.

1.2.1.2 The Representation Question

These observations concerning the phonetics and phonology of accent lead to some interesting questions regarding the representation of accent. The phonology of accent in Russian and Japanese supports a direct comparison, suggesting that they should be represented with the same phonological structures. On the other hand, the phonetic correlates of accent are vastly different; if the phonological representation of accent is required to have a transparent phonetic implementation, this requirement entails different phonological representations for accent. It would appear therefore that there are two basic approaches to the 'representation question'.

(16) Two Basic Approaches to Representation of Accent

a. Different Phonologies Approach: phonological representations for accent are determined on a language particular basis and have universal phonetic interpretations.

b. Different Phonetics Approach: accent is given a consistent phonological representation which has a language particular phonetic interpretation.

Fleshing out the first approach, accent systems like Russian and Japanese require a lexical representation for accent. After all, accent is

contrastive in these languages, and the domain of idiosyncratic distinctions such as these is the lexicon. On the assumption that Russian and Japanese have different phonologies, one clear avenue of analysis is that accent in Russian is encoded with the features in the representation of metrical stress, e.g., grid marks or diacritics marking the heads of stress feet. As accent in Japanese is realized with an f0 contour, the obvious choice here is to posit an autosegmental feature, presumably a tonal melody, or simply a linked high tone, over the lexically accented syllable. In the Different Phonologies theory, therefore, lexical accent is encoded with the phonological features which best describe the phonetic properties associated with accent in these languages. An approach of this kind is taken in the autosegmental literature where languages with non-stress accent are represented with linked tones; see for example Pulleyblank 1986, Poser 1984, Archangeli & Pulleyblank 1984, and Blevins 1993. The Different Phonologies approach leaves stress-accent languages like Russian and Cupeño with a different analysis, presumably lexical markings for stress feet or a set of minor rules which characterize the lexically idiosyncratic stress patterns.

The alternative approach presented in (16b) is that there is a single phonological feature for lexical accent in Russian and Japanese and the phonetic consequences of this feature is dealt with on a language particular basis. The Different Phonetics approach is often taken in the metrical literature, with the underlying assumption that lexical accent is lexically specified stress and that stressed syllables may be assigned other phonological features by rule, or that stress is realized differently from one language to the next. See for example Zubizarreta 1982, Hayes 1980, Bennett 1981, Abe 1981, Prince 1983, HV, Sietsema 1989, Melvold 1990, Prince 1990, Zec 1999, Hayes 1995, McCarthy 2000a, Pater 2000, van der Hulst 1999, Féry 1998, Revithiadou 1997; Idsardi 1992, Kubozono 1995, Katayama 1995, 1998. The Different Phonetics approach is of course not wedded to a metrical representation of accent, and other researchers have posited non-metrical accentual features. For example, Clements & Goldsmith 1984 and Goldsmith 1984 employ an accentual diacritic which guides the association of a pitch accent (=tonal melody) to the lexical sponsor. Also, employing the feature system of Vanderslice & Ladefoged 1972, Beckman & Edwards 1994 encode lexical stress in English with a diacritic feature for accent, which is again not directly tied to metrical structure. These specific implementations of the Different Phonetics theory of accent have in common that the phonological representation of accent does not have a unitary phonetic realization. As we will see, this assumption makes possible certain generalizations in the phonology of a wider range of accent systems than is possible on the Different Phonologies approach.

While the matter of the lexical representation of accent is not directly relevant to the core issues of this thesis, I assume a metrical theory of accent, following the leading ideas in Prince 1983, HV, and Idsardi 1992. Before stating my formal assumptions, I will briefly summarize my reasons for choosing this specific theory. One important reason for formalizing accent as a prominence on the metrical grid is that it explains the phonological similarities

among accent systems. Thus, the basic observation that accent systems have at most one accent receives a natural account if, by hypothesis, accent is encoded as a prominence which embodies a strong position in a bracketed grid structure, i.e., either a grid mark or an '*'. Metrical representations are inherently culminative because of their hierarchical structure (see e.g. Hayes 1995), and so culminative accent, in a sense, comes for free. If, on the other hand, accent is represented as stress-accent in one system, and for example, as a linked tone in another, then culminativity effects do not follow in both systems and thus a direct parallel cannot be made. Furthermore, the non-local character of accentual processes is explained in the metrical interpretation of the Different Phonetics approach, but it does not necessarily follow in other theories. Concretely, the loss of non-adjacent lexical prominences is expected in the metrical theory because a lexical accent is deleted if it does not form the head of a stress foot. On the other hand, the deletion of tone is subject to more stringent locality requirements (Goldsmith 1976, Odden 1995, Myers 1987a). These points will be made more explicit below after a formal theory of lexical accent is proposed.

A second argument in favor of the metrical theory just described is that it leads to a more restricted theory of morpho-accentual processes, an argument originally due to Bennett 1981, cf. Poser 1984, but in a different form. As outlined above, accent systems may be characterized by a set of accentual processes, deletion, insertion and shift. These processes may be phonological or morphological, i.e., triggered by special affixes or only in certain word classes. In other words, there is a restricted set of accentual processes that have counterparts in the morphology, a fact that is clearly relevant for the representation of accent. While all of the pieces are not in place to make this argument succinctly, the theory of morphological accent developed in this dissertation assumes that accentual processes with a morphological basis are derived as reversals of Faithfulness constraints governing the relation between lexical and surface accent. If the Faithfulness constraints operate on the prominence structures employed in metrical theories, then certain phonological operations can be systematically ruled out. For example, the fact that a prominence on the grid is never associated with more than one subordinate element supports the conclusion that grids never 'spread'; thus, it follows that there is no Faithfulness constraint against this phonological operation. Because there is no Faithfulness constraint against spreading of accent, there will never be a morphological process calling for the reversal of an anti-spreading constraint, i.e., a morphological process expressing an imperative to spread. Thus, an advantage of the metrical theory of accent is that it restricts the range of possible morpho-accentual processes.

To summarize this background discussion, following many previous approaches, I employ an accentual feature that does not have a direct phonetic interpretation. The assumption that this accentual feature is a prominence on the grid establishes a clear parallel in the phonology between stress-accent systems like Russian and Cupeño and non-stress accent languages like Japanese.

Though these assumptions are motivated in their own right, if it turns out that the lexical representation of accent in these languages must be different, then this finding will not directly affect the basic arguments to be made here. Thus, if Russian has lexical stress but Japanese has linked tone structure, then the explanations for root-controlled and affix-controlled accent do not substantively change; these explanations lie in the principles applying to Faithfulness constraints in general and not just to a specific type of Faithfulness. Indeed, all that matters in the construction of the theory of accent here is that these languages have an object in the underlying representation to be faithful to. If this is true, then the actual objects referred to by the Faithfulness constraints are quite irrelevant to the analysis of RCA and ACA because the analysis is defined in terms of Faithfulness generally.

1.2.2 A Theory of Prosodic Faithfulness

1.2.2.1 The Constraints

We require a set of constraints to govern the relation between lexical and surface accent, a set I will refer to collectively as 'Prosodic Faithfulness'. Prosodic Faithfulness must therefore make reference to the assumed prominence structure, which requires the notion of Correspondence developed in McCarthy & Prince 1995, 1999.

(17) Correspondence

Given two strings S_1 and S_2, correspondence is a relation R from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as correspondents of one another if $\alpha R \beta$.

As McCarthy & Prince make clear, the set of correspondent elements that can be referred to by the Faithfulness constraints is not limited to segments; these elements may include autosegmental features like moras, tone, and importantly, prominence structure. As discussed above, accent is encoded as a lexical prominence, i.e., a grid mark over an accented vowel in the underlying representation. The Prosodic Faithfulness constraints given below make reference to lexical and surface prominence and require related strings to 'match' in this prominence structure.

(18) Prosodic Faithfulness (PROS-FAITH)

MAX-PROM: For x a prominence, $\forall x\ \exists x'\ [\ x \in S_1 \rightarrow x' \in S_2\ \&\ xRx'\ ]$
'Every prominence in S_1 must have a correspondent in S_2.'

DEP-PROM: For x a prominence, $\forall x\ \exists x'\ [\ x \in S_2 \rightarrow x' \in S_1\ \&\ xRx'\ ]$
'Every prominence in S_2 must have a correspondent in S_1.'

NO-FLOP-PROM
For x a prominence, y a sponsor, and z an autosegmental link,
$\forall x\ \forall y\ \forall z$ [x and y are associated via z in $S_1 \rightarrow \exists x'\ \exists y'\ \exists z'$
such that $(x, y, z)R(x', y', z')$ and x' and y' are associated via z' in S_2]
'Corresponding prominences must have corresponding sponsors and links.'

The above constraints distinguish between two forms of Faithfulness to underlying prosody, which in turn, are responsible for the range of accentual contrasts commonly found in accent systems. The first two constraints, MAX-PROM and DEP-PROM, govern Faithfulness to the presence or absence of prominence in related forms. When properly ranked, these constraints yield a contrast between accented and unaccented morphemes. This type of contrast can take two forms. In a system in which every word has an accent, like Russian and Cupeño, words with accented morphemes are faithful to their lexical prominence, which contrasts with words that have no underlying accent and, as a result, receive a default accentual pattern. Alternatively, the accented/unaccented contrast may directly manifest itself in surface words, as in Japanese where words with no underlying prominence are distinguished from accented forms by the absence of accent in the output. In both systems, MAX-PROM plays a crucial role in enforcing Faithfulness to a lexical prominence. The difference between these two results from the ranking of DEP-PROM: in languages like Russian, DEP-PROM is relatively low-ranking, as unaccented forms receive an inserted accent; in languages like Japanese, by contrast, DEP-PROM is relatively high-ranking, ensuring that unaccented forms in the input will not receive a non-lexical accent in the output.

A different form of Faithfulness concerns the position of prominence in related forms. Unless otherwise motivated, the position of prominence does not change in the mapping from one structure to another, and Faithfulness to the position of accent is governed by NO-FLOP-PROM. Thus, if NO-FLOP-PROM is high-ranking in the grammar, specifically ranked above constraints which assert a fixed position for prominence structures, then a word with n-numbered syllables or moras will have n number of accentual contrasts because the lexical position for accent must be maintained. Importantly, this contrast in the position of accent is only observed if MAX-PROM is also suitably high-ranked; NO-FLOP-PROM is only relevant for a prominence which has a counterpart in the input, which is of course governed by MAX-PROM. Since MAX-PROM (and DEP-PROM) bring about an additional contrast, i.e., the presence or absence of an accent, these constraints together yield the set of contrasts characteristic of accent systems discussed above, namely $n + 1$, where n is equal to the number of sponsors for accent in a given form.

In the characterization of Prosodic Faithfulness above, accent is understood as an autosegmental unit, namely a grid mark, instead of a property of a segment itself or the result of underlying foot structure, as sometimes assumed (Inkelas 1999, Kenstowicz 1995a, McCarthy 2000a, 1997, Benua 1997 [1998], Itô, Kitagawa, & Mester 1996). That is, the constraints which mitigate against the deletion (MAX), insertion (DEP), and migration (NO-FLOP) of accent, are more like the Faithfulness constraints employed in the treatment of other autosegmental objects like moras (McCarthy 2000b) or tone (Bickmore 1996, Zoll 1996b, Yip 1999, Myers 1997a). The reason for this assumption is not part of a plan to rule out metrical constituency in accent systems altogether — there are many good reasons for wanting bracketed grids or stress feet in surface representation of accent. The rationale here is that the principal reasons for positing foot structure in underlying representations, e.g., affix-controlled processes like pre- and post-accentuation, will receive a different treatment in the latter half of the thesis. Since the theory of these processes no longer requires foot structure in the underlying representation, Faithfulness to the hierarchical relations embodied in foot structure is not necessary in the input. Furthermore, as will be illustrated in detail in chapter 5, the Prosodic Faithfulness constraints given here have 'echoes' in the morphology: the attachment of an affix may trigger a violation of one of these constraints. In morphologically triggered accentual processes, then, it is imperative to precisely distinguish the different types of Faithfulness to underlying prosody, as it is done here, in order to account for the differences among affixes that induce deletion, insertion, or shift of an accent.

1.2.2.2 Application of the Constraints

Let us apply these constraints to a concrete example as a means of illustrating the basic assumptions of the theory of Prosodic Faithfulness. Two closely related Cupan languages (Uto-Aztecan), Cupeño and Cahuilla, differ in the behavior of stress in roots. Cupeño has a contrast between initial and pen-initial stress, while Cahuilla has uniform initial stress (Munro 1977, 1990).

(19)

	Cupeño	Cahuilla	
a.	ʔamúl	ʔámul	'agave'
	qaṣál^{y}	qásil^{y}	'sagebrush'
	qewál	kíyul	'fish'
	kaxál	qáxal	'quail'
b.	tévet	tévat	'conifer'
	wáxečil^{y}	wáxačil^{y}	'frog'
	wíʔet	wíʔat	'oak'
	súʔiš	súʔiš	'jackrabbit'

Stress is therefore phonemic in Cupeño, but predictable in Cahuilla. In OT, the presence of a phonemic contrast is an indication of high-ranking Faithfulness, as Faithfulness requires a contrast present in the lexical form to surface in the output. This assumption applies with equal force when stress, or other suprasegmental features, introduce a contrast, which is illustrated by the following schematic rankings.

(20) Phonemic versus Predictable Accent through Constraint Ranking

a. Phonemic Accent: PROS-FAITH >> PHONO

b. Predictable Accent: PHONO >> PROS-FAITH

In this theory, the distinction between phonemic and predictable accent is determined by the ranking of the Prosodic Faithfulness constraints relative to other phonological constraints on the distribution of accent. In Cupeño, the observed contrast in the position of accent is described by ranking two PROS-FAITH constraints above the constraint responsible for deriving regular initial stress, INITIAL-PROM. In a grammar characterized by this ranking, an input with a lexical prominence on the second syllable will be paired with an output which also has a prominence over the second syllable, as illustrated below. Where needed, indices are marked on prominence structure to indicate corresponding prominences; in the forms below, two grid marks bearing the same index indicate that they stand in correspondence according to the definition given in (17) above.

(21) Phonemic Accent in Cupeño

Input: x_1 ʔamúl	MAX-PROM	NO-FLOP-PROM	INITIAL-PROM
a. → (x_1) ʔamúl			*
b. (x_1 .) ʔámul		*!	
c. (x_2 .) ʔámul	*!		

Given the OT principles of constraint ranking and violability, the predicted output may violate a given constraint if such a violation will lead to the satisfaction of high-ranking constraints. Thus, when comparing the first and last candidates above, candidate (21c) is ruled out because it violates MAX-PROM as a means of satisfying lower-ranking INITIAL-PROM. Concretely, the failed candidate has deleted the lexical accent because the lexical prominence x_1 does not have a correspondent, or a 'counterpart', in the surface form. The failed candidate in (21b) is also unfaithful to the input, but in a different way: the lexical prominence has not been deleted but shifted from its lexical position in the input, leading to a crucial violation of NO-FLOP-PROM. The winning candidate is therefore the one that is fully faithful to both the presence of an accent and its position in the input (21a), despite its poor edge-alignment by INITIAL-PROM.

The result achieved by this grammar is the desired opposition between forms like *ʔamúl* and forms that are not marked for second syllable stress, e.g., *tévet*. If such forms are either marked lexically for initial stress, or completely unmarked, they will receive initial stress by the ranking of constraints given above.[6] This result is ensured by the ranking of two important PROS-FAITH constraints, namely MAX-PROM and NO-FLOP-PROM, above INITIAL-PROM, a ranking which favors the realization of the prosodic properties of the input over perfect edge-alignment.

In contrast to this ranking of constraints, the reverse ranking in Cahuilla accounts for regular initial stress in roots, as illustrated below. Regardless of the

[6]The empirical issues of restricting the stress contrast to initial and pen-initial syllables, and the ranking of INITIAL-PROM relative to the anti-insertion constraint DEP-PROM, is taken up in §2.3, where a more thorough analysis of Cupeño root stress is given.

accentual properties of lexical roots in Cahuilla, inputs are mapped onto outputs that have uniform initial stress, even when such a mapping leads to a violation of PROS-FAITH, as in the input-output pairs shown in (22b).

(22) Predictable Accent in Cahuilla

Inputs		Outputs	INITIAL-PROM	PROS-FAITH
a. /tévet/	→	tévet		
		*tevét	*!	*
b. /cvcv́/	→	cv́cv		*
		*cvcv́	*!	

In this way, the presence or absence of a phonemic contrast in accent is derived through constraint ranking. To summarize the above results, phonemic accent in Cupeño involves the ranking of a set of PROS-FAITH constraints above a phonological constraint which requires a systematic pattern (23a). If the reverse ranking holds, on the other hand, the result is a predictable pattern of accent, as observed in the case of Cahuilla (23b). Furthermore, the effects of these two schematic rankings can be combined to account for what might be dubbed 'hybrid accent' systems, i.e., systems where accent is contrastive in some contexts, but certain over-arching constraints limit the distribution of the accentual contrast. For example, Spanish nouns have a contrast in the position of stress in that stress may fall on any of the last three syllables of the word; but antepenultimate stress is systematically avoided if the penultimate syllable is bimoraic (Harris 1983). By interleaving the PROS-FAITH constraints (PR-FAITH for short) between two purely phonological constraints, this type of limited contrast can be achieved in a direct way (see Pater 2000, Alderete 1996, Revithiadou 1998, and Baerman 1998 for analyses of such systems along these lines).

(23) Summary of Results

Classification	Schematic Ranking	Examples
a. Phonemic Accent	PR-FAITH >> PHONO	Cupeño
b. Predictable Accent	PHONO >> PR-FAITH	Cahuilla
c. 'Hybrid' Accent	$PHONO_1$ >> PR-FAITH >> $PHONO_2$	Spanish Nouns

Of course restricted phonemic contrasts can be approached differently in terms of constraints on underlying representations themselves; these are the Morpheme Structure Constraints (MSC) which are commonly used in rule-based

accounts of such restrictions, however they are conceived (see Hammond 1989b and Franks 1991; Inkelas 1999, Pater 1994, Katayama 1995 for different formal approaches to restricted accentual contrasts). One important argument for the treatment of such systems as constraint domination is that it solves a classic problem in Generative Phonology concerning the treatment of constraints on the inventory, namely the Duplication Problem (see Kenstowicz & Kisseberth 1977 and references therein). In many accent systems, the constraints on the distribution of contrast also play a role in governing the output of certain accentual processes. For example, unaccented words in Russian receive a stress on the first vowel of the inflectional ending, e.g., /stol + u/ → *stol-ú* 'table (dative singular)'; furthermore, special accent-deleting suffixes in Russian, e.g., *-ač* , trigger a deletion of the stem accent which results in ending stress as well: /púz + ač + u/ → *puz-ač-ú* 'man with paunch'. Clearly, the constraint requiring ending stress is operative in both cases, showing that a single constraint has a role in the analysis of restricted suffix stress and the stress pattern resulting from de-accentuation.

In the theory proposed here, this constraint has a single instantiation and its application is restricted exclusively to output forms (see §3.2 and §5.2.3 for the details of the analysis). Consistent with the OT principle of the RICHNESS OF THE BASE, there are no language particular restrictions on the input. Therefore, the restriction governing the range of possible stress patterns in unaccented words may not be stipulated of lexical forms because it is a restriction specific to Russian. This reasoning entails that the constraint yielding ending stress is a surface-oriented constraint, which may of course extend to the analysis of ending stress in de-accented structures. In a rule-based theory with MSCs, on the other hand, a constraint on possible inputs applies to the lexical inventory, yielding ending stress in unaccented words. This constraint is in addition to a constraint yielding ending stress in forms like *puz-ač-ú*. The argument is thus that the approach to restricted phonemic contrast with surface-oriented constraints is superior to the theory with MSCs because the latter requires constraints operative in different components of the grammar that achieve essentially the same result.[7]

1.2.2.3 Consequences for Culminative Accent

Recall that accent systems always have a single most prominent accent, entailing the resolution of accent in words with more than one lexical accent. In addition, in words with no lexical accent, an accent is often supplied to the surface representation. These two observations characterize two different meanings for the notion 'culminativity', both the classical sense of Trubetzkoy

[7]See Prince & Smolensky 1993, Pater 2000, 1996, Myers 1997a, Tesar & Smolensky 1997, and Beckman 1997 for further discussion of the solution to the Duplication Problem and conspiracies in general in Optimality Theory.

1939 and the sense in which it is commonly used in studies of metrical stress (see Liberman & Prince 1977, Hyman 1977, Hayes 1995).

(24) Culminativity of Accent (relative to a domain *D*)

a. Existence requirement: every *D* has an accent.

b. Uniqueness requirement: every *D* has exactly one accent that is greater than all others.

To say that some constituent *D* has culminative accent entails that every instance of *D* has an accent. Furthermore, culminativity of accent entails that there be a single accent that stands out among all others in *D*, which can be satisfied simply by the existence of a single accent per *D*.

The role of prosody is largely undisputed in the analysis of culminativity; the assumption that lexical prominences are mapped directly onto bracketed grid structure derives culminative accent in a simple and direct way. A fundamental assumption in metrical stress theory is that prosodic structures are hierarchically structured (Liberman & Prince 1977, Halle & Vergnaud 1978, Selkirk 1980, among many others), as in the hierarchy of prosodic categories arranged below.

(25) Prosodic Hierarchy (modified from Selkirk 1980)

PrWd
|
F
|
σ
|
μ

Within the present OT framework, the hypothesis that prosodic categories are hierarchically organized breaks down into a set of well-formedness constraints, given in (26). Thus, each of these constraints may be ranked on a language particular basis, accounting for the common finding that, while these principles of prosodic organization dictate a target for optimal prosodic structure, they may, in fact, be violated in specific contexts. For example, Itô & Mester 1992 argue convincingly that certain unpaired syllables in Japanese word clippings are directly associated with the prosodic word, rather than being footed by a non-binary foot.

(26) Constraints on Prosodic Domination (Selkirk 1995 [1996], cf. Itô & Mester 1992)

LAYEREDNESS: No C^i dominates a C^j, $j > i$, e.g., 'No σ dominates F.'

HEADEDNESS: Any C^i must dominate a C^{i-1} (except if $C^i = \sigma$ (or consistent with (25), except if $C^i = \mu$)), e.g., 'A PrWd must dominate a F.'

EXHAUSTIVITY: No C^i immediately dominates a constituent C^j, $j < i-1$, e.g., 'No PrWd immediately dominates a σ.'

NONRECURSIVITY: No C^i dominates C^j, $j = i$, e.g., 'No F dominates a F.'

The culminativity requirements given above follow from these assumptions inherent to the organization of prosodic structure, plus a basic assumption about the nature of headed constituents discussed below. First, the existential requirement follows from the principle of HEADEDNESS and the standard assumption that accent is a property of the head of a prosodic foot. The principles of prosodic organization require that every PrWd must have a foot, and since accent is a property of the head of a prosodic foot, the existence requirement follows from these basic assumptions. The same type of result can be modelled for phonological phrases because phrases contain PrWds, and are thus subject to the restrictions on PrWds, including the requirement that they have an accent. Furthermore, the head of a given PCat is more than just an obligatory element at the immediately subordinate level in the hierarchy; the head specifies a structural relationship between itself and other members at the same level (see e.g., Liberman & Prince 1977, Hayes 1980, Selkirk 1980). Thus, in purely arboreal theories of prosodic structure characteristic of early metrical theories, as well as the bracketed grid theories of Hammond 1984, HV, and Hayes 1995, the head specifies a relation between a strong element, i.e., the head, and a weak element, i.e., the non-head. Since every PrWd has a single head foot, and every foot has a single head syllable, it follows that if accent is assigned to a head syllable in the head foot, there can only be a single 'main accent', or a single accent greater in prominence than all others.

To illustrate these results in Cupeño, if an input has more than one lexical prominence, only one of them can be faithfully retained in the related output because there is only a single head foot in the output (27a). Furthermore, given a form with no underlying accent, as in (27b), the related surface form will be supplied with a prominence as a consequence of the assumption that all words must have a prosodic foot, and hence must have a prominence in the head syllable of that foot.

(27) Culminative Accent in Cupeño[8]

	Underlying Representation		Surface Form	
	x x x		(x .)	
a.	/pé + ʔáyu + qál/	→	pe-ʔáyu-qal	'S/he was wanting'
			(x .)	
b.	/yax + em/	→	yáx-em	'Say (plural imperative)'

Importantly, 'culminativity effects' such as these may be derived over long distances, which, as mentioned above, is characteristic of accent systems in general. It makes no difference in the analysis of culminativity above whether the lexical prominences are on adjacent or non-adjacent syllables; what matters is that only one can be realized as the head of the main stress foot.

One question that arises in this theory is whether or not a lexical prominence can give rise to contrastive accent that is not the primary accent in a surface form. After all, accent is equated with prominence on the grid in this theory, and this prominence structure is also the stuff that heads of non-primary feet are made of. So, in languages that allow non-head feet, can Faithfulness to a lexical prominence likewise give rise to a contrastive secondary prominence? Without further stipulation, clearly the theory of Prosodic Faithfulness proposed here does allow for this possibility, which leads to an interesting empirical question: do languages have contrastive secondary stresses (potentially realized as tone or other suprasegmentals)? While it is sometimes asserted that only primary stress is contrastive in lexical accent systems (van der Hulst 1994), the number of reported cases with unpredictable secondary prominence casts some doubt on this claim. In Modern Hebrew, for example, the assignment of secondary stress to the first or second syllable of the word is unpredictable and must therefore be specified for individual words (Bolozky 1980: 277). Secondary (=non-final) stress in Tübatulabal is likewise assigned on a word-by-word basis and is not predictable from the phonological make-up of the form (Voegelin 1935, see also Kager 1989, Crowhurst 1991). A third case concerns the directionality of secondary stress in the Peruvian language Huariapano: secondary stress is assigned on alternating syllables, but whether the stress trains run from left-to-right or right-to-left is again a lexical property of individual

[8]This result for Cupeño relies on the assumption that lexical prominences cannot be 'realized', i.e., faithfully retained in a bracketed grid, in a non-head foot. There are two possible means of ensuring this result: either there are no non-head feet in outputs, consistent with the absence of secondary stresses, or the lexical prominences are on a grid which marks the most prominent foot, and so realization of a foot-level prominence is not sufficient. The latter state of affairs seems to be the correct account of Cupeño, as is made clear in chapter 2.

words (Parker 1998, 1994). All of these cases have in common the fact that a pattern of non-primary prominence is not phonologically predictable, which is exactly the type of lexical idiosyncrasy predicted by the theory of Prosodic Faithfulness assumed here.[9]

The theory of phonemic accent through constraint interaction also has an important implication for an often noted property of accent in underlying representations. In many accent systems, the general trend of 'one accent per word' is also carried over into the lexical inventory, with the effect that individual morphemes also have at most one accentual prominence. Clearly, the same constraints at work in restricting the surface forms extend into the lexicon somehow, raising the question of how underlying forms themselves are subject to said culminativity requirements. In the literature on lexical stress systems, this fact is taken as highly significant and leads to the conclusion that the same universal principles at work in assigning predictable and systematic stress are also at work in assigning lexical stress. Thus, Tsay 1991 approaches lexical stress as different instantiations of a universal set of parameter settings for stress. Building on this idea, Idsardi 1992 proposes a theory of Lexical Edge Marking (LEM), which draws on a restricted set of rule types and posits a metrical bracketing in lexical entries as the representation of lexical stress. In other words, stress in the lexicon is assigned 'by rule', and as a consequence of this assumption, the properties of these stress rules are carried over to lexical stress. As pointed out explicitly by Idsardi, since the rules of regular and systematic stress only assign a single stress, it follows that this feature of stress rules is inherited by the principles of lexical stress markings, thereby explaining the fact that there is only a single lexical stress per morpheme.

This basic result also follows from the theory of lexical accent proposed here once the principles of learning inputs are properly understood, except the current theory does not have the descriptive short-comings of LEM theory. Intuitively, the parallel between these two theories works as follows. Given that there may only be a single prominence in the output, it is of absolutely no use to posit underlying forms with more than one prominence. If the learner goes to the trouble to do such a thing, the lexical form will invariably lead to unfaithful mappings, i.e., ones in which one of the prominences is deleted, and so morphemes with more than one prominence are never learned as a part of the lexical inventory. The principle implicit in this informal statement is not one of grammar construction, but rather, a principle of learning the inputs of a language. As shown in Prince & Smolensky 1993, Tesar & Smolensky

[9]The difficulty in hearing secondary stress may perhaps explain why impressionistic studies do not always report irregularities in secondary stress. Pressing further, if secondary stress is hard to hear, its apparent markedness may be due to a failure to hear such deviations in stress in language learning. Concretely, deviations from a regular pattern of stress is more audible, and hence more reliably retained, for primary stresses than secondary ones, which would appear to explain the preference for lexical primary stress over non-primary stress implicit in van der Hulst's claim.

1993, 1998, the principles of harmonic evaluation may be employed in learning both the grammar and the lexical forms of a particular language. The learning of inputs is governed by Lexicon Optimization (LO), which is given below.

(28) Lexicon Optimization (Tesar & Smolensky 1998, cf. Prince & Smolensky 1993)

> Suppose given an overt structure ρ and a grammar. Consider all structural descriptions (of all inputs) with overt part equal to ρ; let the one with maximal Harmony be *p*, a parse of some input *I*. Then *I* is assigned as the underlying form of ρ.

Given a grammar in which a set of constraints ensuring culminative accent (see discussion above) outranks the PROS-FAITH constraints, culminative accent is guaranteed in lexical forms by LO. As illustrated below, a lexical form with more than one lexical prominence will never realize all of them, because of the role of CULMINATIVITY in the system, and so such a mapping will always have a breach of Faithfulness (29a). When compared with a different input-output mapping of a single lexical prominence that produces same overt structure, the latter will always be chosen by LO; the IO-map in (29b) is more harmonic than the one in (29a), and therefore it is chosen as the lexical form.[10]

(29) Culminativity in Lexical Inventory through Lexicon Optimization

Input	Output	CULMINATIVITY	MAX-PROM
a. /ó σ ó/ →	ó σ σ		*
	ó σ ó	*!	
b. → /ó σ σ/ →	ó σ σ		
	σ ó σ		*!

In this way, the grammatical constraints requiring culminative accent in outputs is 'cycled back' into inputs in the learning of lexical forms. An important property of this account which distinguishes it from various alternatives is that culminativity of inputs is derived by a language particular ranking of universal constraints. That is, there is an intimate relationship between the grammar of outputs and the principles of learning lexical forms: in both cases, it is harmony relative to the language particular constraint hierarchy that matters. Thus, if a language allows for multiple prominence in outputs, it will likewise allow for multiple prominence in inputs. The theory of accent

[10]This result is also obtained if the learner has not yet arrived at the correct ranking of constraints; see Tesar 1998 and Tesar & Smolensky 1998 for discussion of the application of these principles in the acquisition of both inputs and constraint rankings in tandem.

proposed here will have no trouble with cases reported to have lexical accent in more than one position in the word (see Idsardi 1992 for discussion of the relevant cases). The presence of more than one prominence entails that the culminativity requirements are subjugated to MAX-PROM, which in turn allows for more than one lexical prominence in a given form. In contrast, if lexical accent is assigned by rule, as in LEM theory, then an additional provision needs to be stipulated in order to accommodate non-culminative lexical accent.

A final difference between the current theory and theories of lexical accent assignment by rule is that the latter approach makes substantive restrictions on the set of possible lexically accented positions. In essence, lexical accent must fall on a position that is attested as a position of primary stress in some language, e.g., final, initial, or penultimate position, etc. In languages that have a wider range of lexically accented positions, like Russian and Japanese, forms with accent in marked positions must be treated as exceptions on a par with loan words or structures with a complex morphological analysis (see for example Idsardi 1992: 52 for such lexical edge markings in Russian). In the theory of lexical accent as Prosodic Faithfulness, the lexical positions for accent are also restricted, but only by the constraints operative in the language under analysis. Thus, Russian allows stress on any syllable in the stem, so there is nothing precluding the acquisition of an input with, for example, accent on the third syllable from the beginning of a word that has six syllables. Again, the constraints on the distribution of surface accent play an important role in dictating accent in lexical forms, as has just been illustrated for culminativity requirements. Thus, in languages with looser restrictions on surface accent, like Russian, the theory provides a descriptively adequate treatment of lexical accent, which, in other theories, requires additional stipulation to accommodate marked positions for accent.

To summarize, I have proposed a theory of Prosodic Faithfulness in which accent is encoded lexically as prominence on the grid, and Faithfulness to this prominence entails realization of the lexical prominence in the head of a prosodic foot, represented as a bracketed grid. Culminative accent in this theory is explained in terms of requirements on this bracketed structure, i.e., the requirement that every grouping must have a head, and that there is only one head foot in a given accentual domain. Furthermore, restrictions on the surface distribution of accent were stated in the grammar as well-formedness constraints that may dominate the Prosodic Faithfulness constraints. These surface-oriented constraints also have an indirect effect on lexical forms because the principle of Lexicon Optimization systematically excludes lexical forms that would otherwise lead to gratuitous constraint violation. The proposed theory therefore has the descriptive power to extend to the reported cases of contrastive secondary prominence, systems with emergent lexical accent in more than one position per word, and languages like Russian and Japanese where accent is in principle possible in any position in the word. In general, the restrictions on both lexical and surface accent come from the language particular rankings of univerisal constraints.

CHAPTER 2

Root-Controlled Accent in Cupeño

2.1 Introduction

A fundamental observation about the accent system of Cupeño[1] (Uto-Aztecan) is that inherent accent in roots overrides inherent accent in affixes (Hill & Hill 1968). That is, the system recognizes a distinction between accented and unaccented roots, and inherently accented roots cause the deletion of accent in inherently accented prefixes and suffixes. This is illustrated with the following forms.

(1) Accented Roots with Accented Affixes

a.	pe-míʔaw-lu	/pé + míʔaw + lu/
	'He came'	3sg+COME+MOTION
b.	ʔáyu-qa	/ʔáyu + qá/
	'He wants'	WANT+PRES.SING

(2) Unaccented Root √*yax* with Accented Affixes

a.	pé-yax	/pé + yax/
	'He said'	3sg+SAY
b.	neʔen ya-qáʔ	/neʔen yax + qá/
	'I say'	1sg+SAY+PRES.SING

The accented roots in (1) win out over the person marker, *pé-*, and the singular present suffix, *-qá*, because affix accent is overridden by root accent. Inherent accent in affixes only emerges in words containing unaccented roots, as shown in (2). In sum, there is a rank order in the system, with an imperative to realize inherent accent in roots over inherent accent in affixes.

Cross-linguistically, roots are special in another way, which can be seen by examining languages with phonemic stress. In Sanskrit, for example, the

[1]Cupeño, thought to be extinct, is a Takic language spoken in Southern California. The data examined in this chapter are drawn from Hill 1967 (H), Hill & Hill 1968 (H&H), Hill & Nolasquez 1973 (given with page.sentence number), Crowhurst 1994 (C), and a set of unpublished fieldnotes provided for me by Jane Hill (JH). A note on transcription: /e/ is the symbol used here for schwa.

position of accent is contrastive in roots, but accent in suffixes is limited to the first vowel of the suffix (Kiparsky 1973). Likewise, in the Athabaskan language Tahltan, stress is contrastive in roots but not in affixes, as the position of affix stress is predictable from the root stress (Cook 1972, Nater 1989). The basic observation in both cases is therefore that roots are privileged in the phonemic inventory, sponsoring a richer set of accentual contrasts than other morphological domains.

In this chapter, the connection between predominant root accent and the privileged status of roots in inventories is explained as the interaction of Faithfulness constraints in Optimality Theory (Prince & Smolensky 1991, 1993). In particular, the cross-linguistic observation that roots have a wider range of accentual contrasts than affixes motivates the introduction of distinct Root and Affix Faithfulness constraints, with Root Faith ranked above Affix Faith (McCarthy & Prince 1995). With this fixed ranking, predominant root stress in Cupeño is explained as a straightforward case of constraint conflict: root stress overrides affix stress because the constraint responsible for realizing stress in roots is top-ranked. In sum, the observation that root stress takes precedence over affix stress in Cupeño is treated as a special case of the cross-linguistic tendency for roots to license a wider range of contrasts than affixes.

One important goal of this chapter, therefore, is to provide further evidence for the segregation of Faithfulness constraints into the morphological domains root and affix, thereby supporting the findings of McCarthy & Prince 1995, Selkirk 1995a, Urbanczyk 1996, and Beckman 1997 [1998], among others. Morphologically-dispersed Faithfulness is shown to be essential in the explanation of the diverse aspects of Cupeño accent, extending to the analysis of complicated morpho-accentual phenomena. A second goal is to motivate the Faithfulness-based analysis by contrasting it with plausible alternatives. Both of the alternatives examined here employ phonological levels or strata in some crucial way, and the assumptions inherent to these approaches are shown to have descriptive and theoretical problems. Finally, I present a complete analysis of accent in Cupeño, bringing a wide range of observations in this complex accentual system to bear on contemporary issues in theoretical phonology.

The rest of the chapter is structured as follows. The next section (§2.2) lays out the theoretical background necessary for the analysis of Cupeño accent. §2.3 then examines stress in isolated roots and gives the constraint ranking necessary for the accentual inventory in roots. In §2.4, these rankings are incorporated in the larger analysis of stress in fully formed words, including the interaction between roots and several distinct affix types. Two alternatives to the Faithfulness-based account are subsequently considered and argued to be inferior to the proposed account on empirical and theoretical grounds. A residual pattern of default-to-opposite edge accent is presented and analyzed in section §2.5, and the results of the previous sections are then summarized. The last section (§2.6)

summarizes the main results of the chapter and discusses some of the implications of the core ideas.

2.2 Theoretical Background: Root and Affix Faithfulness

Recent work in Optimality Theory has argued for a set of Faithfulness constraints for roots that is distinct from the Faithfulness constraints for affixes. The evidence for this distinction comes in various forms, which are summarized below.

(3) Evidence for Privileged Status of Roots

a. Evidence from inventories (McCarthy & Prince 1995, Beckman 1997 [1998], Urbanczyk 1996, Parker 1997, Adisasmito-Smith 1998): Roots tend to admit a wider range of contrasts than affixes, allowing marked structure which is absent in affixes.

b. Evidence from phonological alternations (McCarthy & Prince 1995, Selkirk 1995a,b, Pater 1996, Blake 1998): Phonological alternations may be 'root-controlled'; that is, there is a premium set for realization of phonological features of the root over features in an affix.

c. Psycholinguistic evidence (see Beckman 1997 [1998] for a survey): Word recognition studies provide support that lexical storage and access is root-based and not affix-based.

The first form of evidence comes from phonological inventories. In many inventories, roots license a wider range of contrasts than affixes, but the reverse state of affairs never occurs. With distinct Root and Affix Faithfulness, this asymmetry in the distribution of contrast may be accounted for in terms of familiar types of constraint interaction (discussed directly below).

A second form of evidence is that roots tend to have privileged Faithfulness properties in alternations, favoring retention of information in roots over information in affixes. For example, consider a well-known case of root-controlled vowel harmony in Igbo. In this language, [±ATR] is contrastive in root vowels, but it is predictable in affixes. As illustrated below, [±ATR] specifications in prefixes and suffixes are determined by the root to which they attach.

(4) Root-Controlled Vowel Harmony in Igbo (Ringen 1975 [1988])

æ-zʊ-læ	'don't buy'
æ-tæ-læ	'don't eat'
e-ke-le	'don't share'

Another example illustrating a root-controlled alternation is [labial] dissimilation in Tashlhiyt Berber. In this case, certain derivational prefixes lose their [labial] specification when they combine with a root bearing a primary [labial] specification, as illustrated by the contrast between (5a) and (5b) below.

(5) Root-Controlled Labial Dissimilation in Tashlhiyt Berber (Selkirk 1993, 1995b)

a.	m-xazar	√xzr 'scowl'	b.	n-fara	√fra 'disentagle'
	m-saggal	√siggl 'look for'		n-ħaššam	√ħššm 'be shy'

Again, retention of information in the root, in this case Place features, is more important than retention of affix information.

These two patterns of root privilege are interpreted by McCarthy & Prince 1995 as evidence for a universal ordering among morphologically dispersed Faithfulness constraints (see also the references listed in (3) above for developments and further discussion).

(6) Meta-Constraint on Constraint Rankings (McCarthy & Prince 1995)[2]

Root Faith >> Affix Faith

This inherent ranking explains root-controlled phenomena in terms of the same constraint interaction required in the analysis of root-affix asymmetries in inventories. Given the ordering of Faithfulness constraints above, any restriction that holds on the distribution of a root feature must also hold of affixes, effectively precluding a contrast in affixes that is not sponsored in roots.

This same ranking also extends to root-controlled alternations, since it asserts that retention of a property in a root is always better than retention of the same property in an affix. To illustrate this result for Igbo, consider the following ranking of constraints for [±ATR] Faithfulness for roots and affixes.

(7) Morphologically-Dispersed Faithfulness in Igbo (after McCarthy & Prince 1995)

IDENT(ATR)$_{Root}$, PHONO >> IDENT(ATR)$_{Affix}$

[2]Root privilege is interpreted here as an ordering between distinct Root and Affix Faithfulness constraints; but an equally coherent analysis would be to posit Root Faithfulness distinct from context-free Faithfulness, i.e., a theory in which there is no Affix Faithfulness. Since both approaches establish a parallel between root-controlled accent and other phonological phenomena, I do not distinguish them here. These distinct theories do, however, make testable predictions for different types of edge effects in root-controlled accent systems, which are discussed in detail in chapter 3.

A grammar with this ranking will allow a [±ATR] contrast in roots because IDENT(ATR)$_{Root}$ is not dominated by any crucial phonological constraints. Predictable [±ATR] specification in affixes, on the other hand, derives from the domination of IDENT(ATR)$_{Affix}$. Thus, if one or more affixes have a [±ATR] specification that conflicts with that of the root, it will be overridden by the root's [±ATR] specification, as depicted below.

(8) Root-Controlled ATR Spread in Igbo

Input: æ + ke + æ -A +A -A	IDT(ATR)$_{Root}$	HARMONY	IDT(ATR)$_{Affix}$
a. æ - ke - æ -A +A -A		*!	
b. æ - kæ - æ -A	*!		*
c. → e - ke- le +A			**

An over-arching constraint, HARMONY, requires a single [±ATR] specification per word. With Root Faithfulness top-ranked in the constraint hierarchy, the [±ATR] specification of the root will always override the affix's [±ATR] specification. Importantly, the Faithfulness constraints make direct reference to the input specification of distinct morphological categories; such morphological and lexical information is crucial in distinguishing (8b) and (8c).

The ordering of Root and Affix Faithfulness, motivated here on purely linguistic grounds, also appears to have a functional basis in word recognition studies. In a number of recognition experiments, a priming effect is found in words that share the same root, but no such effect is found in words that share the same affix, leading to the conclusion that lexical access and storage are root-based (see Beckman 1997 [1998] for a review). In light of these findings, a grammar that assigns special Faithfulness properties to roots will aid considerably in the on-line processing of words. Root Faithfulness in effect precludes the destruction of information in the root, leaving intact properties of the input which are critical to lexical look-up strategies.

In many cases, the morphological root is co-extensive with an underived stem, and so there is no means of distinguishing these two domains in their faithfulness properties. In some contexts, however, stem-forming affixes show privileged Faithfulness properties which are uncharacteristic of affixes generally and therefore call for a notion of Stem Faithfulness which is distinct from Root Faithfulness (see Revithiadou 1997 for an alternative). While not

directly attested in Cupeño, certain derivational suffixes in Russian exhibit these Faithfulness properties; in §5.2.3 the intermediate rank of these morphemes is treated as an effect of ranking Stem Faithfulness between Root and Affix Faithfulness. For the moment, however, I will ignore this formal distinction and treat simplex stems as roots, which will therefore be governed by the Root Faithfulness constraints.

The ordering of Faithfulness constraints given in (5) above is not specific to [±ATR] or segmental features more generally. It is a proposal that extends to all aspects of Faithfulness, including the Prosodic Faithfulness constraints given in §1.2.2.1. Thus, applying the inherent ordering in (6) to the PROS-FAITH constraints yields the following ranking of constraints.

(9) Root-Controlled Accent Systems

$$\text{PROS-FAITH}_{\text{Root}} >> \text{PROS-FAITH}_{\text{Affix}}$$

Before delving into the facts of Cupeño, let us briefly consider the role of this ranking in accentual inventories cross-linguistically. As mentioned above, it is often the case that roots sponsor a wider range of contrasts than affixes; this trend is also observed when accent is responsible for the surface contrast. For example, in Sanskrit, the location of accent is unpredictable in roots, giving rise to surface contrasts in the presence or absence of accent and its surface position in the root. Polysyllabic affixes, on the other hand, when they receive an accent, always have initial accent (Kiparsky 1973). Likewise, in Tahltan (Northern Athabaskan), the presence or absence of accent is contrastive within roots. However, accent is predictable in affixes, basically falling on every other syllable counting from the root stress (Cook 1972, Nater 1989). In both cases, therefore, accent is more restricted in affixes than in roots.

With the distinction between Root and Affix Faithfulness, restricted affix stress becomes a simple matter of ranking the relevant prosodic well-formedness constraint, as shown in (10). The limitations on affix prosody derive from the ordering of various constraints relative to Root and Affix Faithfulness.

(10) Restricted Affix Inventories

a. Sanskrit: $\text{PROS-FAITH}_{\text{Root}}$ >> ALIGN(PK, L, STEM, R) >> $\text{PROS-FAITH}_{\text{Affix}}$

b. Tahltan: $\text{PROS-FAITH}_{\text{Root}}$ >> RHYTHM >> $\text{PROS-FAITH}_{\text{Affix}}$

The ranking for Sanskrit yields the observed accentual contrasts in roots because of the high-ranked status of $\text{PROS-FAITH}_{\text{Root}}$. But accent in affixes is predictable because the Alignment constraint ensures that if accent is on the affix it will always fall on the first syllable, or equivalently, the syllable directly following

the stem, which is derived here through a subcategorization-type Alignment constraint (after McCarthy & Prince 1993a). The intrinsic ordering of Root and Affix Faithfulness also extends to the skewed accentual inventory in Tahltan: roots support a contrast in accent, but accent in affixes must be on alternating syllables because of the force of RHYTHM (Hung 1994), which dominates $\text{PROS-FAITH}_{\text{Affix}}$. In sum, the distinction between Root and Affix Faithfulness applied to the PROS-FAITH constraints provides the correct tools for describing restricted accentual inventories in affixes.

The ordering of the PROS-FAITH constraints in (9) above also has a role in the resolution of accent in words with more than one inherently accented morpheme. Substituting MAX-PROM in this ranking will set a premium on preserving inherent root accent over inherent affix accent. As this pattern of root privilege will support a major theme in the case studies that follow, I state the effects of this inherent ordering in prose.

(11) Root-Controlled Accent Hypothesis (derived from (9))

> In lexical-to-surface mappings of a word with more than one inherent accent, if accent is deleted, accent in the root is realized over accent elsewhere in the word.

As with root-controlled vowel harmony, root-controlled accent follows from the same principles responsible for restricted affix inventories. Concretely, the ordering of Root and Affix Faithfulness employed in the analysis of restricted affix accent in Sanskrit and Tahltan extends to accentual alternations, explaining root-controlled accent as a special case of the cross-linguistic trend for root privilege. The rest of this chapter demonstrates that the RCA hypothesis discloses several important properties of the analysis of Cupeño accent. The first part of this analysis is presented in the next subsection, giving an account of the inventory of stress patterns found in roots, a context where Prosodic Faithfulness for roots has a crucial role. In section 2.4, the role of Root and Affix Faithfulness is further illustrated in the analysis of the morphological influences on accent, showing that the ranking responsible for dynamic alternations directly explains the interaction of root and affix accent.

2.3 Root Stress Inventory

2.3.1 The Data

While earlier work on Cupeño assumed that stress in roots was unpredictable, more recent research has shown that the observed root stress patterns are not completely irregular (Munro 1990, Crowhurst 1994). Stress is

contrastive in certain contexts to be described below, but if a root has a long vowel, that vowel is stressed. The examples below are typical, showing long vowel stress in bare roots (12) and conjugated verbs (13). Most of the roots in these examples are no longer than two syllables, which apparently reflects the canonical pattern.[3]

(12)	a.	máasive-t	'grass' C 185
		xéene	'blow (wind)' C 185
		péexwen	'nothing but' 10.57
		náači	'soon, quick' 38.4
		híimaʔay	'donate to burning ceremony' C 185
	b.	tevxáa-qa	'... is working' C 185
		ʔiyúune	'fast' C 185
		muháan	'shoot with bow' C 185
(13)	a.	pem-téečiŋ-wen	'They ordered' 41.7
		čem-náaxčin	'We passed on' 21.9
	b.	peʔ-ičáay-wen	'They did ...' 24.51
		taváan-pe-qal	'He put him ...' 58.13

Long vowel stress also has the effect of precluding stress on a short vowel in the same word. That is, there are no roots with long vowels where stress falls on a syllable with a short vowel. The historical developments leading up to Cupeño stress, as described in Munro 1990, supports this observation. Pre-Cupeño stressed the root-initial vowel, or the second vowel if it was long; otherwise default stress fell on the initial syllable. Subsequently, contrastive vowel length was lost in unstressed syllables. Thus, the fact that vowel length was only preserved in stressed syllables effectively rules out the possibility of short-vowel stress in forms with long vowels. Summarizing the above discussion in synchronic terms, one key observation governing the distribution of accent in roots is that long vowels attract stress.[4]

[3]It is rare to find roots composed of three or four syllables with post-peninitial stress; this observation has prompted Crowhurst 1994 to invoke an initial two syllable window for stress in roots. The observations on canonical morpheme shape in Hill 1967: 184 ff., however, suggest that such a constraint may in fact be unnecessary because of the rarity of simplex roots greater than two syllables. Also, a cursory inspection of the lexical resources uncovers some exceptions to the two syllable window: *išmivíy* 'things', *tukumáy* 'tomorrow', and *pišʔemáy* 'just then'.

[4]Stress in Spanish loans, e.g., *váaka-ʔam* 'cattle' and *kaváayu-ʔum* 'horses', also conforms to this pattern of long vowel stress. But stressed vowels in both Spanish and English loans tend to be long in Cupeño, suggesting that vowel length in these forms

In contrast to this predictable part of the stress system, stress is contrastive in roots which do not contain long vowels: stress may fall on either the first or second syllable, as shown by the nouns in (14) and the conjugated verbs in (15).

(14)	a.	súʔi-š	'jackrabbits' 10.63
		púki-yka	'by (to) the door' 9.25
		máxiʔč-am	'greens' 9.4
		kúpa-ŋax	'from Cupa' 29.1
		k^{w}íni-l^{y}	'acorns' 29.1
	b.	temá-l	'ground' 29.4
		atáxʔ-am	'the people' 29.1
		savá-l	'grass' 29.4
		kawí-š	'rock' 29.4
		sevé-l	'wind' 9.16
		siʔáyi-š	'cracked acorns' 29.7
(15)	a.	pe-míʔawlu	'He came' 9.1
		čem-yáyax	'We try to ...' 9.7
		pem-híwen	'They stopped' 21.9
		pem-náyxi	'They fought' 1.15
	b.	pe-pulín-qal	'... gives birth' 43.5
		čem-tewáš	'We lost' 125

While there may be a historical account of these patterns, the initial-peninitial stress contrast is synchronically unpredictable. This fact has led Hill & Hill 1968 and Munro 1977 to classify Cupeño as a 'lexical stress' language, i.e., a language in which stress alone may introduce contrast among roots.

is phonological. Considering the role of duration in signaling stress in these languages, however, the most sensible approach to this problem seems to be that stressed vowels in the source languages are perceived as long, and hence represented as such lexically.

To summarize, the inventory of stress patterns observed in roots (excluding monosyllables) is given in (16).

(16) Root Stress Inventory

a. Predictable Long Vowel Stress

cv́vcv	cvccv́v
xéene	tevxáa

b. Contrastive Stress Elsewhere

cv́cvc	cvcv́c
sú?iš	temál

Any analysis of the root stress inventory must account for the fact that long vowels are always stressed, and at the same time, it must allow for lexically determined initial or peninitial stress in forms with no long vowels.

2.3.2 The Analysis

I assume essentially the same foot structures proposed in Crowhurst 1994 to account for certain correspondences between the accent system and the prosodic morphology of the habilitative construction (see also Hill 1970, McCarthy 1979a, 1997, McCarthy & Prince 1986, 1990). In particular, roots are consistently parsed into right-headed feet in the output, even if this results in a monomoraic foot.[5] This is illustrated below.

(17) Uniform Right-Headed Feet

(x)	(. x)	(x)	(. x)
xéene	tevxáa	sú?iš	temál

In constraint-based terms, uniform iambs entail a constraint ranking in which RHTYPE = IAMB dominates RHTYPE = TROCHEE (Prince & Smolensky 1993). In addition, Foot Binarity must be ranked below the Prosodic Faithfulness

[5]The evidence for iambic feet in the analysis of stress is indirect but strong. There is a relationship between the overall shape of the habilitative and the surface stress of its base form: the stressed vowel is always followed by two syllables in the habilitative, e.g., *čál—čá?a?al* 'husk' and *páčik—páči?ik* 'leach acorns'. Assuming that feet are uniformly right-headed, it is possible to describe the prosodic morphology of the habilitative as a bipodal unit. Thus, finally-accented stems receive two epenthetic syllables, i.e., [(čá)(?a?al)], while disyllabic stems with initial stress only get one inserted syllable, as in [(pá)(či?ik)], because one of the stem syllables can be recruited in the final foot.

constraints (PROS-FAITH) because the iambic requirement may have the effect of creating non-binary feet in cases like [(sú)?iš], as depicted in the following tableau.

(18) Emergence of Lexical Initial Stress

x /sú?iš /	PROS-FAITH	FTBIN
a. (. x) su?íš	*!	
b. → (x) sú?iš		*

The losing candidate is the unfaithful one, because the first vowel in the input has a prominence, but the related vowel in the output has no corresponding prominence, hence violating PROS-FAITH. The constraint violations in the first candidate can be due either to deletion of an accent, i.e., a MAX-PROM violation, or, if the grid mark in the input stands in correspondence with the surface prominence, then a violation of NO-FLOP-PROM is incurred. Either scenario is sufficient to motivate the domination of FTBIN. The winner, therefore, is the candidate that matches the input prosody exactly, at the expense of a FTBIN violation.

As for the observation that long vowels are always stressed, this fact is best treated as consequence of the larger distribution of length. Recall from §2.1 that long vowels always appear in stressed syllables. Assuming that only cvv(c) syllables, and not cv(c), count as heavy (Crowhurst 1994), this fact can be treated as an effect of the WSP (following the leading ideas of Prince 1990). In particular, if the WSP dominates the faithfulness constraints regulating vowel length (on which see Urbanczyk 1996, McCarthy 2000b), then all unstressed syllables will shorten to avoid WSP violations, e.g., /cvvcv́v/ → cvcv́v.[6] Of course there is no reason to shorten long vowels in stressed syllables because such output structures do not violate the WSP. To summarize, all long vowels are stressed in Cupeño because stressed syllables are the only contexts where long vowels fail to shorten.

[6]As for extending this result outside of roots, such an endeavor is impossible because it appears that there are no affixes with long vowels. There is only one affix with a long vowel in Hill and Nolasquez's (1973) list of affixes, namely *-kwáani* 'for the sake of'. However, this suffix is probably derived historically from a bare noun root *-kwaan* 'worth, value', a claim which is supported by the fact that *-kwaani* still acts like a root in that it may take person markers and prevails over prefix stress, e.g., /net pé + kwáani/ → *nét pe-kwáani* 'for the sake of the chief'.

2.4 Root-Controlled Accent

In this section, the influence of inherent root accent is examined and analyzed in larger words. The section begins with a detailed study of the interaction between root and affix stress (§2.4.1), followed by the proposed analysis (§2.4.2). The analysis is then extended in §2.4.3 to account for pre-accenting suffixes and the special phonology of the nominalizer, and then the RCA analysis is contrasted with some plausible alternatives (§2.4.4).

2.4.1 Data and Observations

Inherent accent in roots overrides accent in affixes (Hill & Hill 1968). This is shown by the behavior of accented affixes when they combine with different classes of roots. When an accented prefix or suffix is attached to an unaccented root, inherent accent in the affix surfaces. However, when these same affixes attach to an accented root, the root accent prevails. The behavior of the two classes of roots is illustrated below, starting with unaccented roots.

The accented affixes of which I am able to find good examples are listed below. The accented prefixes are the person prefixes listed in (22), which are used to mark the person and number of subjects and possessors. The accented suffixes are listed in (23) (not including pre-accenting suffixes, which are treated in §2.4.3).

(22) Accented Prefixes

1	né-	čém-
2	ʔé-	ʔém-
3	pé-	pém-
	Singular	Plural

(23) Accented Suffixes

-qál	'past durative marker' (PAST.DUR)
-qá	'present singular marker' (PRES.SING)
-í	'object marker' (OBJECT)
-í	'nominalizer' (NOM)

When one of these accented prefixes or suffixes combines with an unaccented root, inherent accent in the affix surfaces, as shown below for three roots classified by Hill & Hill 1968 as unaccented.

(24) a. Accented Prefix Wins

/né + yax/	→	né-yax	'I say' JH
/pé + yax/	→	pé-yax	'He says' 1.15
/čém + yax/	→	čém-yax	'We say' 21.6
/pém + yax + wen/	→	pém-yax-wen	'They said' 42.28

b. Accented Suffix Wins

/neʔep né + yax + qál/	→	néʔep ne-ya-qál	'I was saying' JH
/neʔen yax + qá/	→	neʔen ya-qáʔ	'I say' JH
/pé + yax + qál/	→	pe-ya-qál	'He was saying' 1.9
/mi + yax + qá/	→	mi-ya-qáʔ	He tells them 38.49

(25) a.

/né + max + ʔe/	→	né-max-ʔe	'(I) to give ...' JH
/čem + max + ʔe/	→	čéʔ-max-ʔe	'(We) to give ...' JH
/ʔi + pém + max/	→	ʔi-péʔ-max	'They gave you ...' JH

b.

/max + qá/	→	max-qáʔ	'... giving ...' JH
/ʔi + né + max + qál/	→	ʔi-ne-max-qál	'I was giving you' JH
/čim + pé + max + qál/	→	čim-pe-max-qál	'He was giving us' JH

(26) a.

/né + wen/	→	né-wen	'I put' JH
/čém + wen/	→	čém-wen	'We put' JH
/né + wen + pi/	→	né-wene-pi	'(I) to put it in' JH
/čém + wen + pi/	→	čém-wene-pi	'(We) to put it in' JH

b.

/né + wen + qál/	→	ne-wen-qál	'I was putting' JH
/wen + qá/	→	wen-qáʔ	'... put (it) ...' JH

As is evident from the examples above, when a word has more than one accented affix, it is the rightmost one in the word that surfaces with stress, e.g., /né + wen + qál/ → *ne-wen-qál*. This pattern also holds when the competition is between two accented suffixes, as shown by the following examples which both contain the past durative and objective case marker.

(27) Rightmost Accented Suffix Wins

/yax + qál + í/	→	yex-qel-í	'While ... was saying' H&H 236
/ʔé + yax + qál + í/	→	ʔe-ya-qal-í	'... what you said' JH

When an unaccented root combines with an unaccented affix, however, the word is assigned default initial stress, as exemplified below.

(28) Default Initial Stress

a.	/yax + em/	→	yáx-em	'(You Pl) say!' JH
	/čem + čeme yax + we/	→	čem-čeme yáx-we	'We say' JH
	/neʔq^{w}en ya + ʔa/	→	neʔq^{w}en yá-ʔa	'I can say' JH
b.	/max + em/	→	máx-em	'Give! (Pl)' C 186
	/max + an/	→	máx-an	'Give it to me' JH
	/max + aʔeš/	→	máx-aʔeš	'Give it to us' JH
c.	/wen + em/	→	wén-em	'Put it in (Pl subj)' JH
	/wen + a/	→	wén-a	'Put it in (Sg)' JH

While many of the examples above with emergent prefix stress also have initial stress, as noted in Hill & Hill 1968: 235, stressed prefixes may surface with non-initial stress. In the examples below, an object marker prefix separates the stressed prefix from the beginning of the word, yielding prefix stress on the second syllable of the word.[7]

(29) Non-Initial Prefix Stress

a.	mi-né-tew	'I saw them'
	mi-pé-tew	'He saw them'
	mi-čém-tew	'We saw them'
b.	pi-pú-kuş	/pi + pé + kuş/
	'He ... took it'	3sg+3sg+TOOK
c.	pi-pé-wen	/pi + pé + wen/
	'He put it'	3sg+3sg+PUT
d.	ʔi-peʔ-max	/ʔi+ pém+ max/
	'They gave you ...'	2sg+3pl+GIVE
	mi-peʔ-max-wen	/mi + pém + max + wen/
	'They were giving ...'	3pl+3pl+GIVE+PRES.IMPER

In contrast to the forms above containing unaccented roots, when an inherently accented affix combines with an accented root, root accent always prevails. This is shown below for each affix type individually (30), and with accented roots which combine with both accented prefixes and suffixes (31).

[7]The object markers preceding the stressed prefixes here cannot be clitics because they do not meet the requirements for stand-alone pronouns stated in Hill & Nolasquez 1973: 122 ff.

(30) Root Accent Overrides Affix Accent

a. Root-Controlled De-Accenting in Prefixes

/pé + ŋíy + pi/	→	pe-ŋíy-pi	'He would go away' 1.15
/pé + ŋéye + yax/	→	pe-ŋéye-yax	'It shakes' 1.17
/pé + míʔaw + lu/	→	pe-míʔaw-lu	'He came' 9.1
/čém + náačin/	→	čem-náačin	'We passed on' 21.9
/pém + ŋíy + wen/	→	pem-ŋíy-wen	'They went out' 29.2
/pém + čáŋnu/	→	pem-čáŋnu	'They got angry' 1.15
/pém + číʔ + l^{y}u + wen/	→	pem-číʔ-l^{y}u-wen	'They went gathering' 29.1

b. Root-Controlled De-Accenting in Suffixes

/píq + pe + qál/	→	píq-pe-qal	'... touched him' 43.31
/mi + k^{w}áw + pe + qál/	→	mi-k^{w}áw-pe-qal	'He was calling them' 44.1
/nánva + ya + qá/	→	nánva-ya-qa	'... is done' 44.9
/ʔáyu + qá/	→	ʔáyu-qa	'... (He) wants' 23.31

(31) Root-Controlled De-Accenting

/pé + ʔáyu + qál/	→	pe-ʔáyu-qal	'He was wanting' 1.14
/pé + túl + qá/	→	pe-túl-qa	'He finished' 42.22
/pé + háw + pe + qál/	→	pe-háw-pe-qal	'He sang' 42.22
/pé + pulín + qál/	→	pe-pulín-qal	'She gave birth' 43.5
/né + ŋíy + qál + í + pe/	→	ne-ŋíy-qal-i-pe	'When I go away' 1.16

To summarize, the interaction between root and affix accent may be described as follows (roots are underlined).

(32) Summary of Cupeño Accent

•If the root contains an inherently accented vowel, that vowel receives the unique word stress:

/ ...róot... / → [... róot ...]
/pé + <u>túl</u> + qá/ → [pe-<u>túl</u>-qa]

•In words without an accented root, the rightmost accented vowel in an affix bears word stress:

/ ... áf + ... + áf / → [... af + ... + áf]
/ pé + <u>yax</u> + qál / → [pe-<u>ya</u>-qál]
/<u>yax</u> + qál + í/ → [<u>yex</u>-qel-í]

•If the word does not contain an inherently accented morpheme, the first vowel receives the word stress:

/ σ σ ... / → [σ́ σ ...]
/ <u>yax</u> + em / → [<u>yáx</u>-em]

2.4.2 The Analysis

The observations presented above show that Cupeño has the type of dynamic effects in alternations described in §2.2. Using the Root-Controlled Accent hypothesis as our guide, the basic property of predominant root accent is analyzed as follows.

(33) Root-Controlled Accent in Cupeño

PROS-DOM
|
PROS-FAITH$_{Root}$
|
PROS-FAITH$_{Affix}$
|
ALIGN-R(PK, PrWd)

The constraints on Prosodic Domination from §1.2.2.3 are ranked above both of the Prosodic Faithfulness constraints, ensuring that stress-accent is culminative (even in roots). Therefore, when an underlying form supplies both an accented root and an accented affix, only one may surface. The ordering PROS-FAITH$_{Root}$ >> PROS-FAITH$_{Affix}$, which by hypothesis holds in all languages, resolves this conflict, favoring retention of the root accent. The pattern of rightward edge orientation observed in affixes shows a role for the alignment constraint, ALIGN-R(PK, PrWd), which, in the right context, accounts for the pattern of 'rightmost affix accent wins'. As the pattern of default-to-opposite edge accent is governed by a different set of constraint interactions, its treatment is postponed to §2.5.1.

The following tableaux illustrate the basic result. As shown in (34), when the competition for the unique word accent is between an accented prefix and an accented root, the accented root wins. Likewise, when the competition is between an accented root and an accented suffix, the root will again prevail with the word stress, as shown in (35).

(34) Root-Controlled De-Accenting in Prefixes: / áf + róot ... / → [af-róot ...]

x_1 x_2 /pé + míʔaw + lu/	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (x_1) pé-miʔaw-lu	*!	
b. → (. x_2) pe-míʔaw-lu		*

(35) Root-Controlled De-Accenting in Suffixes: / ... róot + áf / → [... róot-af]

x_1 x_2 /ʔáyu + qá/	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (. x_2) ʔayu-qá	*!	
b. → (x_1) ʔáyu-qa		*

The same result obtains when an accented root combines with both an accented prefix and an accented suffix, as depicted in (36). Here again, the outcome is predominant root stress because of the universal ordering between Root and Affix Faithfulness.

(36) Root-Controlled De-Accenting: / áf + róot + áf / → [af-róot-af]

x_1 x_2 x_3 /pé + túl + qá/	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (. x_3) pe-tul-qá	*!	*
b. (x_1) pé-tul-qa	*!	*
c. → (. x_2) pe-túl-qa		**

When the competition is instead between two accented affixes, the Faithfulness constraints cannot be decisive, as the MAX-PROM violations are equal in such a case. The decision therefore falls to another constraint, namely the lower ranked Alignment constraint, ALIGN-R(PK, PrWd), which favors right-aligned stress peaks. This constraint thus picks the candidate with the rightmost affix stress, as shown below for a word with an accented prefix and suffix.

(37) Rightmost Affix Stress: / áf + root + áf ... / → [af-root-áf ...]

x_1 x_2 /pé-yax-qál/	MAX-PROM$_{Affix}$	ALIGN-R(PK, PrWd)
(x_1) a. pé-yax-qal	*	yax-qal !
(. x_2) b. → pe-yax-qál	*	

This result obtains in words with two stressed suffixes, e.g. /yax + qál + í/ → *yex-qel-í*. The correct outcome here is more harmonic than a form which stresses the penultimate suffix, e.g., *yex-qál-i*, because the former better satisfies ALIGN-R(PK, PrWd).

The fact that inherent accent can be realized non-finally in Cupeño shows that MAX-PROM$_{Affix}$ dominates ALIGN-R(PK, PrWd). If the opposite ranking held, then inherent accent could only surface word-finally, which is not true for Cupeño. In the tableau below, lexical accent emerges in a non-final vowel, despite the resulting violation of ALIGN-R(PK, PrWd).

(38) Non-Final Prefix Stress: / áf ... / → [áf ...]

x_1 /pé + yax/	MAX-PROM$_{Affix}$	ALIGN-R(PK, PrWd)
(. x_2) a. pe-yáx	*!	
(x_1) b. → pé-yax		**yax**

To give an interim summary of the results, the inherent ordering between Root and Affix Faithfulness explains each pattern of root retention depicted above. That is, regardless of affix type, if an inherently accented root combines with an inherently accented affix, the accent of the root prevails because of the intrinsic ranking of MAX-PROM$_{Root}$ above MAX-PROM$_{Affix}$. Affixal accent only emerges in words with unaccented roots because in such cases there is no root accent to realize. Finally, in words with more than one accented affix, the rightmost affix accent wins because of the role of ALIGN-R(PK, PrWd) in the system.

2.4.3 Extending the Analysis

The discussion so far has focused squarely on the interaction between root and affix accent where the affixes are themselves stressed. A large number of affixes in Cupeño, however, may contribute an accent, but do not themselves surface with stress. These are the pre-accenting suffixes, which typically cause accent to fall on the root-final vowel. Any analysis of Cupeño accent must account for these cases, and as will be shown directly below, the ideas developed so far provide a clear line of analysis for pre-accentuation. The analysis will also be extended to account for the unique phonology of the nominalizer suffix *-í*.

A list of the pre-accenting suffixes in Cupeño is given below.[8]

(39) Pre-Accenting Suffixes (see Hill 1967, Hill & Hill 1968, and Hill & Nolasquez 1973)

-ʔaaw	'at'
-či	'with, by means of' (WITH)
-maa	'diminutive' (DIM)
-nuukV	'punctual subordinator' (PUNCT)
-ŋa	'in'
-ŋaʔaw	'on'
-ŋax	'from'
-pe	'place of'
-wi	'augmentative' (AUG)
-yka	'to'

One basic fact about these suffixes is that the accent contributed by the pre-accenting suffix generally surfaces on the root-final syllable, as shown by the input-output mapping /√wena + nuk$_{pre}$/ → *wená-nuk* 'having put it' (H: 192).[9] As illustrated in the data below, the accent contributed by the pre-accenting suffix always wins out over an accented prefix, producing root-final stress, as shown in (40-1). The forms in (42) exemplify the same pattern, except the roots are disyllabic, which shows that pre-accenting suffixes yield root-final stress, and not for example root-initial stress.[10]

[8]A distinction is made in Hill & Hill 1968 between the suffixes given in (39) and ones that are claimed to yield root-initial stress in unaccented forms, e.g., *-we* 'present imperfect (plural subject)' and *-weene* 'past imperfect'. The evidence given for this two-way distinction is largely based on theory-internal assumptions with regard to syncope, and for this reason I will only discuss the root-final accenting suffixes.

[9]Pre-accentuation is subject to certain locality conditions, and when these are not met, it appears that stress may fall on a immediately preceding suffix (though the evidence for this observation is rather unclear). See Hill and Hill 1968: 236 for the empirical details, and §5.3.2 for a sketch of an analysis.

[10]Unfortunately it is impossible at this time to determine if the accent contributed by a pre-accenting suffix also takes precedence over an inherent suffix

(40) Accented Prefix + Unaccented Root √*ma* 'hand'+ Pre-Accenting Suffix

	/né + ma + $\check{c}i_{pre}$/	→	ne-má-či	'with my hands'	H: 192
	/pé + ma + $\check{c}i_{pre}$/	→	pe-má-či	'by the hand'	10.52
cf.	/pém + ma/	→	pé?-ma	'their hands'	8.130

(41) Accented Prefix + Unaccented Root √*ki* 'house' + Pre-Accenting Suffix

/pé + ki + yka_{pre}/	→	pe-kí-yka	'to his house'	10.49
/čém + ki + $?aw_{pre}$/	→	čem-kí-?aw	'in our homes'	21.1

(42) Accented Prefix + Unaccented Root (Disyllabic) + Pre-Accenting Suffix

/pé + √tama + $ŋa_{pre}$/	→	pe-tamá-ŋa	'in his mouth'	1.37
/pé + √qewi + $?aw_{pre}$/	→	pe-qewí-?aw	'at (on) its forehead'	11.108
/pé + √qil^{y}i + $?aw_{pre}$/	→	pe-qil^{y}í-?aw	'on nape of his neck'	15.240

A significant and important fact of pre-accentuation in Cupeño is that it is blocked in words that have inherently accented roots (Hill and Hill 1968). That is, when a pre-accenting suffix attaches to an accented root, no accent is inserted by the suffix and the root accent is realized, as exemplified below.

(43) Accented Prefix + Accented Root + Pre-Accenting Suffix

a.	méme-yke	/√méme + yke_{pre}/
	'to the ocean'	OCEAN + TO
b.	tívi?-ma-l	/√tívi? + maa_{pre} + le/
	'small round basket'	BASKET + DIM + INFL

To summarize the main features of pre-accentuation, pre-accenting morphemes cause root-final stress. Further, pre-accenting morphemes win out over accent in a prefix, but lose to a root accent. The analysis given below builds on the ideas developed in §2.4.2 in accounting for these facts.

In order to study the interaction between pre-accenting suffixes and inherent accent in roots and affixes, it is necessary to have a concrete analysis of pre-accentuation. While at present there is no 'standard' theory of pre-accentuation, a specific analysis will be given as a means of illustrating the role of the privileged faithfulness status of roots in the analysis. This role is in no way diminished in other theories of pre-accentuation, however, as different theories still need to reckon with the blocking effects of accent roots (see for example §5.3 for discussion and a different analysis).

Observationally, pre-accenting suffixes directly follow a stressed

accent. The indeterminacy of the data, however, will not have crucial implications for the analysis presented here.

syllable. Following Kager 1996, this subcategorization-like requirement is treated as an alignment property, formalized within Generalized Alignment Theory (McCarthy and Prince 1993a).

(44) PRE-ACCENT ≡ ALIGN($Affix_{pre}$, L, PK, R)
The left edge of pre-accented suffixes (a lexically marked affix class) must coincide with the right edge of a syllable dominated by a stress peak.

According to the above constraint, pre-accenting suffixes must be left-aligned to the right edge of a syllable with a stress peak.[11] PRE-ACCENT must therefore be ranked above ALIGN-R(PK, PrWd), as words with an unaccented root and a pre-accenting suffix receive non-final stress, in contrast to the general pattern of rightward edge orientation observed in words with accented affixes (see §2.4.1 and §2.4.2 for data and analysis). The role of PRE-ACCENT is thus to ensure that pre-accenting suffixes are properly aligned with a stressed syllable, which may be non-final in the word, as illustrated below.

(45) Root-Final Stress in Pre-Accentuation: / ... root + af_{pre} / → [... róot-af_{pre}]

/√wena | nuk_{pre}/	PRE-ACCENT	ALIGN-R(PK, PrWd)
a. (. x) wena | $núk_{pre}$	*!	
b. → (. x) wená | nuk_{pre}		*

The two candidates above differ in their obedience to the prominence subcategorization requirement. The losing candidate has final stress, and while this pattern leads to satisfaction of ALIGN-R(PK, PrWd), it is fatal because the pre-accenting suffix is not properly aligned with the stressed syllable. The winner is thus the form with root-final stress because such a pattern satisfies PRE-ACCENT.

Concerning the interaction between roots and pre-accenting suffixes, root accent overrides pre-accentuation, as it does with accented suffixes. The explanation of this fact is very much on a par with the explanation of

[11]This prosodic subcategorization constraint is functionally independent of morphological subcategorization, which is not dealt with here. The latter type of constraint is responsible for precluding infixation, where the pre-accenting affix aligns with a non-final stressed syllable in the root (as in McCarthy and Prince's 1990 analysis of Ulwa possessives), in addition to the basic ordering properties of these affixes.

predominant root accent given above. The competition for word stress is again determined by top-ranked Root Faithfulness.

(46) Blocking Effect with Accented Roots: / ... róot + af_{pre}/ → [... róot-af_{pre}]

x_1 /√tíviʔe | maa_{pre} + le/	MAX-PROM$_{Root}$	PRE-ACCENT
a. (. x_2) tiviʔé | maa_{pre}-le	*!	
b. → (x_1) tíviʔe | maa_{pre}-le		*

This result truly shows the importance of Prosodic Faithfulness in the analysis. The competition here is between two morphemes, both of which yield stress on the root. Therefore, it is only by considering the lexical sources of accent, and their morphological affiliation, that the correct outcome is arrived at. In particular, inherent accent in the root wins not because stress surfaces within the root; the accent contributed by the pre-accenting suffix surfaces in this position as well. Rather, it is the affiliation with the root that leads to satisfaction of top-ranked MAX-PROM$_{Root}$.[12]

As a final puzzle, let us examine the special phonology of the nominalizer *-í*, which is characterized by Hill and Hill 1968: 236 as being intermediate between a root accent and an affix accent. The nominalizer is 'weaker' than a root accent because it is not stressed when it combines with an accented root, as shown in (47). But it is stronger than a suffix accent, as shown by the fact that it can cause deletion of a subsequent accent (48), going against the general pattern of retaining of the rightmost affix accent.

(47) Intermediate Behavior of the Nominalizer *-í*

wíw-i-š	/wíwe + i + če/
'acorn mush'	COOK.ACORN.MUSH+NOM+ABSO
páčik-i-š	/páčike + i + če/
'leached acorn meal'	LEACH.ACORN.FLOUR+NOM+ABSO

[12]See §5.3 for discussion and analysis of this same pattern of root privilege in pre-accentuation in Tokyo Japanese, Modern Russian, and Getxo Basque.

(48) Intermediate Behavior of the Nominalizer *-í*

a.	yex-í-qe-t	/yax+ i + qá + te/
	'one who is going to say'	SAY+NOM+PRES+ABSO
b.	k^waʔ-í-qa-t	/k^wa + i + qá + te/
	'I'm gonna eat ...'	EAT+NOM+PRES+ABSO
	k^wa-ʔí-q-te-m	/k^wa + i + qá + te + m/
	'we're gonna eat ...'	EAT+NOM+PRES+ABSO+PLUR
c.	max-í-qa-t	/max + i + qá + te/
	'(I'm) gonna give'	GIVE+NOM+PRES+ABSO
	ne-max-í-ve-ŋax	/né + max + i + ve + $ŋax_{pre}$/
	'(the way) I always do'	1sg+GIVE+NOM+SUBORD+FROM

When compared to other known morpho-accentual phenomena, the behavior of the nominalizer suggests several possible analyses. For example, as a stem-forming suffix, *-í* may be ascribed the special faithfulness properties characteristic of derivational affixes to account for the retention of its accent over an affix accent (see especially Revithiadou 1999).[13] Alternatively, the nominalizer could be approached as another well-known accentual class, namely dominant morphemes, which trigger a deletion of a neighboring accent (see Inkelas 1998 and §5.2 for extensive discussion) and in turn allow the suffix to realize its own inherent accent. Third, as a noun-forming affix, the intermediate status of *-í* may also be a faithfulness effect due to its membership in the class of nouns, providing further support for the notion of Noun Faithfulness proposed in Smith 1997, 1998. For the matters at hand, however, the specific details of the analysis are not directly relevant, and so I will generalize across these proposals by assuming that there is a rankable constraint, STRESS-TO-*í*, which specifically requires stress on the nominalizer.

The importance of the nominalizer is that it has an intermediate status among the accentual types of morphemes in Cupeño, e.g., roots and affixes, and thus, it must be distinguished from these types in a formal way. Consistent with the line of analysis pursued in this thesis, morphemes of different inherent strengths are distinguished through constraint ranking. Thus, if STRESS-TO-*í* is ranked above MAX-PROM$_{Affix}$, the fact that the nominalizer takes precedence over affix accent is directly accounted for, as show below.

[13]Though such an analysis would require recognizing a notion of Root Faithfulness which is distinct from Faithfulness to derivational affixes, to account for the blocking effects observed in words with accented roots.

(49) Special Behavior of Nominalizer *-í*: / ...i + áf / → [... í-af]

/√yax + i + qát/ (x_1)	STRESS-TO-*í*	MAX-PROM$_{Affix}$
a. (. x_1) yax-i-qát	*!	
b. → (. x_2) yax-í-qat		*

The nominalizer loses to a root accent, however, which shows that STRESS-TO-*í* is dominated by MAX-PROM$_{Root}$:

(50) Root-Controlled Accent in Derived Nominals: /... róot + i / → [... róot-i]

/√páčike + i + če/ (x_1)	MAX-PROM$_{Root}$	STRESS-TO-*í*	MAX-PROM$_{Affix}$
a. (. x_2) pačike-í-če	*!		
b. → (x_1 .) páčike-i-če		*	

The up-shot is thus that the behavior of the nominalizer further substantiates the distinction between root and affix faithfulness in the analysis. The intermediate status of the nominalizer is directly characterized by ranking STRESS-TO-*í* between root and affix faithfulness.

To summarize the results of this section, the rankings shown below build on the constraint system of §2.4.2 to account for pre-accentuation and the behavior of the nominalizer *-í*.

(51) Summary Ranking

MAX-PROM$_{Root}$
| \
STRESS-TO-*í* \
| \
MAX-PROM$_{Affix}$ PRE-ACCENT
| /
ALIGN-R(PK, PrWd)

Distinguished lexically from the accented suffixes, the pre-accenting suffixes preferably appear to the right of a stressed syllable. This subcategorization requirement, embodied in PRE-ACCENT, is ranked above the alignment constraint

because it may bring non-final stress. However, PRE-ACCENT is ranked below MAX-PROM$_{Root}$ because the presence of a root accent precludes pre-accentuation. Finally, the intrinsic ordering between MAX-PROM$_{Root}$ and MAX-PROM$_{Affix}$ is crucial to the characterization of the intermediate strength of the nominalizer, providing the right slot for the ranking of STRESS-TO-*í* in the system.

In conclusion, the distinction between Root and Affix Faithfulness has two important functions in the analysis. First, it explains the fundamental property of predominant root accent, even in subtle cases involving the morpho-accentual process of pre-accentuation. Second, it is instrumental in the analysis of the intermediate rank of the nominalizer. These two independently established ranking arguments converge on the same result, providing strong evidence for the privileged faithfulness status of roots over affixes.

2.4.4 Discussion of Alternatives

In this subsection, two alternatives to the Faithfulness-based analysis of predominant root stress are considered: the level-ordering analysis proposed in Crowhurst 1994 (§2.4.4.1), and a cyclic account along the lines of Halle & Vergnaud 1987a (§2.4.4.2).

2.4.4.1 A Level-Ordering Account

Crowhurst 1994 gives a level-ordering account of predominant root stress. The crux of the analysis centers on a lexical distinction between accented and unaccented roots: accented roots have a lexical foot, and unaccented roots do not. Furthermore, on the root cycle prior to affixation (the Level 1 phonology), a word tree is built only over accented roots because of an additional assumption that feet may not be inserted at this stage. Accented roots hence leave the Level 1 phonology with word-level prosodic analysis, while unaccented roots exit with no prosodic structure above the syllable. At the next level, a different stress rule is proposed for affix stress, accounting for the difference between accented and unaccented roots with a two level grammar.

This analysis is depicted graphically in (52) below. The inputs to the Level 1 phonology differ in the presence of a lexical foot, and they are likewise distinguished in the output by the presence of a word-level category. The root syllable in (52b) cannot be parsed directly by the prosodic word because this option violates the principle of Strict Layering (Selkirk 1984), and furthermore, this form cannot be supplied with an epenthetic foot because this strategy is not available.

(52) Level 1 Phonology

```
        INPUT                OUTPUT

a.                            PrWd
                              / \
        F                    [F]  \
       / \                   / \   \
      σ  ó  σ               σ  ó  σ
     te sí  we             te sí  we

b.
      σ                     σ
     yax                   yax
```

When these outputs are then subjected to the Level 2 phonology, the difference between accented and unaccented roots is exploited in the following way. Words with accented roots already have word-level structure, which in turn determines the position of the main stress foot (53a). On the other hand, words with unaccented roots will be devoid of such structure, and can therefore be assigned rightmost affix stress with a different set of stress principles (53b).

(53) Level 2 Phonology

```
        INPUT                OUTPUT

a.          PrWd                PrWd
            / \                 / | \
     F     [F]  \              F [F]  \
     |     / \   \            /  / \   \
     σ    σ  ó  σ            σ  σ  ó  σ
   čem   te sí  wen         čem te  sí wen

b.
                                PrWd
                                / | \
          F  F                 / F  [F]
          |  |                /  |   |
     σ    σ  σ               σ  σ   ó
   yax   qal  í             yax qal  í
```

In summary, the level-ordering analysis accounts for predominant root stress by defining a root cycle prior to affixation in which certain principles of prosodic organization apply, effectively distinguishing accented and unaccented roots in the relevant way. Crucial to this analysis, therefore, is the assumption

that the grammar cycles on bound roots. This claim, however, has been argued against extensively in the literature (see e.g. Kiparsky 1982b and Inkelas 1989 and references therein). The empirical finding in these works is that bare bound roots do not form domains for cyclic rules. It would seem, therefore, that the level-ordering account bases its analysis on an assumption for which there is little cross-linguistic support.

There is an additional empirical problem with this analysis, stemming from the distinction made between accented and unaccented roots. The Level 1 phonology distinguishes between accented roots and unaccented roots by the presence of word-level prosodic structure. In effect, unaccented roots are clitics when they leave the Level 1 phonology. As it happens, Cupeño's Level 2 phonology supplies a word tree, so unaccented roots do not retain their clitic-like status. However, there is nothing inherent to the level-ordering analysis that ensures that this necessary step would take place. So the typological prediction is made that there should be some language where unaccented roots behave like clitics post-lexically. To my knowledge, however, no such language exists. For example, in Tokyo Japanese, unaccented roots have no special prosodic properties other than their lack of tone structure. It seems, therefore, that the core idea of the level-ordering analysis has little empirical support outside of Cupeño.

2.4.4.2 A Cyclic Analysis

A different approach to predominant root stress can be modelled in the multi-stratal framework given in Halle & Vergnaud 1987a (HV). In this work, dominant morphemes are distinguished from recessive ones through cyclicity. In particular, dominant affixes are cyclic morphemes that are represented on a metrical plane that is distinct from that of other morphemes. Thus, in the examples from Vedic Sanskrit below, the accent of the dominant suffix *-íṇ* is represented on a different autosegmental plane than the one for the roots and noncyclic suffixes.

(54)	/ráth+íṇ + e/	rath-íṇ -e	'charioteer' (dative singular)
	/mitr+íṇ + e/	mitr-íṇ -e	'befriended' (dative singular)

Furthermore, cyclic affixation triggers a copying process from one metrical plane to the plane of the cyclic affix. This copying is governed by the Stress Erasure Convention (SEC), which essentially states that information about stress generated on previous cycles is carried over only if the affixed constituent is not a domain for the cyclic stress rules. Thus, as depicted below, the accented/unaccented contrast in roots is lost when they combine with dominant (cyclic) suffixes.

(55) Dominant Affixes in Vedic Sanskrit (HV)

Cyclic Stratum	(Accented)	(Unaccented)	
Cycle 1	* ráth	mitr	
Cycle 2	* ráth-íṇ *	mitr-íṇ *	
OUTPUT	rath-íṇ *	mitr-íṇ *	Root accent deleted by the SEC.

In this illustration, accented and unaccented roots are distinguished by the presence of stress above the root. This information is represented on a metrical plane apart from the one marking stress on cyclic affixes, which is placed directly below the form. Hence, when root stress is copied at Cycle 2, this information is lost because the larger constituent forms a domain for the cyclic stress rules, in effect neutralizing the accentual contrast in roots.

Consider next the application of the basic proposal to predominant root stress in Cupeño. Suppose that the direction of copying can be parameterized on a language particular basis. That is, suppose that instead of copying from the root stress plane to the cyclic plane, as in Vedic, stress information for affixes is copied to the root stress plane. Assuming that the affixed constituents form cyclic domains effectively accounts for predominant root stress with the SEC. This result is illustrated in the chart below.

(56) Predominant Root Stress in Cupeño

Cyclic Stratum	(Accented)	(Unaccented)	
Cycle 1	* tesíwe	yax	
Cycle 2	* čem-tesíwe *	yax-qál-í * *	
OUTPUT	* čem-tesíwe	* yáx-qal-i	Affix stress deleted by SEC.

With accented roots, it is clear how the SEC applies to give the correct result: when copying from the affix plane to the root plane, information specified for affixes is lost because the larger constituent forms a cyclic domain. This same principle, however, gives an incorrect result for words with unaccented roots. On a par with the accented roots, affix stress is lost with cyclic affixation, yielding a metrical plane with no stress information whatsoever, and which

therefore receives a default initial stress. In sum, just as dominant affixes neutralize the accentual contrast in the roots they attach to, roots in Cupeño would neutralize the accentual contrast in affixes, leading to the incorrect outcome above of **yáx-qal-i*.

The only way around this descriptive problem is to posit a feature [+/-cyclic], which governs the possibility of copying from the affix plane when applied to roots. That is, accented roots must be marked [+cyclic] in order to require copying, which results in deletion of affix stress, while unaccented roots must be marked [-cyclic] to preclude this copying. Going beyond the lack of explanatory insight, this approach leads to a more serious empirical problem. By introducing cyclicity as a marker of dominance which is independent of the accentedness contrast, the cyclic approach essentially claims that these two features will cross-classify roots in some language. However, a recent paper (Inkelas 1998) which surveyed effects such as these in a variety of languages, found that the dominant/recessive distinction is not used in any language to classify roots (see §5.2.4 for further discussion). The application of such a feature to account for predominant root stress in Cupeño, therefore, seems to make an empirical prediction for which there is no cross-linguistic support.

2.5 The Larger System

This sections picks up where we left off in §2.4.3, providing an analysis of default-to-opposite edge stress. The next subsection presents an analysis that is consistent with the findings made thus far, which is then followed by a summary of the larger system.

2.5.1 Default-to-Opposite Edge Accent

Recall from §2.4.1 that words that do not have a lexical accent receive initial stress. Alongside the rightward orientation of affix accent, Crowhurst 1994 compares this pattern of conflicting directionality to default-to-opposite edge orientation in unbounded stress systems. Naturally, it is desirable to account for this pattern of 'rightmost lexical accent/otherwise default initial stress' with the same basic toolbox employed in the analysis of default-to-opposite stress, and this is the spirit in which the following analysis is proposed.[14]

At the heart of most recent approaches to default-to-opposite stress is a

[14]Recent work (Herrick 2000) has proposed an interesting alternative to the analysis of default-to-opposite edge pattern given here, arguing that the distinction between alignment and anchoring constraints brings about the observed conflicting directionality.

ranking of conflicting alignment constraints. Thus, Zoll 1997 and Walker 1998a employ opposing alignment constraints formulated to contrast different syllable types, i.e., heavy versus light; Baković 1998 approaches the problem in terms of constraint conflict between alignment constraints defined at different levels of metrical structure (cf. Prince 1983); and similar constraint rankings are used in Kenstowicz 1995, and Crowhurst and Hewitt 1997. For concreteness, I follow Baković 1998 in distinguishing among levels of metrical structure, exploiting the distinction between stress peaks (heads of PrWds) and stress prominences (heads of stress feet). In particular, stress peaks are properly aligned with the right edge of the word, while stress prominences are left-aligned, preferably coinciding with the left edge of the word, as depicted below.

(57) Default-to-Opposite Stress in Cupeño

a. Rightmost Stress Peak Wins

```
x       x       (     x)
x       x         (.  x)
x   x   x       x  x  x
/pé + yax + qál/  →  pe-yax-qál
```

b. Leftmost Stress Prominence

```
                (.  )  Peak
                (x  .) Prominence
x   x           x  x
/yax + em/  →  yáx-em
```

While the distinction between different grid levels does not appear to have any direct phonetic consequences for stress, it is crucial to the analysis. The rightmost stress peak (=lexical accent) wins in a word with more than one accented affix, but in the absence of a lexical accent, the most prominent syllable is leftmost in the word.[15] This result is very much on a par with the treatment of default-to-opposite edge stress in the aforementioned analyses, except the pattern of default initial stress does not have a grid mark equated with a stress peak. The generalization governing this non-uniform set of structures above is thus that a stress peak is not inserted if it is not needed to distinguish a most prominent syllable from all others. The constraint interaction giving this result involves ranking DEP-PROM above the constraint requiring a head of the prosodic word (=stress peak), namely HEADEDNESS(PrWd) (see §1.2.2.3 for the definition of this constraint).[16] Because of this ranking, stress peaks will only be present in the output if they are also present in the input, correctly predicting the input-output mappings given above.

[15]See Anttila and Bodomo 1996 for a parallel result in Dagaare where lexical accent is likewise argued to be more prominent than non-lexical accent.

[16]This ranking does not entail that words with no lexical accent will surface fully unaccented since DEP-PROM only dominates the headedness constraint for the prosodic word; the parallel constraint requiring syllablic heads of feet ensures that all words have a stress prominence.

The alignment constraints that are responsible for the conflicting directionality effects are given below.

(58) Alignment Constraints for Conflicting Directionality

a. INIT-PROM ≡ ALIGN(PROM, L, PrWd, L): the left edge of every stress prominence must coincide with the left edge of some PrWd.

b. ALIGN-R(PK, PrWd) ≡ ALIGN(PEAK, R, PrWd, R): the right edge of every stress peak must coincide with the right edge of some PrWd.

INIT-PROM refers to stress prominences and characterizes the imperative for prominence on the initial syllable, as illustrated in the tableau below.

(59) Default Initial Stress: / σ σ ... / → [σ́ σ ...]

/yax + em/	ALIGN-R(PK, PrWd)	INIT-PROM
a. (.)PrWd (. x)Ft yax-ém		yax!
b. (.)PrWd (x)Ft → yáx-em		

(60) Rightmost Affix Stress: / áf + root + áf ... / → [af-root-áf ...]

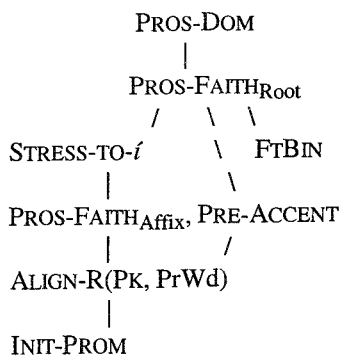
x_1 x_2 /pé + yax + qál/	ALIGN-R(PK, PrWd)	INIT-PROM
a. (x_1)PrWd (x)Ft pé-yax-qal	yax-qal!	
b. (. x_2)PrWd (. x)Ft → pe-yax-qál		**pe-yax**

In sum, the divergent patterns of directionality are handled as conflicting alignment constraints that refer to different levels of prominence structure. When these constraints conflict, rightmost inherent accent prevails because of the ranking of ALIGN-R(PK, PrWd) above INIT-PROM.

2.5.2 Summary Ranking

The rankings below summarize the argumentation dealing with the interaction between root and affix accent.

(61) Root and Affix Accent in Cupeño



A high ranking set of constraints, PROS-DOM, ensures that only one lexical accent can be realized as stress in the output. The universal ordering of Root and Affix Faithfulness correctly predicts that lexical accent in a root will override lexical accent elsewhere in the word. Further, the privileged faithfulness status of roots derived from this ordering provides a direct avenue of analysis for two additional facts in the system. Through the domination of PRE-ACCENT and STRESS-TO-*í*, Root Faithfulness successfully explains the blocking effects of accented roots in pre-accentuation and the peculiar behavior of the nominalizer suffix.

When the interaction of root and affix faithfulness is not enough, i.e., in words with unaccented roots, the low ranking alignment constraint ALIGN-R(PK, PrWd) becomes active and accounts for the observed rightward orientation of lexical accent by specifically referring to this level of the grid, namely stress peaks. Words with no lexical accent are not supplied with stress peaks at the surface, because of the ranking DEP-PROM >> HEADEDNESS(PrWd), and as a result they are subject to a different alignment constraint, INIT-PROM, which produces initial stress is just this context.

In sum, the interaction between root and affix accent is analyzed as constraint interaction in OT. A language particular ranking of alignment constraints negotiates the 'rightmost affix accent, otherwise initial stress' pattern, and the ordering of root and affix faithfulness constraints, superordinate to these constraints, explains basic preference for realizing a root accent as a consequence of a general theory of root privilege in inventories and alternations.

2.6 Summary and Implications

In this chapter, I have developed a comprehensive analysis of accent in Cupeño. At every stage in the analysis, the notion of Prosodic Faithfulness has played an important role in describing the diverse aspects of the system. First, Prosodic Faithfulness provided the formal means of characterizing phonemic stress. This set of constraints was then segregated into Root and Affix Faithfulness constraints to account for the cross-linguistic observation that roots license a wider range of accentual contrasts than affixes. This division was in turn employed in the explanation of dominant root stress, a pattern which pervades the accent system of Cupeño. Finally, distinct Root and Affix Faithfulness proved essential in extending the analysis to the far corners of the system, including the analysis of pre-accentuation and the intermediate strength of the nominalizer.

In developing the Faithfulness-based analysis, I have made connections between these observations in an accent system and diverse phonological phenomena. By characterizing Cupeño accent as root-controlled, one can see parallels to well-known vowel harmony systems (McCarthy & Prince 1995, Selkirk 1995a, Beckman 1997 [1998]) and other segmental processes like dissimilation (Holten 1995, Selkirk 1995b, Alderete 1997b, Blake 1998). The domain-sensitive constraints employed in the analysis of Cupeño are in no way specific to this language and have been applied to a wide range of phenomena. The analysis proposed here therefore accomplishes one of the central goals in

linguistic theory, namely the description of language particular patterns with universal principles.

In addition, I have argued for this analysis by contrasting it with the plausible alternatives. It was shown that, in contrast to the Faithfulness-based analysis, the alternatives employing phonological levels lead to descriptive problems and loss of generalization. First, the level-ordering account was shown to rely on the assumption that bare bound roots form cyclic domains, and this assumption was challenged on empirical grounds. Second, the cyclic alternative was shown to have a descriptive problem with dominant root stress, and the fix-up to this problem led to an ad hoc feature system which was also challenged. In summary, the available alternatives to the Faithfulness-based analysis are inferior on empirical and theoretical grounds.

I would like to conclude with a brief discussion of some further issues that are raised by the main ideas developed here. The first issue involves the examination of a set of languages that also require root stress, but where this requirement is apparently not a function of phonemic stress. For example, roots are always stressed in the Nicobarese language Nancowry, but the distribution of stress is predictable, falling on the last vowel of the root (Radhakrishnan 1981). Likewise, Chukchee has predictable root stress, typically falling on the rightmost vowel of the root (Krause 1979). A third case is Nisgha, where root-based stress exhibits an interesting interaction between edge alignment and quantity sensitivity (see Shaw 1992 and references therein). In these languages, there is a constraint requiring root stress, but this constraint cannot be an input-output Faithfulness constraint because it applies to all the roots in the language. This observation, therefore, raises the question of whether there are two sets of constraints in Universal Grammar, both of which encourage root stress. That is, the analysis of Cupeño proposed here involves a Faithfulness constraint which encourages realization of inherent root stress over affix stress, but a cross-linguistic perspective reveals a need for a constraint which also encourages root stress, but only evaluates outputs.

Evidence from the Athabaskan language Tahltan appears to resolve this issue because in this language both constraints function independently in the same system. A fundamental component of the Tahltan stress system is that every root must have a stress (Cook 1972), which classifies this language with Nancowry and Chukchee. Furthermore, stress is also assigned to every odd syllable counting from the root stress, resulting in fixed root stress and variable affix stress, as in *hóde-<u>séeh</u>* 'I talk', cf. *hodéθii-<u>déeh</u>* 'We talk' (roots are underlined). Stress in polysyllabic forms is not fully predictable, however, as Nater 1989 shows that stress introduces phonemic contrast in longer words. Thus, stress is contrastive in roots, leading to variation in stress in longer words; furthermore, every root must have a stress. In this system, therefore, both a Faithfulness constraint for root stress and an over-arching constraint requiring

every root to bear stress are needed (see Hewitt 1992, Kennedy 1994, and Fitzgerald 1997 for some leading ideas).

A second issue concerns the retention of accent in words with more than one inherently accented morpheme. According to the Root-Controlled Accent (RCA) hypothesis, accent in the root is retained over accent elsewhere in the word. An interesting feature of this hypothesis is that it assigns a role to the morphology in the description of a pattern that has formerly been treated as a directionality effect. Thus, in a very influential paper, Kiparsky & Halle 1977 describe accent retention in a variety of Indo-European languages in terms of a principle of edge orientation, according to which accent is lost in all but the first inherently accented morpheme in a word. Poser 1984 assumes a similar principle in the analysis of non-stress accent in Japanese. These precedents raise the issue of whether both the assumptions embodied in the RCA hypothesis and this principle of edge orientation are indeed necessary in the analysis of the retention of accent cross-linguistically.

It is helpful to return to the analogy of vowel harmony systems developed in §2.2 as a way of addressing this issue. The well-known cases of back (and round) harmony in Finnish and Turkish show alternations in suffixes which are amenable to a left-to-right spreading rule, an analysis which also involves a principle of directionality (see Bach 1968 and Lightner 1972). Considered alongside root-controlled [±ATR] harmony in Igbo (Ringen 1988), however, an equally coherent analysis of Finnish and Turkish is that the specification for vowel features in the suffix is root-controlled. In this analysis, the suffixing preference in these languages only gives the appearance of a directionality effect, but it is the vowel specifications in the root that have the formal role in the analysis.

In a similar way, the analysis of root-controlled accent in Cupeño presented here sheds new light on the two accent systems mentioned above.[17] In particular, Japanese, as well as many Indo-European languages, shows a strong preference for suffixing morphology. Thus, in stem + suffix sequences where both morphemes have a lexical accent, the deletion of accent in the suffix may be analyzed in terms of the same principles of root-control employed in Cupeño. In the absence of prefixed structures that can decide between the two approaches, the RCA analysis is thus quite attractive because it explains retention of root accent in terms of a universal ordering between Root and Affix Faithfulness. Furthermore, root accentedness has the same effect of blocking morpho-

[17]An important difference between vowel harmony systems and accent systems is that only the former exhibits blocking effects from opaque vowels. The analysis of this difference stems from the theory of autosegmental spreading: because root-control in vowel harmony systems is achieved through linking of a feature, substantive constraints on these linkages can prohibit spreading across or through an opaque vowel; since grid marks cannot spread, such blocking effects are not possible in accentual systems described in terms of prominence on the grid.

accentual processes like pre- and post-accentuation in these languages, which is also explained in terms of Root Faithfulness. I therefore propose to investigate the interaction between root and affix accent in Russian and Japanese, and much of the next chapter is dedicated to developing this argument in more detail.

CHAPTER 3

Restricted Edge Effects in Root-Controlled Accent Systems

3.1 Restricted Edge Orientation

3.1.1 Factorial Typology

Much of the discussion of the previous chapter focuses on the consequences of culminative accent in Cupeño. The over-arching requirement that words have a single stress-accent in this language creates a competition in words with more than one inherent accent. Furthermore, the resolution of accent in multiply accented words, which I will refer to as Accent Resolution (AR), identifies a set of factors that determine which lexical accent is retained. The novel aspect of the analysis of Cupeño is that a role for word structure is recognized in AR. The finding that root accent takes precedence over affix accent is argued to derive from a principle of root-control, according to which retention of a root accent is favored over retention of accent in an affix. Root-controlled AR is apparently not typical, however, as many have argued for a phonological principle at work in AR. For example, in a very influential paper, Kiparsky & Halle 1977 argue that AR in many Indo-European languages is governed by directionality: a word level prominence is assigned to the lexical accent that is closest to the beginning of the word (1a). Likewise, Poser's 1984 rule of Accent Resolution in Tokyo Japanese is characterized in terms of directionality, favoring retention of a leftmost lexical accent.

(1) Accent Resolution with Directionality

a. Basic Accentuation Principle (Kiparsky & Halle 1977): If a word has more than one accented vowel, the first of these gets the word accent. [If a word has no accented vowel, the first vowel gets the word accent.]

b. Accent Resolution (Poser 1984): Delete all but the leftmost accent within a minor phrase.

The existence of root-controlled AR in Cupeño, alongside directional AR, raises the question of whether Universal Grammar countenances both morphological and phonological principles in the analysis of this accentual phenomenon. Furthermore, if this question is answered affirmatively, are there principles that can predict when the morphological principle of root-control applies, as opposed to the phonological principle of directionality?[1]

The way to approach these typological questions in Optimality Theory is to consider the implications of the only mechanism for language variation in OT, constraint permutation, for the constraints at work in each type of AR. Starting first with directional AR, this type of pattern implies a constraint, EDGEMOST, which sets a premium for accent that appears at a designated edge (after Prince & Smolensky 1993; see also McCarthy & Prince 1993a). In §1.2.1.1, two distinct types of edge effects are identified: categorical edge tropism and gradient edge orientation. The type of edge effect predicted by the EDGEMOST constraint is in large part due to the rank of EDGEMOST in the system (though the way its violations are interpreted is also important — see Zoll 1996a and Gafos 1996b). Thus, if EDGEMOST is undominated, the result is edge-tropic accent that is co-extensive with the favored edge. The rules in (1), by contrast, are characterized by the second type: they favor accent which is as close as possible to the left edge, yet allow for non-initial accent. EDGEMOST has a role in yielding this type of edge effect too, but in these contexts, it is dominated by other constraints in the system.

The EDGEMOST constraint is also ranked on a language particular basis in relation to the constraints at work in root-controlled AR, i.e., the MAX-PROM constraints from §1.2.2.1. Furthermore, the fact that root accent takes precedence over affix accent entails that there is a natural ordering between Root and Affix Faithfulness. The explanation of predominant root accent given in §2.4 rests on this universal ordering because it provides a basis for understanding root-controlled AR in Cupeño as a special case of a more general pattern of root privilege. Therefore, three constraints are at work in the analysis of AR: EDGEMOST, MAX-PROM$_{Root}$, and MAX-PROM$_{Affix}$; also, MAX-PROM$_{Root}$, by hypothesis, always ranks above MAX-PROM$_{Affix}$ because of the universal ordering Root Faith >> Affix Faith.

These background assumptions, together with the assumption that the EDGEMOST constraint may be freely re-ranked relative to the two MAX-PROM constraints, yields the following factorial typology. The resulting typology is characterized in (3) with a brief description for each grammar.

[1]See Beckman 1995, 1997 [1998] for discussion of a related issue concerning various factors at work in vowel harmony.

(2) Factorial Typology with Decisive EDGEMOST Constraint

(A)	>>	MAX-PM$_{Root}$	>>	(B)	>>	MAX-PM$_{Affix}$	>>	(C)
↑				↑				↑
EDGEMOST				EDGEMOST				EDGEMOST

(3) Grammars Resulting from Factorial Typology

Grammar A: accent is delimitative (always coincides with a designated edge) in all contexts; accent is not contrastive.

Grammar B: accent is contrastive in roots, but delimitative in words with unaccented roots. In words with more than one accented root, the edgemost (i.e., closest to a designated edge) accented root wins.

Grammar C: accent is contrastive in roots and affixes, but a root accent takes precedence over an affix accent. In words with more than one accented morpheme of the same morphological class, the edgemost accent wins. In words with no accented morphemes, accent is delimitative.

If accent is not contrastive in a language described by these grammars, it is edge-tropic, or locked into an edgemost position, because of the unmitigated force of EDGEMOST, as in grammar A. The gradual demotion of EDGEMOST, however, brings about a loosening of the edge requirements on accent, and consequently, the emergence of an accentual contrast in roots and affixes (B and C). In the grammars with contrastive accent, a pattern of edge orientation is found. If accent is sponsored by a morpheme of the same morphological class (that is, all are roots or affixes), then the accent which is closest to the favored edge is retained. Interestingly, this pattern of edge orientation is only permitted under very special circumstances in this factorial typology, which stems from the intrinsic ordering of MAX-PROM$_{Root}$ and MAX-PROM$_{Affix}$. This ranking consequence is stated below and subsequently tested against the three grammars shown above.

(4) Restricted Edge Orientation (REO)

Edge orientation for accent is only observed in contexts where PROS-FAITH is indecisive.

PROS-FAITH is decisive if it predicts which, among possibly many, inherently accented morpheme realizes its lexical accent. In words with accented morphemes of the same morphological class, however, the ordering of MAX-

PROM$_{Root}$ and MAX-PROM$_{Affix}$ is indecisive, and so other factors, like phonological directionality, can take effect. REO therefore predicts that root-control is primary because all grammars in which PROS-FAITH is not crucially dominated favor realizing a root accent over an affix accent; directional AR only comes in word types that cannot be resolved on the basis of morphological factors. To show the primacy of root-controlled AR, however, it is necessary to study the characteristics of each grammar more carefully and to see that they are all in fact consistent with REO.

In the illustrations which follow, EDGEMOST is set for the left edge of the word, hence LEFTMOST, to compare these results with a common type of system. This decision is entirely arbitrary, however, and so it is clear that the same points hold of other systems that exhibit different types of edge effects. Starting first with a familiar system, grammar C in many ways resembles accent in Cupeño. Words with an accent on the root in the input realize this lexical accent at the surface, even if the root accent is not leftmost in the word (5a), or if retention of the root accent entails the loss of an affix accent (5b). Importantly, the input-output mapping in (5b) is consistent with REO because the Prosodic Faithfulness constraints are crucial for predicting the outcome, as shown by the conflicting constraint violations for the MAX-PROM constraints (MAX-PM for short). The result depicted in (5c), by contrast, is pure directional AR: the leftmost affix wins. It turns out that this input-output pair is also compatible with REO because in a sequence of accented affixes, Prosodic Faithfulness is not decisive, and so the lower-ranking constraint LEFTMOST takes effect and gives the observed directionality effect.

(5) Grammar C: Root-Controlled Accent with Restricted Edge Orientation

Input		Output	MAX-PM$_{Rt}$	MAX-PM$_{Afx}$	LEFTMOST
a. /af + róot/	→	af-róot			*
		*áf-root	*!		
b. /áf + róot/	→	af-róot		*	*
		*áf-root	*!		
c. /áf + áf + root/	→	áf-af-root		*	*!
		*af-áf-root		*	
d. /af + áf + root/	→	af-áf-root			*
		*áf-af-root		*!	

This hypothetical example therefore illustrates the primacy of morphological factors in AR: edge orientation is only found in contexts where the ordering of Root and Affix Faithfulness is not enough to predict the winner.

REO is also consistent with a grammar in which LEFTMOST is promoted in the constraint hierarchy to a position above MAX-PROM$_{Affix}$. Like grammar C, such a constraint system also favors retention of a root accent over leftmost accent, as illustrated in (6a) and (6b). The principal difference between this system and that described by grammar C is that only the latter has an accentual contrast in affixes. In grammar B, affix accent is predictable, and so accent on a non-initial affix is lost (6d), which contrasts with the outcome above in (5d). What these two grammars have in common, however, is that edge orientation only occurs when Prosodic Faithfulness is not relevant in deciding the winner. Thus, the role of the MAX-PROM constraints in negotiating between two accented morphemes is only apparent in (6b) where the favored pattern of edge orientation is not observed; in (6c), by contrast, neither MAX-PROM constraint is active, and so the pattern of leftward edge orientation emerges.

(6) Grammar B: Contrastive Accent in Roots and Predictable Accent in Affixes

Input		Output	MAX-PM$_{Rt}$	LEFTMOST	MAX-PM$_{Afx}$
a. /af + róot/	→	af-róot		*	
		*áf-root	*!		
b. /áf + róot/	→	af-róot		*	*
		*áf-root	*!		
c. /áf + áf + root/	→	áf-af-root			*
		*af-áf-root		*!	*
d. /af + áf + root/	→	áf-af-root			*
		af-áf-róot		*!	

The last case, grammar A, also accords with REO because the MAX-PROM constraints are crucially dominated by LEFTMOST. In this system, accent is delimitative, and so regardless of the lexical properties of roots and affixes, accent always marks the left edge of the word.

(7) Grammar A: Delimitative Leftmost Accent

Input		Output	LEFTMOST	MAX-PM$_{Rt}$	MAX-PM$_{Afx}$
a. /af + róot/	→	áf-root		*	
		*af-róot	*!		
b. /áf + róot/	→	áf-root		*	
		*af-róot	*!		*
c. /áf + áf + root/	→	áf-af-root			*
		*af-áf-root	*!		*
d. /af + áf + root/	→	áf-af-root			*
		af-áf-root	*!		

In this scenario too, then, the patterns of edge orientation observed in cases like (7b-c) arise when Prosodic Faithfulness is not a predictor of which lexical accent is retained in the surface form.

The finding here is thus that no ranking of MAX-PROM$_{Root}$, MAX-PROM$_{Affix}$, and LEFTMOST gives a purely directional pattern of AR. That is, the ranking of LEFTMOST relative to the intrinsically ordered Prosodic Faithfulness constraints never produces a system with contrastive accent and where edge orientation completely ignores the internal structure of words. If this theory is correct, then in systems with contrastive accent, inherent accent in roots should always take precedence over inherent accent in an affix; edge orientation is thus only found among morphemes of equal status with respect to the morphologically dispersed Faithfulness constraints. The rest of this chapter studies the implications of this restriction on the scope of edge orientation, both in the context of close formal analyses of accent in two languages, Russian and Japanese, and from a broader perspective on Accent Resolution in a wider range of languages developed directly below.

3.1.2 Empirical Issues

The predictions of Restricted Edge Orientation appear, at first glance, to be rather strong, as there are several examples that have been described precisely in terms of directional AR. As mentioned above in (1), directionality is integral to the analyses given in Kiparsky & Halle 1977 (K&H) of AR in the Indo-European languages Russian, Lithuanian, and Sanskrit. The principle argued to be at work in these systems, the Basic Accentuation Principle (BAP), is a straightforward pattern of leftward edge orientation. Furthermore, BAP has been a very influential tool in describing AR in non-Indo-European languages. A very similar idea is employed in Poser 1984 for Japanese minor phrases, in

Idsardi 1992 for stress placement in Shuswap, Spokane, and Moses-Columbia Salish, cf. Czaykowska-Higgins 1993, in Hualde & Bilbao 1993 for Getxo Basque, and in Payne 1990 for the Jivaroan language Aguaruna (p. 181). The loss of all but the first high tone in many Bantu languages, rather like Poser's Accent Resolution, is also often described in terms of leftward edge orientation. Finally, while not described in precisely these terms, the tonomechanics of Northern Tepehuan (Uto-Aztecan) given in Bascom 1959 show a pattern of AR similar to that found in Japanese and Bantu.

(8) Accent Resolution with Straight Leftward Edge Orientation

a.	Russian	Halle 1973, 1996, K&H, HV, Melvold 1990, Idsardi 1992
b.	Lithuanian	K&H, HV, Blevins 1993, Halle 1996
c.	Sanskrit	K&H, Kiparsky 1982c, 1984b, HV, Halle 1996
d.	Japanese	Poser 1984
e.	Interior Salish	Carlson 1976, 1989, Czaykowska-Higgins 1993, Black 1996
f.	Getxo Basque	Hualde & Bilbao 1992, 1993, Hualde 1991
g.	Aguaruna	Payne 1978, 1990, Larson 1956
h.	Northern Tepehuan	Bascom 1959, 1965, Woo 1970, Kim 1996
i.	Misc. Bantu	See Myers 1997 for a survey

If these systems present valid cases of purely directional AR, which is oblivious to word structure, then the theory of root privilege developed here will have to be modified to accommodate them. However, upon closer inspection, there are reasons to doubt the analysis of these systems in terms of directionality, and so these cases, in fact, may not refute the restricted theory of edge effects embodied in REO. In the interest of pursuing this more restrictive theory, therefore, it is worthwhile to probe further into the characterization of edge effects in these systems.

The first problem is that most accounts of these languages do not give the crucial evidence required to show a pattern of directional AR. As mentioned above, most of the languages are said to follow a BAP-type principle with leftward edge orientation. Considering a sample of the sequences of accented morphemes consistent with this pattern, only one runs counter to the patterns predicted by Restricted Edge Orientation.

(9) Some Affixed Structures in Directional Accent Resolution

a.	/róot + áf/	→	róot-af	
b.	/áf + róot/	→	áf-root	≠ REO
c.	/root + áf + áf/	→	root-áf-af	

If the root accent is retained over a suffix accent, as in (9a), this pattern is of course compatible with both directional and root-controlled AR, and so it is

inconclusive. Moreover, the retention of accent in the first of a sequence of two accented suffixes (9c), as found for example in Getxo Basque (Hualde & Bilbao 1993) and Russian (Melvold 1990), is also inconclusive. This pattern of AR is consistent with REO because in these affixed structures, the morphemes are of equal status, and so Prosodic Faithfulness is indecisive. However, the pattern shown in the prefixed structure in (9b), if found across the board, is diagnostic of directional AR because PROS-FAITH is relevant in such a context and prefix retention is contrary to the expected pattern. How then do these prefixed structures behave in the languages in (8) above?

Many of these systems only have a few prefixes, or lack prefixation altogether, which precludes using these affixed structures as a reliable test for directional AR (though this is clearly not the case for Bantu languages). For example, Basque (King 1994) and Aguaruna are exclusively suffixing[2] and so they are consistent with REO. In other languages, like Russian and Japanese, prefixes are productive or mildly productive in certain word classes, but fully unproductive in others, providing little help in determining the scope of edge orientation. In these systems, a common strategy is to mark the prefixes as outside the domain of accentual rules. Thus, Melvold 1990 assumes that prefixes in Russian verbs are non-cyclic, and hence do not trigger a second pass of stress assignment, or do so only under special circumstances. Also, Carlson 1989: 204 notes that prefixes are never stressed in Spokane, which requires a similar set of assumptions to those needed for Russian. Finally, while Northern Tepehuan appears to have directional AR, as noted in Woo 1970: 19, prefixes play no role in tone assignment, so they too are outside the scope of tonal resolution in this system. To summarize, it appears that the evidence from prefix + root sequences in these languages does not give strong support for an analysis in terms of directional AR, and hence, they do not directly contradict REO.

There is another fact about these systems that is curious in a purely phonological analysis of AR. Most, if not all, of the accent systems listed in (8) exhibit a specific pattern of directionality, namely leftward edge orientation. It is the leftmost inherently accented morpheme which surfaces with stress in Russian and a pitch fall in Japanese, and this pattern is duplicated in each of the accent systems listed above.[3] Unlike other types of directionality in phonology, as in the assignment of prosodic structure, directional AR in these cases seems to

[2]Though David Payne (personal communication) notes that Aguaruna has a semi-productive prefix which forms causatives. As a derivational affix, however, it may not be helpful in diagnosing directionality in this language.

[3]Some Salishan languages show a pattern of rightward orientation for stress in a sequence of so-called 'strong' suffixes, which adds an additional complication in these cases. However, in Moses Columbia Salish, this pattern is in conflict with the leftward pattern for stress found elsewhere in the language, which shows that the behavior of these special suffixes requires a different treatment (see Czaykowska-Higgins 1993 and Idsardi 1992, and §4.1 for general discussion of the problem).

always be set for the left edge. If AR is a matter of directionality, then the expectation is that there should also be patterns of AR showing rightward edge orientation.[4]

A brief look at a set of cases previously treated in terms of directional AR therefore turns up two interesting findings. First, the analyses of these systems often lack the evidence from prefix + root sequences which is needed to show that they must be governed by directionality. Second, a directional asymmetry is found in these cases, showing a strong preference for leftward edge orientation. The conclusion that I draw from these findings is that these systems need to be examined in more detail before they can be taken as counterexamples to REO, and the next two sections give special attention to affixed structures in Russian and Japanese with this issue in mind. A second, perhaps more speculative, inference that can be drawn is that these cases are amenable to an analysis very much in line with the one given for Cupeño in chapter 2. Indeed, the lack of a class of prefixes that override accent in a following root is exactly the predicted pattern if these systems have root-controlled AR. Furthermore, the morphological analysis of AR can also make sense of the observed directional asymmetry. Languages often show a preference for suffixes over prefixes (see Greenberg 1966, Hawkins & Gilligan 1988), a trend sometimes expressed in terms of implicational statements like, 'if a language has prefixes, it also has suffixes'. The absence of a robust set of prefixes in a root-controlled system may thus give the appearance of a directionality effect in AR because the root is always word-initial. If the cases mentioned above are truly root-controlled, then the preference for suffixing morphology found in these systems (except Bantu) would give the illusion of leftward edge orientation. Of course, this pattern is just an illusion because if the Root-Controlled Accent hypothesis applies to these cases as well, then they are fully symmetric: they all favor retention of a root accent over an affix accent.

From these considerations, the notion of root-control may indeed have some currency beyond the accent system of Cupeño. First, the absence of a class of prefixes whose inherent accent takes precedence over the root accent is expected. Second, the apparent directional asymmetry may be accounted for in terms of a general preference for suffixing morphology. Moreover, the analysis of AR in these systems explains the pattern of root retention in terms of a general pattern of root privilege, accounting for AR with the same basic assumptions at work in root-controlled vowel harmony and dissimilatory phenomena. I therefore propose to examine two of the accent systems listed above in more detail and consider the hypothesis that these systems too have root-controlled accent.

[4]Myers 1997b suggests that this directional asymmetry is due to a perceptual difficulty with non-initial high tones, though this approach is not extended to stress languages.

3.2 Extended Case Study: Modern Russian

The section has two goals. The first goal is to present an analysis of the stress patterns in Modern Russian which is consistent with one of the restrictions on edge effects derived in §3.1, namely that edge orientation effects are only observed in contexts where Faithfulness is not decisive. As discussed above, Russian has formerly been approached as a case of unrestricted edge orientation, i.e., in terms of an analysis in which 'the leftmost inherently accented morpheme wins'. I argue below, however, that an alternative to this analysis is also viable, which is consistent with the restrictive theory of edge effects; thus, this alternative is superior to the previous approach on theoretical grounds. The second objective here is to construct an analysis of the basic stress system that can be called upon in §5.2.3 in the analysis of de-accenting suffixes. The theory of accent-deleting affixes proposed in chapter 5 makes the prediction that the accentual pattern resulting from de-accentuation is a default structure in the language. It is therefore necessary to establish a language particular default for Russian stress in order to test this prediction. The accentual defaults will be deduced from the constraint rankings given below in the analysis of stress in inflected words, and their role will then be extended to a wider range of data in chapter 5, including certain minor accentual patterns involving a shift of stress in inflectional paradigms and derived nouns and verbs.

The rest of this section is organized as follows. The first subsection provides the necessary linguistic background on Russian, essentially stating my assumptions about Russian morphology and the phonetics of accent. The next subsection, §3.2.2, presents an analysis of the major stress patterns in underived nouns, which is a necessary point of departure because these patterns form the core of any description of Russian stress. Finally, §3.2.3 broadens the empirical scope further, examining the implications of the analysis for stress in verbs and prefixed words. It will be shown here that the analysis of Russian stress in terms of root-control is consistent with the findings in these areas, and therefore this analysis is consistent with the more restrictive theory of edge effects proposed here.

3.2.1 Preliminaries

Let us begin the study of Russian nominal stress with some preliminaries of Russian word structure from Townsend 1975: IC. First, roots in Russian typically have the shape CVC, where C stands for one or more consonants and V stands for one vowel. Roots of Church Slavonic origin always end in consonants, but a few are vowel-initial. Some roots have the shape CVRVC, with the medial R representing a resonant consonant. In most cases, however, there is a related Church Slavonic root with a single syllable. Other

polysyllabic roots are often derivatives from roots with one syllable or borrowings.

Nouns are formed by attaching to the stem a set of inflections for gender, case, and number, as shown in the sketch below. The term 'stem' thus refers to the word minus inflections, which in this section simply involves a bare root.

(10) Morphological Frame for Underived Nouns

$$[\text{ Root }]_{\text{Stem}} + \text{Infl}$$

Suffixation plays a very important role in word-formation, and as I will show in §5.2.3, noun-forming suffixes interact in interesting ways with the root accent. It is necessary, however, to determine the basic accentual principles in underived nouns before examining derived nouns. In contrast to suffixation, prefixation is much less important in nouns. While there are many prefixes, they are typically unproductive or have a low degree of productivity (Townsend 1975), which is probably why they are rarely taken into consideration in discussions of noun accentuation. Prefixed nouns and prefixed verbs have some important similarities, and so prefixed nouns will be addressed in §3.2.4., where I examine verb stress as well as the accentual properties of prefixes generally.

With respect to the phonetics of stress, Russian words have a single stress prominence per word, and this prominence is realized as a peak in intensity and greater duration than the neighboring syllables (see Jones & Ward 1969 for more details). Russian also has a phonological pattern of vowel reduction in which non-high vowels are reduced in unstressed syllables. These patterns suggest that vowel quality may also have a role in cueing stress.

3.2.2 Noun Stress: The Basic Patterns[5]

As illustrated below, a fundamental observation in many nominal paradigms is that stress is fixed on the stem. The words with disyllabic stems given below, while somewhat rare in Russian, illustrate that stress may either fall on the first or second syllable, e.g. *kómnat-a* versus *tetrád'*.

[5]Most of the data presented in this section are from Brown et al. 1996, which differs from many generative descriptions of noun stress in classifying the nominal paradigms by declension class, rather than by gender markings (as in, e.g., Melvold 1990). I am convinced by the arguments presented in Brown et al. (and references cited therein), and I follow this work in classifying the data in this way. However, the argumentation presented here does not hinge crucially on this choice of data organization.

(11) Fixed Stem Stress (Sorted by Declension Class)

SG	I	II	III	IV
Nominative	rák	kómnat-a	tetrád'	bl'úd-o
Accusative	rák-a	kómnat-u	tetrád'	bl'úd-o
Genitive	rák-a	kómnat-i	tetrád'-i	bl'úd-a
Dative	rák-u	kómnat-e	tetrád'-i	bl'úd-u
Instrumental	rák-om	kómnat-oj	tetrád'-ju	bl'úd-om
Locative	rák-e	kómnat-e	tetrád'-i	bl'úd-e
PL				
Nominative	rák-i	kómnat-i	tetrád'-i	blúd-a
Accusative	rák-ov	kómnat-i	tetrád'-i	blúd-a
Genitive	rák-ov	kómnat	tetrád'-ej	blúd
Dative	rák-am	kómnat-am	tetrád'-am	blúd-am
Instrumental	rák-am'i	kómnat-am'i	tetrád'-am'i	blúd-am'i
Locative	rák-ax	kómnat-ax	tetrád'-ax	blúd-ax
	'crayfish'	'room'	'exercise book'	'dish'

This pattern of fixed stress accounts for roughly 92% of the nominal paradigms in all declension classes. For a significant majority of nouns, therefore, stress is fixed on a stem vowel.

A second important stress pattern in nouns is fixed stress on the inflectional ending. Since most of the inflections are monosyllabic, this stress pattern gives stress on the first vowel following the stem, as shown below.

(12) Fixed Inflection Stress

stól	č'ert-á	vešč'estv-ó	Nominative Singular
stol-ú	č'ert-é	vešč'estv-ú	Dative Singular
stol-ám	č'ert-ám	vešč'estv-ám	Dative Plural
'table'	'characteristic'	'substance'	

There is a small percentage of nouns, mostly from declension class II, with fixed inflection stress but with initial stress in the nominative plural, e.g., *skovorod-á* 'frying pan (nom sg)', cf. *skóvorod-i* (nom pl), or in both the nominative plural and the accusative singular, e.g., *borod-á* 'beard (nom sg), cf. *bórod-u* (acc sg), *bórod-i* (nom pl). Since these forms constitute less than a tenth of one percent of the total number of nouns, I will simply treat them as exceptions which are lexically marked for initial stress in the appropriate grammatical cases.

The frequencies for these two patterns given below support the following generalization (based on the generalizations formulated in Brown et al. 1996): stress is either fixed on a stem vowel or on the first vowel of the inflectional ending.

(13) Frequencies for Predominant Stress Patterns (n = 43,996; from Zaliznjak 1977)

Fixed Stem Stress	92%
Fixed Inflection Stress	6%

This generalization accounts for roughly 98% of the nouns, and when considering the size of Zaliznjak's corpus, it is sensible to assume that these two patterns of fixed stress constitute the core set of stress patterns. Furthermore, the remaining nominal paradigms conform to a basic pattern that distinguishes them from the major patterns examined here. Thus, in contrast to the fixed stress patterns here, the residual nominal paradigms exhibit two patterns of mobile stress, both of which have an opposition between the singular and plural case forms, as shown below with some partial paradigms.

(14) Mobile Stress Patterns

a. Stem-Initial/Inflection		b. Inflection/Stem-Final		
tél-o	kólokol	dir-á	kolbas-á	Nominative Singular
tél-u	kólokol-u	dir-é	kolbas-é	Dative Singular
tel-á	kolokol-á	dír-i	kolbás-i	Nominative Plural
tel-ám	kolokol-ám	dír-am	kolbás-am	Dative Plural
'body'	'bell'	'hole'	'sausage'	

The pattern of mobile stress in (14a) has initial stress in singular forms, but ending stress in the plural. Likewise, the mobile stress patterns in (14b) show a related pattern of mobile stress: singular forms have ending stress while the plural forms have stem-final stress. While a handful of nouns stray from these two patterns in having anomalies within the singular or plural sub-paradigms, the basic pattern is that the singular inflected forms have a fixed stress pattern, as do the plural inflected forms, and that these two fixed patterns are different (see Stankiewicz 1962 and references therein for discussion of this opposition). It appears therefore that the mobile stress patterns, constituting roughly 2% of the data, can be safely set aside and analyzed in a different way. I will return to the analysis of mobile stress in chapter 5 when the theoretical background for understanding these patterns has been sufficiently established.

The general strategy for analyzing Russian noun stress is the same as with the analysis of Cupeño: stress is 'root-controlled' in the sense that it is governed by the accentual properties of the obligatory constituent of the stem. With the Prosodic Faithfulness constraints for roots top-ranked, as shown below, root stress will override affix stress. Thus, in a word with an accented root, inherent accent in the root will be preserved throughout the paradigm, giving the

observed pattern of fixed stress. Furthermore, because the Root Faithfulness constraints dominate other prosodic well-formedness constraints, the position of stress may contrast in polysyllabic roots.

(15) Root-Controlled Stress in Russian

a. MAX-PROM$_{Root}$ >> PHONO, MAX-PROM$_{Affix}$

b. NO-FLOP-PROM$_{Root}$ >> PHONO

The Root Faithfulness constraints given above have no say in words with unaccented roots, and so in such contexts the low-ranking constraints play a decisive role. In particular, a purely phonological constraint, which I will now motivate, becomes active and requires stress to appear on the ending.

In characterizing the constraint responsible for ending stress, it is helpful to briefly compare this pattern in Russian with a related pattern in Sanskrit. In Sanskrit thematic nouns (nouns with a theme vowel), there is also a basic distinction between stems which have a fixed accent on the stem and stems which have an accent on a post-stem vowel, namely the theme vowel. For the latter class of stems, the so-called 'oxytone stems', Kiparsky 1973 argues for a post-stem accent rule which specifically posits an accent on the vowel directly following the stem. The evidence for the restriction to the directly following vowel is that it limits accent to the first syllable of polysyllabic suffixes, which, while not significant for the case endings, is correctly borne out for verbal suffixes (Kiparsky 1973: 810). It would seem, then, that a parallel constraint is at work in Russian, which is the spirit in which I propose the following constraint (see also 'the Oxytone Rule' of Halle 1973).

(16) POST-STEM-PROM (PSP) ≡ ALIGN (PROM, L, Stem, R)
The left edge of the stress prominence must coincide with the right edge of some stem.

POST-STEM-PROM is formulated as a subcategorization-type constraint in the constraint schemata provided in Generalized Alignment (McCarthy & Prince 1993a). The effect of stress on the first vowel of the inflectional ending is thus the same effect observed in suffixation generally: the left edge of a prominence (i.e., the left edge of the vowel dominated by a grid mark) must co-incide with the right edge of the stem, giving post-stem stress. Formulated as a gradient Alignment constraint, PSP requires a prominence on the first vowel of the

inflectional ending, or as close as a prominence can get to this position, which will be crucial in the analysis presented below.[6]

The results of these constraint rankings will now be illustrated in a series of tableaux. First, words with fixed stem stress are assumed to have an inherently accented root, and so √*rák* shown below is endowed with a lexical prominence. Assuming that the plural ending is inherently accented as well (a possibility we must entertain, given Richness of the Base), these two morphemes compete for the unique word prominence. The inherent ranking between Root and Affix Faithfulness gives predominant root stress because, as with the parallel set of facts in Cupeño, failure to preserve the root accent leads to a fatal violation of MAX-PROM$_{Root}$.

(17) Predominant Root Stress in Russian

x_1 x_2 /rák + í/	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
x_2 rak-í	*!	
x_1 → rák-i		*

If, on the other hand, the plural ending is unaccented, the outcome is the same. Since MAX-PROM$_{Root}$ dominates PSP, inherent root stress wins over default stress on the inflectional ending.

Root Faithfulness has another role in the analysis, namely that it ensures that the accent of the root does not shift forward to the favored post-stem position. As shown below, if the root accent flops to the inflection, this option leads to a violation of NO-FLOP-PROM$_{Root}$, and since this constraint dominates PSP, the winning candidate is the form that does not undergo the shift.

[6]This constraint finds additional support in Pierrehumbert & Beckman's 1988 analysis of 'initial lowering' effects in Tokyo Japanese, where the boundary tone of a preceding minor phrase appears on the initial mora of the following phrase; hence, the operative constraint appears to be ALIGN(L%, L, Minor Phrase, R).

(18) Lack of Accent Shift

x_1 x_2 /rák + í/	NO-FLOP-PROM$_{Root}$	POST-STEM-PROM
x_1 rak-í	*!	
x_1 → rák-i		*

Because of the rank of NO-FLOP-PROM$_{Root}$, the root accent does not shift. This result leads to a further prediction which is borne out in Russian, namely that polysyllabic roots will show a contrast in accent position within the root. As shown with the input-output mappings below, disyllabic roots show such a contrast because failure to preserve the accent, and realize it in a position corresponding to its lexical position, leads to violation of either MAX-PROM$_{Root}$ or NO-FLOP-PROM$_{Root}$.

(19) Positional Contrast in Disyllabic Roots

Input		Output	MX-PM$_{Rt}$	NO-FLOP$_{Rt}$	PSP	MX-PM$_{Af}$
a. /kómnat + í/	→	kómnat-i			*	*
		*komnát-i		*!	*	*
		*komnat-í	*!			
b. /tetrád' + í/	→	tetrád'-i			*	*
		*tétrad'-i		*!	*	*
		*tetrad'-í	*!			

Other stem-internal elements, such as derivational suffixes, also participate in this contrast, but since their Faithfulness properties are not governed by Root Faithfulness, they are treated in §5.2.4., where the derivational suffixes are analyzed.

So far we have only been concerned with the ranking consequences of the grammar in (15) above for words with accented roots. In words with unaccented roots, however, the Root Faithfulness constraints such as MAX-PROM$_{Root}$ are irrelevant because there is not an underlying accent to realize. The lower-ranking constraints therefore become active in these word types and give default ending stress. For example, a word with an unaccented root such as √*stol*, receives stress on the first vowel of the inflectional ending because this is the position prescribed by POST-STEM-PROM. As shown below, this result is

obtained even if the inflectional ending is unaccented. Thus, the two plural endings *-i* and *-am'i* get a stress on the first vowel because this structure properly aligns the surface prominence with the right edge of the stem

(20) Default Ending Stress with Unaccented Root

Input		Output	MAX-PM$_{Root}$	POST-STEM-PROM
a. /stol + i/	→	stol-í		
		*stól-i		*!
b. /stol + am'i/	→	stol-ám'i		
		*stol-am'í		*!

The same result holds for most cases if the endings are inherently accented, which will be illustrated at the close of the discussion where the accentedness of the endings is clarified.

The constraint POST-STEM-PROM also has a role in words with unaccented stems and null inflections. As exemplified below, if a noun with fixed inflection stress has a null inflection, as with the nominative singular in first declension nouns, stress falls on the next closest vowel, i.e., the stem-final vowel.

(21) Fixed Inflection/Stem-Final Stress

topór	slovár'	p'iróg	karás'	Nominative Singular
topor-ú	slovar'-ú	p'irog-ú	karas'-ú	Dative Singular
topor-ám	slovar'-ám	p'irog-ám	karas'-ám	Dative Plural
'axe'	'dictionary'	'pie'	'carp'	

Because of the gradient nature of PSP, this observation receives a natural explanation in terms of the minimal violation of this constraint. As illustrated in the tableau below, the candidate with stem-final stress is the winner because it posits the accent closer to the right edge of the stem than the available alternative.[7]

[7]This result also provides an argument against employing the constraint DEP-PROM$_{Root}$ in the analysis of fixed inflection stress, in effect banning the insertion of accent in roots in words with no inherent accent and leaving the inflection as the only viable option. This anti-insertion constraint is clearly irrelevant in the analysis of stem-final stress in words with null inflections, so the analysis with PSP covers more empirical ground.

(22) Minimal Violation of POST-STEM-PROM

/topor + ∅/	PROS-FAITH$_{Root}$	POST-STEM-PROM
tópor-∅		**!
→ topór-∅		*

Furthermore, as we will see in §5.3, PSP plays a crucial role in the analysis of certain patterns of mobile stress. In both of these patterns, ending stress is found throughout either the plural case forms or the singular case forms, providing further evidence for ending stress as a default. While it is impossible to establish this claim without an analysis in hand, it is clear that a constraint such as POST-STEM-PROM will have a role in the analysis of these patterns as well.

As discussed in §1.2, given Richness of the Base, it is necessary to derive the inventory of possible stress patterns without imposing a Russian-specific constraint on underlying representations. The analysis presented here meets this requirement, as the constraint rankings motivated above will generate all and only the observed stress patterns without language particular restrictions on the input. Thus, the following illustration shows the predicted outcomes in all possible input-output mappings, factoring in both the accentedness of roots and endings. I assume, for ease of exposition, that accentual shifts are not possible here, which is a safe assumption, given the ranking of NO-FLOP-PROM$_{Root}$ in the grammar.

(23) Inventory of Noun Stress Patterns

	Inputs		Outputs	MAX-PM$_{Root}$	PSP	MAX-PM$_{Affix}$
a.	/rák + i/	→	rák-i		*	
			*rak-í	*!		
a'.	/rák + í/	→	rák-i		*	*
			*rak-í	*!		*
b.	/stol + i/	→	stol-í			
			*stól-i		*!	
b'.	/stol + í/	→	stol-í			
			*stól-i		*(!)	*(!)

The point to be emphasized here is that the winning output form is predicted purely on the basis of the accentual properties of the root. Thus, if the input contains an accented root, the prediction is that the root will realize its accent in the output, regardless of the accentedness of the ending (23a-a'). Likewise, if

the input is a word with an unaccented root, the resulting output has inflection stress, even if the ending is itself unaccented (23b).

We have not as yet determined the ranking of POST-STEM-PROM relative to MAX-PROM$_{Affix}$, or any of the Affix Faithfulness constraints, as this issue has not as yet been directly relevant for the empirical matters at hand. The evidence needed to settle this ranking issue is the presence or absence of an accentual contrast in the position of accent in affixes, and in this area, Russian morphology is not especially helpful. Most all of the endings are monosyllabic, except the instrumental plural *-am'i* and perhaps a few others as well if suffixes with yers are counted. This set is clearly not a large enough sample to decide whether Russian affixes have a contrast in the position of accent. Furthermore, there are only about 4 or 5 disyllabic derivational suffixes that are clearly not morphologically complex, which does not add much to the baseline here. It is certainly true, however, that when they are stressed, the polysyllabic suffixes have stress on the initial syllable (a point emphasized in Stankiewicz 1993: 185); thus, if POST-STEM-PROM is ranked above NO-FLOP-PROM$_{Affix}$, this ranking will not make false predictions. Moreover, as alluded to above, when polysyllabic suffixes attach to oxytone stems in Sanskrit, the result is always accent on the first vowel of the suffix. To be consistent with Sanskrit, therefore, I hypothesize that this pattern is also significant in Russian, which justifies the following ranking.

(24) Root-Controlled Accent in Russian

$$\left\{\begin{array}{l}\text{MAX}-\text{PROM}_{\text{Root}}\\ \text{NOFLOP}-\text{PROM}_{\text{Root}}\end{array}\right\} >> \text{POST-STEM-PROM} >> \text{PROS-FAITH}_{\text{Affix}}$$

To summarize the results of this constraint system, accent is root-controlled in Russian nouns. That is, in words with accented (simplex) stems, inherent accent in the stem always prevails, as predicted by the ranking of the Root Faithfulness constraints MAX-PROM$_{Root}$ and NO-FLOP-PROM$_{Root}$ above all other constraints. In words with unaccented stems, these constraints are irrelevant, and the decision therefore falls to the next highest constraint in the hierarchy, namely POST-STEM-PROM, which ensures stress on the first vowel of the inflectional ending. The above ranking therefore accounts for the core set of stress patterns, namely fixed stem stress and fixed inflection stress, as a consequence of the accentual properties of the root.

The analysis presented above applies the theory of root-controlled accent to Russian nouns. The next question to be addressed therefore is, how does the analysis apply to the stress patterns found in other word classes? Specifically, does it extend to the accentuation of adjectives and verbs? Concerning adjectives, both Halle 1973a and Melvold 1990 emphasize that the

principles of accentuation in adjectives are fundamentally the same as those found in nouns, and so it appears that investigating adjective stress will not turn up a new set of challenges. Stress in verbs, however, presents a new empirical problem, namely the accentuation of prefix + root sequences. Since these sequences may present crucial evidence for or against the root-controlled analysis, it is worthwhile studying prefixed verbs in some detail.

3.2.3 Extending the Analysis: Verb Stress and Prefixed Words

There is a basic distinction between thematic and athematic verbs in Russian. Thematic verbs are derived verbs that are essentially the product of attaching one of a set of theme vowels to a root. Athematic verbs are underived and therefore do not have a theme vowel. As thematic verbs involve certain complications that are irrelevant to the main issues at hand, I will focus exclusively on athematic verbs here, but see Halle 1973a and Melvold 1990 for comprehensive discussions.[8]

The following morphological frame describes the composition of athematic verbs.

(25) Morphological Frame for Athematic Verbs

$$[\ (\text{prefix}) + \text{root} + \begin{Bmatrix} 1 \\ e \end{Bmatrix} + \text{suffix}_{\text{Agr}}\ ]$$

Verbs in Russian have complex inflections consisting of a tense suffix and an agreement suffix. The inflections are shown in the forms below, which illustrate the range of possible stress patterns in verbs.

[8]Much of the data and descriptive generalizations below are drawn directly from these key works.

(26) Stress Patterns in Verbs

a. Present tense verbs

		Pattern A	Pattern B	Pattern C	Pattern D
SG	1	léz-u	pek-ú	živ-ú	strig-ú
	2	léz-eš	peč-óš	živ'-óš	striž-óš
	3	léz-et	peč-ót	živ'-ót	striž-ót
PL	1	léz-em	peč-óm	živ'-óm	striž-óm
	2	léz-ete	peč-óte	živ'-óte	striž-óte
	3	léz-ut	pek-út	živ-út	strig-út
		'crawl'	'bake'	'live'	'shear'

b. Past tense verbs

Masculine	léz	pék	ží-l	stríg
Feminine	léz-la	pek-lá	ži-lá	stríg-la
Neuter	léz-lo	pek-ló	ží-lo	stríg-lo
Plural	léz-li	pek-lí	ží-li	stríg-li

Using some common alphabetic labels, the descriptions for the patterns exemplified above are given below (after Halle 1973a and Melvold 1990).

(27) Four Basic Patterns

a. Pattern A: fixed stem stress.

b. Pattern B: fixed stress on the inflection (when there is one).

c. Pattern C: stem-initial stress in the masculine, neuter, plural past tense forms, ending stress elsewhere.

d. Pattern D: ending stress in present tense forms, and stem-final stress in the past.

The point to be emphasized here is that the same basic stress patterns in nouns are also found in the verbs shown above. Thus, patterns A and B are exactly on a par with the core patterns observed in nouns: stress is either fixed on the stem or on the inflectional ending. Furthermore, verbs show the same two patterns of mobile stress; compare the verb stress patterns shown above with the nominal paradigms in (14). Pattern C has initial stress in a subset of the past tense forms, and ending stress elsewhere, which is mirrored in the pattern of singular-plural opposition found in stems like *kólokol* 'bell'. Also, pattern D stress is directly

parallel to singular-plural opposition in words like *kolbás-a* 'sausage', ending stress in one grammatical class, and stem-final stress in another. In sum, the range of possible patterns are the same in both verbs and nouns.[9]

At this point, I can only give a partial story for verb stress, as the principles governing patterns C and D stress have not yet been proposed. It is clear, however, that the same basic analysis for nouns may be extended to verb stress, which is satisfactory for the moment. This interim sketch will be sufficient to cover prefixed verbs and nouns, which is the focus of this section. The full range of stress patterns in verbs will be revisited and analyzed in chapter 5, where the principles governing mobile stress are introduced.

The patterns of fixed stress, i.e., patterns A and B, are covered by the constraint system developed in the previous section, as I will now demonstrate. First, fixed stem stress (pattern A) may be straightforwardly analyzed as the realization of inherent accent in roots. Hence, regardless of the accentuation of the inflections, if one assumes that the root √*léz* is inherently accented, then the grammar given in (24) for nouns will preserve the root accent, giving fixed stem stress (28a). Moreover, fixed inflection stress in verbs is treated in exactly the same way as nouns: if one assumes that in such words the root is unaccented, then it will receive default inflection stress, as shown in (28b).

(28) Fixed Stress in Verbs: Patterns A and B

	Input		Output	MAX-PROM$_{Root}$	POST-STEM-PROM
a.	/léz + u/	→	léz-u		*
			*lez-ú	*!	
b.	/pek + u/	→	pek-ú		
			*pék-u		*!

Importantly, these results do not depend on the accentedness of the inflections: if the present tense inflection here was inherently accented, it would still go unstressed in the case of *léz-u*, and it would still be stressed in the case of *pek-ú*. This result follows from the rank of the Root Faithfulness constraints, as it is observed in root + inflection sequences in nouns in §3.2.2.

As for patterns C and D stress, these patterns of mobile stress resemble the corresponding nominal patterns in that they show oppositions between well-defined grammatical classes. An obvious comparison is seen in pattern D stress with verbs like √*stríg* where present tense forms have fixed ending stress and the

[9]According to Halle 1973a, fixed inflection stress is the predominant pattern in athematic verbs, which contrasts with noun stress where fixed stem stress is the most common. It is not clear if this difference is significant, given the vast differences in the baselines for each system (there are far fewer verbs than nouns in Halle's samples).

related past tense forms have stem-final stress. The opposition in pattern C in verbal paradigms like √*žív* is more subtle, but equally coherent. Thus, there is a basic opposition again between present and past tense forms, except in this pattern the opposition goes in a different direction. Specifically, past tense forms generally have initial stress (excluding feminine past tense forms), while present tense forms have ending stress. As for the ending stress in the feminine forms, this pattern is the manifestation of a different morphological opposition, namely between masculine and feminine forms. There is abundant evidence in Russian for such an opposition, as illustrated with the following contrasts in derived nouns (see especially Halle 1973a: 340 ff.). In masculine-feminine noun pairs derived with the suffix *-Ok*, for example, if the stem is unaccented the noun pairs differ in stress, e.g., *pastuškí* versus *pastúški* '(dear little) shepherds/shepherdesses'. This pattern is more akin to pattern D stress, as it is an opposition between ending stress (masculine) and stem-final stress (feminine), but the overall point still holds: the stress system is being used to mark an opposition between two grammatical classes. In sum, while pattern C stress appears to be somewhat complicated, the mobile stress patterns in verbs can be cogently described in terms of a contrast between pairs of grammatical classes, which is directly on a par with the singular-plural oppositions found in nominal mobile stress patterns. So, once these tools have been developed for noun stress, they may be straightforwardly extended to verbs, as is done in the case study on Russian derived nouns in chapter 5.

The comparison between noun and verb stress given above shows two things. First, it shows that the principle of root-control employed in the analysis of noun stress applies with equal force in verbs to describe the two patterns of fixed stress (patterns A and B). Second, it draws explicit parallels between the morphological oppositions found in nouns and verbs, which in turn suggests that these patterns of mobile stress (i.e., patterns C and D) should be treated together. The productive patterns of prefixation in verbs present a further empirical domain in which to test the RCA hypothesis because such patterns yield prefix + root structures which are directly relevant for this analysis. Remarkably, it turns out that the only pattern of verb stress that is affected by prefixation is pattern C (Melvold 1990). That is, fixed stem stress and fixed ending stress are generally not affected by prefixation (excluding one prefix to be discussed below). Furthermore, pattern D stress is generally not changed in prefixed verbs. This finding is highly significant because if the Russian stress is modelled in terms of root-control, prefixes cannot have an effect on fixed stem stress at all, as I have shown above with the inflectional suffixes. In what follows, I examine the effect of prefixation on pattern C stress and consider its implications for root-controlled accent in Russian. Then, the discussion is generalized to prefixes in nouns, which are far less productive, but show a related pattern.

Verbs that show pattern C stress show a related pattern when the verb root is combined with a prefix, as illustrated below with some past tense forms.

(29) Past Tense forms with √*živ* 'live'; *pro-živ* 'live (a period of time)'

Masculine	ží-l	pró-ži-l	pro-ží-l
Feminine	ži-lá	pro-ži-lá	pro-ži-lá
Neuter	ží-lo	pró-ži-lo	pro-ží-lo
Plural	ží-li	pró-ži-li	pro-ží-li
		Standard	Colloquial

Recall from above that pattern C stress exhibits root-initial stress in all the past tense, save the feminine past form. In prefixed verbs, the same pattern of mobile stress may hold, which appears to correspond to a more prevalent, perhaps colloquial usage. Alternatively, initial stress in the non-feminine forms may be extended to word-initial stress, with stress falling on the first syllable of the prefix, which corresponds roughly to the standard pronunciation one might learn in school.[10] It is clear, however, that these two patterns are simply different realizations of pattern C stress, with some variation in the delimitation of the domain to which initial stress is assigned.

This pattern of variation, while it may yield stress on the prefix, is fully consistent with the assumption that accent is root-controlled. Succinctly, the roots in these contexts cannot be inherently accented, and so the prefix is not 'in competition' with an accented root. To flesh out the logic more concretely, the chief diagnostic for accented roots is fixed stem stress; pattern C stress does not have fixed stem stress, and so it follows that the verb roots with pattern C mobile stress are not inherently accented. Furthermore, since predominant root accent is only found in words with both an accented root and an accented affix, these data do not reveal anything about the hypothesis that accent is root-controlled in Russian. This reasoning is more or less consistent with most previous generative approaches to this pattern because mobile stress of this kind is only possible in words with unaccented roots (Halle 1973, 1996, Melvold 1990, Idsardi 1992). In §5.2.3, I will also develop an analysis with this assumption, which will establish this point more explicitly with a specific analysis.

There is one prefix that is consistently accented in certain contexts, which may even have the effect of stealing the accent from an inherently accented root. This is the prefix *vi-* 'out-', which perfectivizes the stem it

[10]Melvold 1990: 299 mentions in passing that it appears that if a 'standard' pronunciation is possible, so too is the 'colloquial' stress pattern. Perhaps this tendency reflects a regularization of root-initial stress in the non-feminine forms.

attaches to (a general property of verbal prefixes in Russian). As illustrated below, *vi-* is always stressed in the perfective, but never in the imperfective.[11]

(30) Derived Verbs with *vi-*

	Perfective	Imperfective	
p'isát'	ví-p'isat'	vi-p'ísivat'	'write/write out'
skazát'	ví-skazat'	vi-skázivat'	'say/express'
vest'í	ví-vest'i	vi-vod'ít'	'lead out

This verbal prefix therefore appears to pose a challenge to the root-controlled analysis because it competes with an accent from a root and wins in perfective forms. However, the accentuation of derived imperfectives shows that the pattern is more complicated, involving an intricate interplay between the imperative to stress *vi-* and the patterns of stem and ending stress required in the imperfectives. Given that *vi-* is the sole prefix showing this pattern in the entire language (including some twenty productive verbal prefixes), rather than abandon the root-controlled analysis, it seems sensible to construct an analysis of *vi-* which accounts for its peculiar behavior. In chapter 5, I analyze this prefix on a par with other affixes that idiosyncratically delete the accent of the stem to which they attach (the so-called 'dominant affixes'). On this analysis, the behavior of the imperfectives falls out quite naturally from the fact that the perfective forms serve as the input to derived imperfectives, which also induce a specific morpho-accentual process, namely pre-accentuation.

Finally, I will conclude the discussion with a brief look at prefixed nouns. Prefixation in nouns and adjectives is far less important than in verbs as most prefixes vary between having a low degree of productivity and being completely unproductive. According to Townsend 1975, there are two basic types of prefixed nouns, shown below.

[11]Browne 1978 notes the following exception: *vígljadet'* 'look like, appear' which is necessarily an imperfective given its inherent meaning.

(31) Two Types of Prefixed Nouns (Townsend 1975)

a. Nouns with prefixes based on prepositions

bez-rabót'ica	'unemployment'	bez rabóti	'without work'
za-kavkáz'o	'Transcaucasia'	za Kavkázom	'beyond the Caucasus'
pod-lésok	'underbrush'	pod lésom	'under the forest'

b. Nouns with prefixes added to independent words

ne-	'non-'	ne-znán'ie	'ignorance'
pod-	'sub-'	pod-grúppa	'sub-group'
pra-	'proto-'	pra-jazík	'proto-language'
so-	'co-'	so-ávtor	'co-author'

Given the paucity of examples, no clear patterns emerge concerning stress in prefixed nouns. A handful of prefixes in my sample, however, surface with stress, e.g., *pr'í-gorod* 'suburb' and *prá-ded* 'great grandfather', which of course requires some thought. One sound line of analysis for these examples is that they pattern with the prefixed verbs discussed above with pattern C stress. This tack is invariably the case with *pr'í-gorod*, as *gorod* is an independent word with mobile stress (and thus has an unaccented root). Moreover, the fact that one type of nominal prefix is derived from a preposition further supports this parallel, as most verbal prefixes are also derived historically from prepositions (Townsend 1975). A final piece of evidence bearing on this comparison between prefixed verbs and nouns is that prepositions were at one time included in the stress domain to which initial stress is assigned in pattern C mobile stress (see Halle 1973a: 318-19). Thus, while the stem *gorod* receives initial stress in the present day prepositional phrases shown below, the historically prior pattern had stress on the preposition.

(32) Stress in Prepositional Phrases

za górod < zá gorod	'out of town (to the countryside)'
za górodom < zá gorodom	'outside of town (in the countryside)'

Thus, it is clear that prefixed nouns with stress on the prefix may be approached in terms of pattern C stress, which, as clarified above, is consistent with the root-controlled accent analysis.

To bring this case study to a close, I have examined the full range of stress patterns in underived nouns and verbs and constructed an analysis of most of these patterns which is consistent with the restricted edge effects derived in §3.1. Thus, while there are many previous analyses of Russian stress which describe certain patterns in terms of unrestricted edge orientation, an analysis in terms of root-controlled accent is also possible, and indeed desired, because it is consistent with a restrictive theory of edge effects. Furthermore, I have

examined a range of prefixed structures, with an eye towards evidence for or against the two basic analyses, and this investigation has only turned up one context which might pose a problem for the RCA hypothesis, namely verbs with the prefix *vi-*. As I suggested above, the peculiar behavior of this prefix may be analyzed in terms of a morpho-accentual process involving deletion, as will be shown in chapter 5, so this case does not provide compelling evidence one way or the other. I conclude, therefore, in favor of the RCA analysis of Russian, chiefly because it is consistent with Restricted Edge Orientation. Chapter 5 will present additional arguments in favor of this approach.

3.3 Extended Case Study: Tokyo Japanese

The primary goal of this section is to consider the implications of the Root-Controlled Accent (RCA) hypothesis for the accent system of Tokyo Japanese. This goal is achieved by first proposing an analysis of the basic facts of Japanese word accent in terms of root-control and then studying the consequences for accent in affixed words. The analysis of the basic facts also satisfies a secondary goal of this section, which is to establish a consistent set of assumptions which will be necessary in the treatment of the various morpho-accentual processes in Japanese examined in chapter 5.

A first pass through the literature on Japanese accent[12] would lead one to the conclusion that Japanese constitutes a counter-example to the RCA hypothesis as affixed structures have been described in terms of a principle of edge orientation, namely 'the leftmost inherent accent wins'. Thus, a BAP-like (Basic Accentuation Principle, Kiparsky & Halle 1977) rule has been used to account for the fact that stem accent wins out over various inherently accented suffixes, such as the conditional suffix *-tára*, e.g., /yóm + tára/ → *yón-dara* 'if he reads', cf. /yob + tára / → *yon-dára* 'if he calls'. This stem and suffix interaction is of course consistent with a RCA-driven analysis, but the two analyses differ in their treatment of prefix accent. The analysis which employs the BAP predicts that inherent accent in a prefix will override accent in a root. In contrast, the RCA hypothesis predicts the absence of such a pattern and predominant root accent, as seen in Cupeño. The basic finding here is that there are no prefixes that take precedence over root accent, which provides empirical support for the analysis in terms of root-control. This analysis is also motivated on theoretical grounds because it is compatible with a restrictive theory of edge

[12]The phonetics and phonology of Standard Tokyo Japanese and other Japanese dialects have been extensively investigated; see McCawley 1968, Chew 1973, Haraguchi 1977, 1991, Poser 1984, Beckman 1986, Beckman & Pierrehumbert 1986, Pierrehumbert & Beckman 1988, Kubozono 1988 [1993], and references therein.

effects and explains resolution of accent in Japanese as a general pattern of root privilege.

This section is organized as follows. I begin with the necessary preliminaries in §3.3.1, presenting the essential features of word accent in Tokyo Japanese and some basics of Japanese word structure. The next subsection (§3.3.2) gives a constraint-based analysis of the basic accentual system and clarifies the predictions of the RCA hypothesis. Taking a slight detour, I examine the accentuation of noun-noun compounds in §3.3.3, as compounds are directly relevant to prefix accent, and I present a new analysis of this construction. The set of assumptions motivated up to this point in the study will then be applied in §3.3.4 to the analysis of the various influences of prefixation on word accent. Finally, I close the section by showing that the various types of prefixes are in fact consistent with the predictions of the RCA hypothesis, which supports the overall argument that word accent in Japanese is root-controlled.

3.3.1 Background

A basic fact in Japanese is that accent is contrastive, both for the position of accent and its presence or absence in a word. Thus, accent alone may introduce contrast among otherwise identical words, as shown below with some examples familiar from McCawley 1968.

(33) Contrastive Accent

hási 'chopsticks' hasí 'bridge' hasi 'edge'

The convention I use to mark accent is to place an acute accent directly on the accented vowel, which differs from some work where the accented vowel has an accent directly after that vowel, e.g., *ha'si* 'chopsticks'. This accent marks a tonal event in which pitch drops directly after the accented vowel (illustrated below); thus, accent in Japanese differs from accent in Russian and Cupeño, where pitch is not a primary correlate to surface accent.

The position of accent is contrastive in Japanese, but not all positions in a word may bear accent. In syllables greater than a single mora, the pitch accent always falls on the first mora. This restriction on the inventory of accentual contrasts also has important consequences in various accentual rules. For example, foreign words typically receive accent on the syllable containing the third mora from the end of the word. Thus, the pre-antepenultimate mora is accented if it and the subsequent mora are tautosyllabic, e.g. *hambáagaa* 'hamburger'. Based on evidence such as this, Japanese is often referred to as a

'mora-counting', but 'syllable-accenting' accent language (see McCawley 1968: 133 ff. and Poser 1990a for discussion and additional evidence).[13]

A second important qualification concerning the distribution of surface accent is that contrastive accent is largely a property of nouns (see Smith 1997, 1998 for extensive discussion and analysis). Other word classes, such as verbs and adjectives, conform to certain regular patterns with accent typically falling on the syllable with the penultimate or antepenultimate mora. Furthermore, loans exhibit some accentual regularities, with accent mostly falling on the antepenultimate, pre-antepenultimate, or initial mora of the word. Following previous accounts (e.g., Katayama 1995, 1998, Kubozono 1995, Smith 1997; see also Zubizarreta 1982, Abe 1981, and Bennet 1981), I assume that these regularities are due to an effect of an Alignment constraint which requires an accentual prominence to appear on the head of a prosodic foot.

Concerning phonological phrasing, words are grouped into phonological constituents, called minor phrases, which are in turn organized into so-called major phrases.[14] Minor phrases are characterized by two important facts. First, a minor phrase may only have a single pitch accent, meaning that there can only be one rise and fall in f_0 per minor phrase. Also, in phrases where the first mora is unaccented, there is a rise in pitch to the second mora, which then rises to a following accent, if there is one, and gradually falls to the final syllable if the phrase has no accent. This rise at the onset of a phrase is often referred to as 'initial lowering'. The basic features of minor phrases in Japanese are illustrated by the pitch contours given below.

(34) F_0 Contours of Minor Phrases

ínoti desu	kokóro desu	atamá desu	miyako désu
'it's a life'	'it's a heart'	'it's a head'	'it's a city'

As shown by the above examples, each minor phrase begins at a low point for f0, rises to a high point over and beyond the second mora of the word. In words with accent on the initial syllable, as with the first example, there is a smaller rise from a higher, or 'weak' low, at the onset of the first mora, an effect which is also observed in phrases which begin with syllables containing two moras (see Pierrehumbert & Beckman 1988 for further discussion). In addition, each

[13] Another restriction on the distribution of accent is that there is an avoidance of devoicing accented vowels. The interaction between accent and vowel devoicing is very complex, involving both phonological and phonetic factors. It is not clear, therefore, to what extent vowel devoicing restricts the phonological inventory of accentual patterns (see Tsuchida 1997 for extensive discussion of this interaction).

[14] The terminology is due to McCawley 1968, cf. 'accentual phrase' and 'intonational phrase' of Pierrehumbert & Beckman 1988.

example has a fall in pitch somewhere in the phrase, and as mentioned above, this fall directly follows the inherently accented vowel.

An important qualification that is needed before we can proceed is that I develop an analysis of accent in words, not minor phrases. While there are important similarities between words and minor phrases, there is also an important difference. As noted in Poser 1984, the generalization concerning edge orientation in Japanese accent is absolute in minor phrases, but this same generalization is subject to exceptions in words. For example, Japanese has a set of so-called 'dominant' suffixes which steal accent from the stem, counter-exemplifying the claim that the leftmost accent wins. For this reason, we focus here on word accent, leaving aside the problem of initial lowering and the observed edge orientation in phrasal accent (as this accent is certainly of the restricted type). The problem of immediate interest therefore is the characterization of the fact that inherent accent is contrastive in Japanese words.

Before moving to the analysis of contrastive accent, I will briefly review some basic features of Japanese morphology that will be relevant in the subsequent analysis.[15] Concerning the concatenative morphology, affixation is mostly agglutinative. While affixes of both Sino-Japanese (SJ) and native origin are common, SJ affixes tend to be more productive (as they have most recently been introduced). Japanese has a rich inventory of suffixes, several of which will be examined in chapter 5, but a great many of these tend to behave like the second member of a compound (see Appendix I of McCawley 1968 for a long list). As for the prefixes, they are fewer in number, and attach mostly to nouns, but a few do attach to adjectives, e.g., *hi-* 'slight', *o-* 'honorific', *ko-* 'slight', and *o-* may also attach to verbs, but the result is an adjective. Japanese also has several recently borrowed English prefixes, as in *suupaa-* 'super-', *nyu-* 'new', *posuto-* 'post', *mini-* 'mini', and these tend to pattern with the Aoyagi prefixes (meaning that words that contain them may have two rises and falls in pitch, see §3.3.4).

Another very important word-forming process in Japanese is compounding. Concerning noun-noun compounds, there appears to be two basic types (see Poser 1984: 47 ff. and Otsu 1980).[16] The first type are the so-called *dvandva* compounds, as in *eda-ha* 'branches and leaves' (eda + ha) and *kúro-siro* 'black and white' (kúro + síro). As illustrated with these examples, *dvandva* compounds involve semantic conjunction of two morphemes and are characterized by the lack of Rendaku voicing in the first obstruent of the second member. Most noun-noun compounds, however, are not of the *dvandva* type.

[15]This characterization of Japanese morphology draws heavily on Kageyama 1982, Abe 1985, Shibatani 1990 §10 and Bloch 1946a,b.

[16]Otsu actually distinguishes among three types of compounds, including a less well defined class of 'strict compounds' which are semantically opaque and do not undergo Rendaku.

Non-*dvandva* compounds, referred to as 'loose compounds' by Otsu, show sequential voicing and semantically involved modification of one member by another. For example, the initial obstruent is voiced in the following examples: /ori + kami/ → *ori-gami* 'folding paper' and /yama + tera/ → *yama-dera* 'mountain temple'. While the accentuation of *dvandva* compounds is straightforward, following the pattern of 'leftmost accent wins' observed in minor phrases, accent in loose compounds is far less straightforward. As the proper treatment of loose compounds bears directly on the analysis of the accentuation of prefixes, this classic problem will be studied in detail in §3.3.3, where an analysis is proposed in terms of Word Binarity constraints and default-to-opposite edge orientation.

With this linguistic background, we may now proceed to the analysis of the basic accentual system of Japanese.

3.3.2 Analysis of Japanese Word Accent[17]

Consistent with the theoretical assumptions laid out in the introduction, the lexical-to-surface mappings for the content words in (34) will be represented as the input-output mappings given below. That is, inherent accent is represented with a lexical prominence (marked here with an acute accent) which is mapped onto surface forms with the corresponding prominence structure. This surface prominence structure is aligned with a pitch accent, H*L, which in conjunction to other rules of phonetic implementation, accounts for the phonetic differences among these words.

(35) Contrastive Accent in Nouns

/ínoti/	→	ínoti	'life'
/kokóro/	→	kokóro	'heart'
/atamá/	→	atamá	'head'
/miyako/	→	miyako	'city'

The lexical-to-surface correspondence in prominence structure is governed by the Prosodic Faithfulness constraints (see §1.2 for the formal definitions). In the usual way, the accentual contrasts observed in Japanese are accounted for by ranking the PROS-FAITH constraints above a set of Markedness constraints: PROS-FAITH >> M. The dominated Markedness constraints in Japanese are given below.

[17]This analysis presented here has been inspired by the work of Katayama 1995, 1998, Smith 1997, and Kubozono 1995.

(36) Dominated Markedness Constraints

ALIGN-L(PM, PrWd): Prominence must be aligned to the left edge of prosodic word.

ALIGN-R(PM, PrWd): Prominence must be aligned to the right edge of prosodic word.

NONFINALITY: The head (foot, syllable) of the prosodic word must not be final.

With these Markedness constraints dominated, the accentual contrasts allowed in the input will be mapped onto corresponding outputs, as depicted below.

(37) Prosodic Faithfulness derives Positional Contrast

	Input		Output	PR-FAITH	ALIGN-R	ALIGN-L	NONFINAL
a.	/ínoti/	→	ínoti		*		
			*inotí	*!		*	*
b.	/kokóro/	→	kokóro		*	*	
			*kókoro	*!	*		
c.	/atamá/	→	atamá			*	*
			*atáma	*!	*	*	

These input-output pairs do not reveal all of the intricacies of a fully articulated constraint system, which would be too cumbersome here (but see analysis of compounds presented below for more detail). However, they do show the important rankings that will be relevant for later analysis. First, the ensemble of PROS-FAITH constraints must outrank the two Alignment constraints. If this ranking did not hold, then non-final accents in the input could be paired with right-aligned accents in the output, as in the failed candidate in (37a); and conversely non-initial lexical accents could be left-aligned (37b). It is also necessary to assume that PROS-FAITH dominates NONFINALITY because words with accent on the last mora do not shift accent to a non-final mora (37c).

The role of the two Prosodic Faithfulness constraints, MAX-PROM and NO-FLOP-PROM, is clear from this brief illustration: lexical prominences are not deleted or shifted in these input-output pairs. The role of DEP-PROM, on the other hand, is less transparent, but still crucial in the overall analysis. High-ranking DEP-PROM accounts for the fact that a default accent is not inserted in words like *miyako*, which do not have a surface pitch accent. Therefore, the ranking of DEP-PROM above a constraint calling for a prominence in every word,

i.e., HEADEDNESS(PrWd) of Selkirk 1995 [1996] (see §1.2.2.3), accounts for the Faithfulness to the absence of underlying accent. Together with MAX-PROM, DEP-PROM effectively accounts for the second accentual contrast between accented and unaccented words.

The positional and accented/unaccented contrasts shown above motivate the ranking of the Prosodic Faithfulness constraints above a set of Markedness constraints. The limitation of accent to the initial mora of a syllable shows that PROS-FAITH is also dominated. For concreteness, I follow Haraguchi 1991 in assuming that this restriction is due to a high-ranking constraint that requires the prominence to appear on the head mora of a syllable, which in a bimoraic syllable is the first mora in Haraguchi's analysis. Thus, I assume that the 'syllable-accenting' character of Tokyo Japanese is accounted for by ranking ACCENT-TO-HEAD(σ) above PROS-FAITH constraints, though nothing crucial hinges on this assumption.

The various Prosodic Faithfulness constraints have not thus far been distinguished for their position in the word, and as entailed by the Root-Controlled Accent hypothesis, these constraints are sensitive to the distinction between roots and affixes. Thus, Japanese, like all languages, has the constraint ranking given below.

(38) Root-Controlled Accent in Japanese

$$\text{PROS-FAITH}_{\text{Root}} >> \text{PROS-FAITH}_{\text{Affix}}$$

This ranking, which is an inherent ranking that does not need to be learned in Japanese, is responsible for the preference for realizing accent in stems over accent in suffixes. Thus, on a par with the same set of results in Cupeño and Russian, inherently accented suffixes lose their accent when they attach to accented stems, as in /yóm+tára/ → *yón-dara* 'if he reads', because PROS-$\text{FAITH}_{\text{Root}}$ is ranked above PROS-$\text{FAITH}_{\text{Affix}}$. The same inherent ranking predicts that inherent accent in stems will win out over inherent accent in prefixes, and this prediction is studied in detail in the final subsection of this case study.

The ranking given below summarizes the basic results established thus far in the analysis (the four lowest rankings constraints are in an unordered stratum).

(39) Japanese Word Accent (Interim Ranking)

ACCENT-TO-HEAD(σ)
|
PROS-FAITH$_{Root}$
|
PROS-FAITH$_{Affix}$
|
{ALIGN-R, ALIGN-L, NONFINALITY, HEADEDNESS(PrWd)}

With ACCENT-TO-HEAD(σ) ranked above the Prosodic Faithfulness constraints, lexical prominence will be limited to the first mora of a heavy syllable, the head mora of the syllable. The Prosodic Faithfulness constraints in turn dominate a set of Markedness constraints, which accounts for two kinds of accentual contrasts observed in the system. First, the contrast in the position of accent is derived by ranking PROS-FAITH above three constraints that require accent to appear at the left or right edge of the PrWd or in non-final positions. Second, the ranking of the Prosodic Faithfulness constraint DEP-PROM above HEADEDNESS(PrWd) accounts for the contrast between accented and unaccented words by banning the insertion of non-lexical prominence. An important empirical point is that this ranking pairs unaccented lexical words with unaccented surface forms, which will be crucial in the analysis of morphologically de-accented structures in chapter 5.

3.3.3 Analysis of Noun-Noun Compounds

An examination of noun-noun compounds in Japanese is essential for two reasons. First, it will enable us to establish some ranking relations that have not yet been established in the analysis of the basic facts given above. The analysis of compound accent, therefore, will clarify some important constraint rankings that will be needed in the characterization of default accentual patterns elsewhere in the system (investigated in detail in chapter 5). A second reason for studying compounds, which will become more apparent in the next subsection, is that many prefixes behave like the first member of a compound. Thus, a thorough account of prefix accent will first require an analysis of compound accent.

The accentuation of noun-noun compounds is a classical problem in Japanese phonology which has led to many contributions to the study of Japanese accent, including Martin 1952, Hirayama 1960, Chew 1964, McCawley 1968, Hiraguchi 1983, Poser 1984, 1990a, and Kubozono 1988 [1993], 1995, 1997. It is not possible to review all of this work here, nor is it desirable, as a thorough review would lead us too far afield. It is, however, necessary to be

clear on some empirical matters, which involve comparing two recent analyses, namely Poser 1990a and Kubozono 1995.

Excluding *dvandva* compounds from the picture, the description of noun-noun compounds involves determining a 'default' position for accent; this accentual default is sensitive to the prosodic size of the second member. Thus, if the second member is 'long', i.e., trimoraic or greater, then the default position for accent is the first syllable of the second member, as shown by the behavior of compounds in which neither member has an inherent accent, e.g., /me + kusuri/ → *me-gúsuri* 'eye wash'. On the other hand, when the second member is 'short' (two moras or less), then the characterization of the default position depends on certain assumptions about how to treat exceptions. Following Chew 1964, Poser 1990a describes two distinct default patterns in compounds with short second position nouns: (i) word-final accent in the first member (N_1) when the second member (N_2) is unaccented (with some exceptions), as in /kábuto + musi/ → *kabutó-musi* 'beetle', and (ii) unaccented compounds when the second member is accented on the final syllable, e.g., /garasu + tamá/ → *garasu-dama* 'glass bead'. Kubozono 1995 reduces this two-fold pattern to a single accentual default, namely default final accent in N_1, by assuming that compounds surfacing without an accent are exceptional and are treated on a par with other exceptions. I follow Kubozono's descriptive approach here because, as he shows quite convincingly, this approach enables a unification of certain generalizations about extrametrical elements. Let us first consider Kubozono's generalizations and see how this unification applies to particular examples.[18]

While Kubozono describes the default patterns in foot-based terms, it is possible to achieve the same descriptive insight without this construct, and this is the spirit in which the following generalization is formulated.

(40) Noun-Noun Compounds in Tokyo Japanese (after Kubozono 1995)

> If the second member of a noun-noun compound has an inherent accent on a syllable other than the final syllable, keep it. Otherwise, assign a default accent.

The difference between noun-noun compounds and nouns generally is therefore that compounds introduce a kind of final syllable extrametricality; and in cases where the second noun is unaccented (either lexically or through extrametricality), a special accentual principle applies. Employing the long versus short distinction mentioned above, this principle assigns accent to a default position, which is characterized as follows.

[18] While I follow Kubozono in admitting a set of exceptions to be accounted for in some other way, I will not go into them in detail here, as that would lead us too far from the focus of this section. But see Kubozono 1995 for some attractive proposals.

(41) Default Accent with Long and Short Distinction (cf. Poser 1990)

a. Default with long N_2: if $N_2 \geq \mu\mu\mu$, accent the first syllable of N_2.

b. Default with short N_2: if $N_2 \leq \mu\mu$, accent the last syllable of N_1.

Moving now to some examples, these generalizations give the correct results for compounds with a long second member, as illustrated below.

(42) Compounds with Long Second Member

a.	/oo + kámakiri/	→	oo-kámakiri	'big mantis'
	/yámato + nadésiko/	→	yamato-nadésiko	'Japanese lady'
	/nise + karakása/	→	nise-karakása	'paper umbrella'
b.	/ne + syoogatú/	→	ne-syóogatu	'lazy New Years holiday'
	/áisu + koohíi/	→	aisu-kóohii	'ice coffee'
	/minami + amerika/	→	minami-ámerika	'South America'

Starting with the examples in (42a), the accent of N_2 is non-final, and so it is preserved in the surface form. The examples in (42b), on the other hand, show the initial default pattern in words of this type. If N_2 has accent on the final syllable, as in the first two examples, it cannot be preserved because of final syllable extrametricality, and so these forms receive default initial accent. Lastly, if the second member is unaccented, it also receives initial accent, as shown with *minami-ámerika*.

Concerning compounds with a short second member, the same basic accentual principles are at work, but we find a different default pattern. Thus, if a non-initial syllable is accented, then this accent is preserved in the output, as shown below in (43a). If, however, N_2 has final syllable accent, or is unaccented, the resulting compound surfaces with final accent on the first member of the compound, a strikingly different pattern from the forms in (42) above.

(43) Compounds with Short Second Member

a.	/maikuro + básu/	→	maikuro-básu	'micro-, mini-bus'
	/faasuto + kísu/	→	faasuto-kísu	'first kiss'
b.	/témuzu + kawá/	→	temuzú-gawa	'Thames River'
	/míito + pái/	→	miitó-pai	'meat-pie'
	/kuwagáta + musi/	→	kuwagatá-musi	'stag bettle'
	/kensetu + syoo/	→	kensetú-syoo	'Ministry of Construction'

The importance of Kubozono's generalization (40) is therefore that it employs the principle of final syllable extrametricality across the board, that is, in all noun-noun compounds. This approach differs, therefore, from Poser's 1990a approach in which compounds with long N_2's are assumed to have an extrametrical foot, while short N_2's are not subject to an extrametricality requirement. Kubozono has thus clarified a pattern that applies to compounds with both long and short second members and also broadened the empirical coverage of the analysis to cases like /nise + karakása/ → *nise-karakása* (where Poser's analysis predicts default initial accent). A final point is that the generalization given in (40) is formally different than Kubozono's characterization of default accent, which essentially states that default accent falls on the non-final foot derived with a foot-parsing algorithm. The system used here is descriptively identical to Kubozono's, however, because it gives the same default for compounds with short and long second members. It differs only in the theoretical assumption that the default is derived in terms of feet.

To focus the following discussion, consider the following observations.

(44) Salient Observations in Noun-Noun Compounds

a. Final Syllable Extrametricality: the final syllable of the whole compound is ineligible for accent.

b. De-Accentuation of N_1: all initial members are treated as unaccented.

c. Prosodic Minimum on Accented Noun: a preference is given to positing accent on nouns larger than two moras.

d. Default-to-Opposite Edge: if the accent occurs in N_1, it is rightmost; if it occurs in N_2 (and N_2 is unaccented), it is leftmost.

The first two observations are rather straightforward, and it is clear how to proceed in analyzing them. Thus, following Kubozono 1995 (see also Poser 1990a), I will treat the extrametricality effects as the result of a NONFINALITY constraint (Prince & Smolensky 1993), though some additional assumptions are necessary to make the analysis consistent with the constraint system given in §3.3.2 (see below). As for the observation in (44b), morphological processes often correlate with the neutralization of an accentual contrast; indeed, there is abundant evidence in Japanese for such a morpho-accentual process. Therefore, in completing the picture here, it seems sensible to approach this pattern as a dominance effect induced by the morphological process of compounding, an idea which is originally due to McCawley 1968 I believe. The remaining observations are somewhat more subtle, but because they too have clear

precedents in the literature, the parallels found in other languages will suggest a clear line of analysis.

Starting first with (44c), the characterization of the default positions given above show a prosodic requirement on the accented noun: if it is suitably large, accent appears on the second member, but if N_2 does not meet the three mora threshold, accent falls on the first member. Prosodic minima of this kind are very common cross-linguistically, and the standard treatment of this observation is in terms of a binarity requirement on the prosodic structure of the word (McCarthy & Prince 1986 et seq., Hayes 1995, Itô & Mester 1992). Thus, one clear line of analysis is to posit a binarity requirement of some kind on the noun which receives the accent of the larger compound. This approach will require some additional consideration of the internal structure of compounds, essentially positing the binarity requirement on the prosodic head of the compound.

The next question is, once the correct noun has been accented, where does the accent fall? The answer to this question also seems to have clear parallels in other accent systems, as the default patterns for the first and second members show a clear pattern of default-to-opposite edge accent. Thus, if the first member is accented, accent falls on the final syllable. This pattern is in contrast to the accentuation of the second member, which receives initial accent by default (in cases where lexical accent is not preserved). I analyze this pattern in the same way as in other languages, modelling this effect in terms of constraint conflict between different Alignment constraints. To sum up the new ideas, I propose to use a binarity requirement on the head of the prosodic compound to describe the prosodic minimum on the accented element; once this contextually determined head is identified, the constraint rankings for default-to-opposite edge accent will take effect, explaining the conflicting edge effects.

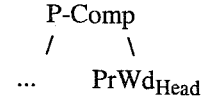
Starting first with the effect of final syllable extrametricality, there are two important differences between the behavior of accent in noun-noun compounds and nouns generally that need to be addressed. First, bare nouns may have final syllable accent, but compound nouns may not. Furthermore, as shown in the previous subsection, the default accentual pattern for nouns is to be unaccented, but with compounds, the default pattern is either word-initial accent (with long N_2) or word-final accent (with short N_2). These disparities in the inventory of possible accent patterns and the characterization of accentual defaults call for some new theoretical developments that I will now introduce.

The presence of an accentual contrast of the final syllable in non-compound nouns shows that NONFINALITY is dominated by the Prosodic Faithfulness constraints. This ranking, however, cannot be the same ranking which is responsible for the distribution of accent in compound nouns because in this context final accent is not possible. To deal with this restriction, I propose to relativize NONFINALITY to a different prosodic category for compounds than the one already in use for bare nouns, namely PrWd. Thus, I will employ a

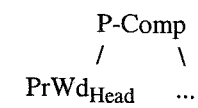
higher level prosodic category which I will provisionally call P-Comp, for prosodic compound (see Peperkamp 1997 and references therein). The prosodic words that dominate the segments of the nouns are thus grouped together under one P-Comp, as shown below.

(45) Proposed Structures for Compounds

a.



b.



As a prosodic category, P-Comp must have a head. While the best P-Comp is right-headed, meaning the structurally subordinate PrWd head is on the right as in (45a), it may also be left-headed (45b) under duress, i.e., when the second member does not meet the prosodic size requirement for heads. The constraint interaction that derives these results will be returned to below.

Returning to the matters at hand, the proposed structures for noun-noun compounds solve the two problems outlined above in one stroke. Thus, extrametricality effects observed only in compounds may be explained by relativizing NONFINALITY to P-Comp and ranking this constraint as shown below. With the relativized NONFINALITY$_{P\text{-}Comp}$ constraint ranked above the Prosodic Faithfulness constraints (46a), the effect is that accent may not appear in the final syllable of compounds, but may in nouns otherwise. Furthermore, it is natural to posit a head PrWd of P-Comp. Since it is a fundamental characteristic of headed structures is to have an accent, the constraint responsible for this accent-to-head tropism may be ranked above DEP-PROM to give the required accent in compound nouns (46b).

(46) Final Syllable Extrametricality Effects

a. NONFINALITY$_{P\text{-}Comp}$ >> PROS-FAITH: preserve the accent of N_2, unless it appears in the final syllable of the compound.

b. ACCENT-TO-HEAD(P-Comp) >> DEP-PROM: the head of the compound must have an accent.

The following two tableaux illustrate the results of these rankings. Starting with (46a), because NONFINALITY$_{P\text{-}Comp}$ dominates the Prosodic Faithfulness constraints, final syllable accent is not allowed in this construction, as illustrated below. Accent in the second member is preserved if the satisfaction of Faithfulness does not lead to a violation of NONFINALITY$_{P\text{-}Comp}$,

as in the input-output pairs in (47a) and (47b). On the other hand, if satisfaction of PROS-FAITH leads to violation of NONFINALITY$_{P\text{-}Comp}$, a default pattern is assigned, as in (47c) and (47d).

(47) Final Syllable Extrametricality Effects

	Input		Output	NONFIN$_{P\text{-}Cmp}$	PR-FAITH
a.	/yámato + nadésiko/	→	yamato-nadési⟨ko⟩		
			*yamato-nádesi⟨ko⟩		*!
b.	/nise + karakása/	→	nise-karaká⟨sa⟩		
			*nise-káraka⟨sa⟩		*!
c.	/ne + syoogatú/	→	ne-syóoga⟨tu⟩		*
			*ne-syooga⟨tú⟩	*!	
d.	/áisu + koohíi/	→	aisu-kóo⟨hii⟩		*
			*aisu-koo⟨híi⟩	*!	

The second ranking in (46) describes the fact that compounds are, as a rule, always accented. Thus, by ranking ACCENT-TO-HEAD(P-Comp) above DEP-PROM, the PrWd head of the P-Comp must have an accent, as shown below. (The head of the P-Comp is underlined.)

(48) Obligatory Accent Insertion in Compounds

/minami + amerika/	ACCENT-TO-HEAD(P-Comp)	DEP-PROM
→ minami-<u>á</u>merika		*
minami-<u>a</u>merika	*!	

To summarize, the typical pattern for compounds is for them to be accented. This behavior differs from that of bare nouns, which are unaccented in some contexts because DEP-PROM dominates ACCENT-TO-HEAD(PrWd). Furthermore, noun-noun compounds differ from nouns in general because they are subject to final syllable extrametricality. This fact requires the domination of the PROS-FAITH constraints by the NONFINALITY constraint specific to compounds.

Moving next to the problem of the distinct default positions for accent, as alluded to above, I propose to treat this fact by assuming that long and short compounds are prosodized differently, and as a result, these different prosodic structures yield two distinct defaults. The structural differences stem from a contextually determined position for the head PrWd, which is derived by the following prosodic well-formedness constraint.

(49) WORD-BIN$_{Head}$ (after Itô & Mester 1992)
The head PrWd of the prosodic compound must be binary; in effect, the PrWd prosodic head must be at least trimoraic.

Like the prosodic foot, the prosodic word subordinate to P-Comp is subject to a binarity requirement, essentially requiring a branching structure at the level directly below the prosodic word. The effect of this constraint, when applied to the head PrWd, is that this prosodic head must either consist of a pair of feet, or a foot plus a syllable, giving the effect that the head can be no less than trimoraic (assuming that feet must be binary as well). The constraint WORD-BINARITY$_{Head}$ can therefore be employed in explaining the distinction between short and long N_2's: the three mora minimum needed to satisfy this constraint is exactly on a par with the requirement for the second member to be 'long'. By ranking the Word Binarity constraint relative to another constraint, ALIGN-R-HEAD, the contextually determined headedness effect mentioned above can be straightforwardly derived. Thus, the force of ALIGN-R-HEAD is that the PrWd head of the compound would like to be the second member, which gives N_2 as the head when N_2 is big enough, i.e., three moras or more, as in (50a). When N_2 is less than trimoraic, however, it cannot be the head PrWd because of high-ranking WORD-BINARITY$_{Head}$. As a result, a marked non-final head is chosen, as illustrated in (50b).[19]

(50) Headedness in Noun-Noun Compounds

a. Long Second Member
[... [μμμ ...]$_{Hd}$]

b. Short Second Member
[[...]$_{Hd}$ μ(μ)]

This proposal is illustrated with the constraint interaction depicted in the following tableau.

[19]Concerning the prosodic analysis of compounds with sub-minimal nouns, there are at least two options: (i) they can be directly associated with the P-Comp, or (ii) they can be grouped into a separate PrWd which is in turn dominated by P-Comp. As I do not know of any empirical evidence that can decide between these two analyses, I leave both options open.

(51) Long/Short Distinction via Word Binarity

Input	Output	WORD-BIN$_{Hd}$	ALIGN-R-HD
a. /yámato + nadésiko/	→ [yamato-[nadesiko]]		
	*[[yamato]-nadesiko]		*!
b. /míito + pái/	→ [[miito]-pai]		*
	*[miito-[pai]]	*!	

When both the first and second member of a compound are suitably binary, the grammar chooses in favor of a rightmost PrWd head, as shown by the input-output mappings in (51a). But when the preferred PrWd is not large enough, a marked position for the head is chosen, as in (51b).

With these assumptions in place, we are in a position to explain the two default positions for accent in compounds in terms of a phenomenon that has clear parallels in other languages, namely default-to-opposite edge tropism. The analysis unfolds as follows. Accent must be a property of the PrWd head by ACCENT-TO-HEAD(P-Comp), and so when N_2 is long, N_2 must be accented in order to satisfy this constraint. When N_2 is short, on the other hand, N_1 is the head, and so it must be accented. Thus, as illustrated below, by assuming that the default position for accent is at the right edge of the PrWd, in compounds with a short N_2, the accent will be rightmost in the head PrWd by default (52a). In compounds with long N_2's, however, N_2 is the head, and so accent is assigned to the second member. But in just this context, accent cannot fall on the final syllable because the final syllable is extrametical. Accent cannot be rightmost, so it defaults to the left edge (52b).

(52) Divergent Accentual Defaults as Default-to-Opposite

a. Rightmost Accent with Short N_2 b. Leftmost Accent with Long N_2

↓ ↓

[[σ ... σ] + μ(μ)] [... + [σ ... ⟨σ⟩]]

Let us formalize these ideas with some constraint rankings. Following Baković 1998, I assume that default-to-opposite edge accent follows as a consequence of the domination of one Alignment constraint, which in turn activates a lower-ranking Alignment constraint (see also Samek-Lodovici 1998 and Nelson 1998 for related results and Kenstowicz 1995b and Zoll 1997 on the role of conflicting Alignment constraints in default-to-opposite stress). In

particular, the rankings required for 'default rightmost accent, otherwise, leftmost accent', are given below.

(53) Default-to-Edge Accent in Japanese Compounds

NONFINALITY$_{P\text{-}Comp}$ >> ALIGN-R(PM, PrWd) >> ALIGN-L(PM, PrWd)

Before demonstrating this result, however, it is necessary to account for the absence of an accentual contrast in the first member. That is, in contrast to N_2, compounding generally suppresses the lexical accents of N_1, in effect making all first members unaccented. Following McCawley 1968 and Kurata 1984, I analyze this as a dominance effect, i.e., a deletion of accent that is triggered by the application of the morphological process itself. As this kind of morpho-accentual process is the topic of a discussion in chapter 5, I will not go into the details of the analysis here, except to say that there is a rankable constraint, DE-ACCENT-N_1, which causes de-accentuation of the first member of a compound because it is ranked above the Prosodic Faithfulness constraints.

(54) Dominance Effect in First Member

DE-ACCENT-N_1 >> PROS-FAITH

Now that all of the ranking arguments have been established, I will demonstrate the results of this system with a series of tableaux. Starting first with compounds that have short N_2's, as shown in the tableau below, when the first member is unaccented, the expected pattern is the observed one, namely rightmost accent in the word (55b). Putting accent on the final syllable of the whole compound, a different rightmost accent, results in a violation of both ACCENT-TO-HEAD(P-Comp) and NONFINALITY$_{P\text{-}Comp}$, and so this option is ruled out (55a). Furthermore, initial accent in N_1 is also marked because it results in a violation of ALIGN-R, which is ranked above ALIGN-L, and so this candidate is eliminated as well (55c).

(55) Rightmost Default with Short Second Member (N_1 is Unaccented.)

/kensetu + syoo/	ACCENT-TO-HD	NONFIN	ALIGN-R	ALIGN-L
a. [[kensetu]-syóo]	*!	*		
b. → [[kensetú]-syoo]				*
c. [[kénsetu]-syoo]			*!	

Rightmost accent in N_1 is also predicted if this noun is accented on a non-final syllable because it will be de-accented by the constraint ranking given in (54),

but to compare the compound structures above with some related compounds with accented N_2's, I return to this result below.

Moving next to compounds with long second members, when such an N_2 has final syllable accent, rather than being faithful to this lexical accent, which would violate high-ranking NONFINALITY$_{P\text{-}Comp}$ (56a), an initial accent is posited, because this candidate fares better on the low-ranking constraint ALIGN-L (56c). Importantly, I assume that violations of the Alignment constraints here are interpreted categorically (see Zoll 1996a for motivation and discussion), and thus, a close-to-rightmost accent, as in candidate (56b), is not good enough. Finally, ALIGN-R cannot be satisfied here by positing an accent in the first member, as in (56d), because this option puts accent on a non-head, which violates ACCENT-TO-HEAD(P-Comp).

(56) Leftmost Default with Long Second Member (N_2 is Accented.)

/ne + syoogatú/	ACCENT-TO-HD	NONFIN	ALIGN-R	ALIGN-L
a. ne-syooga⟨tú⟩		*!		*
b. ne-syoogá⟨tu⟩			*	*!
c. → ne-syóoga⟨tu⟩			*	
d. né-syooga⟨tu⟩	*!			

Thus, while the language on a whole prefers rightmost accent, in compounds with a final head, the extrameticality requirement triggers a default-to-opposite edge effect. Significantly, this result holds regardless of whether the final syllable is inherently accented or not: compounds with unaccented second members also receive default initial accent, as the following tableau shows.

(57) Leftmost Default with Long Second Member (N_2 is Unaccented.)

/minami + amerika/	ACCENT-TO-HD	NONFIN	ALIGN-R	ALIGN-L
a. minami-ameriká		*!		*
b. minami-ameríka			*	**!
c. → minami-ámerika			*	
d. minamí-amerika	*!			

Consistent with the above results, accent is assigned to the head PrWd, hence ruling out (57d). And since ALIGN-R cannot be satisfied because of final syllable extrametricality, the winner is the form with initial accent on the head prosodic word because this candidate does best on ALIGN-L.

The same principles of default edge effects are predicted in structures that are de-accented, as with compounds that have accented N_1's (and short N_1's, which trigger the non-standard left-headed structure). Thus, when the non-final accent of N_1 is deleted, ruling out fully faithful accentuation (58a), the resulting pattern is default right-aligned accent (58b), as observed above with lexically unaccented N_1's.

(58) Dominance Effect in First Member

/kuwagáta + musi/	DE-ACCENT-N_1	PROS-FAITH	ALIGN-R	ALIGN-L
a. kuwagáta-musi	*!			
b. kúwagata-musi		*	*!	
c. → kuwagatá-musi		*		*

This result is in fact consistent with a general prediction made in chapter 5, namely that morphologically triggered de-accentuation of this kind always brings about a default pattern of accent. De-accentuation in compounds is thus consistent with this prediction because it causes default right-aligned accent.

A final puzzle to be dealt with is the Faithfulness effect in compounds like the following: /maikuro + básu/ → *maikuro-bá⟨su⟩*. Such cases have a short second member, and so the first noun is the head of the prosodic compound. Given the ranking of ACCENT-TO-HEAD(P-Comp) over Prosodic Faithfulness, the system currently predicts that accent should fall somewhere in the first member, since it is the head PrWd. This case can be straightforwardly accounted for, however, if we employ the distinction used throughout this thesis, namely the one between the anti-deletion constraint, MAX-PROM, and the anti-insertion constraint, DEP-PROM. Specifically, the desired result can be achieved by ranking these two constraints as shown below.

(59) Evidence for the Distinction between MAX-PROM and DEP-PROM

/maikuro + básu/	MAX-PROM	ACCENT-TO-HD	DEP-PROM
a. → maikuro-bá⟨su⟩		*	
b. maikuró-ba⟨su⟩	*!		*

Walking through the above candidate set, the loser is out because it fails to realize the inherent accent in *básu* and the constraint governing the realization of inherent accent, MAX-PROM, is ranked above ACCENT-TO-HEAD(P-Comp). The winner therefore is the form that has an accent outside of the head PrWd as a means of satisfying this high-ranking Faithfulness constraint. Crucially, this Faithfulness effect only holds with inherent accent in the second member of a compound, as lexical accents in the first member are wiped out by DE-ACCENT-

N_1. Because of this last ranking, inherent accent in the first member is not realized when N_2 is long, which accords with the observed facts.

To summarize the above constraint rankings, I have argued for the following partial ordering of constraints.

(60) Summary Rankings for Noun-Noun Compounds

```
NONFINALITY_P-Comp, DE-ACCENT-N1          WORD-BINARITY_Head
        \          /                            |
{MAX-PROM, NO-FLOP-PROM}                   ALIGN-R-HEAD
        |        /
ACCENT-TO-HEAD(P-Comp)
        |
DEP-PROM
        |
ALIGN-R(PROM, PrWd)
        |
ALIGN-L(PROM, PrWd)
```

The second column, with the Word Binarity constraint top-ranked, accounts for the position of the head in the prosodic compound, which was shown to be sensitive to the size of the second member. This context-sensitive headedness effect in turn leads to the analysis of the divergent default patterns in terms of default-to-opposite accent. Because ALIGN-R dominates ALIGN-L, as shown in the first column, the accentual default in compounds with initial heads is rightmost in the word. But when the head is final in the word, ALIGN-R cannot be fully satisfied, and so the lower-ranking Alignment constraint, ALIGN-L, takes effect, giving leftmost accent in the word. The remaining rankings dealt with some further peculiarities of the compound accent rule. For example, the high-ranking constraint DE-ACCENT-N_1, accounts for the neutralization of accentual contrast in the first member, which appears to be a necessary stipulation. Finally, the ranking of ACCENT-TO-HEAD(P-Comp) between the two Faithfulness constraints is needed to account for the fact that accent insertion is a possible means of satisfying the imperative to put accent in the head PrWd, while deletion of inherent accent (in the second noun) is not.

Before moving on to examine prefixing structures, it is worth mentioning some of the advantages of the analysis proposed here. First, this analysis handles a complex set of phenomena with arguably universal constraints. Thus, many of the basic ideas used here, e.g., word binarity, default-to-opposite, and dominance effects, have clear parallels in other systems, and I relate the components of Japanese compound accent to these other phenomena by using the same, or formally related, well-formedness constraints. The analysis therefore differs from the one offered in Kubozono 1995 which treats

the two default patterns in terms of a non-standard interpretation of Alignment constraints.

The second important advantage of the analysis proposed here is that it clarifies the constraint rankings that characterize the accentual defaults elsewhere in the language. Thus, in addition to the accentual default observed above in underived words, i.e., unaccented structures, there are two additional defaults which crop up in different corners of Japanese morpho-phonology.

(61) Accentual Defaults Elsewhere in Japanese (cf. Poser 1984)

a. Default Structure 1: unaccented words, pattern resulting from dominant unaccented affixes, main pattern of exceptions in compounds

b. Default Structure 2: rightmost accent, as in first member of noun-noun compounds, the position to which accent is shifted in word with accent-shifting suffixes, many deverbal nouns, (ante-) penultimate accent in loans, verbs, adjectives

c. Default Structure 3: leftmost accent, as in second member of compounds, some deverbal nouns, and some loans

As we will see in chapter 5, the default rightmost/leftmost accent is also important in the outcome of certain accent shifts triggered by suffixation, which falls out from the constraint rankings given here because the suffixed structures are compound-like. Thus, when the accent falls on the first member, the accent is rightmost in the PrWd, but when it occurs on the second member, it is leftmost, exactly as we have seen above in noun-noun compounds. Deverbal nouns also support the right edge default pattern here, as this is the main pattern when an accented verb is changed to a noun, e.g., *hirakí* 'opening, closet', cf. *hiráku* 'open'. Deverbal nouns formed from accented verbs may also have initial accent, perhaps showing variation in the application of NONFINALITY(σ) in these cases. Thus, if ALIGN-R dominates ALIGN-L, and the accentuation of the verb must change (a typical affix-controlled process) then the prediction is that the accent of the verb base will gravitate to the right edge of the word in forming a noun. Or, if this is not possible because of NONFINALITY(σ), then accent defaults to the left edge of the word. Clearly these sketches do not cover all the morpho-accentual processes in Japanese, but the characterizations of the different defaults deriving from the analysis of compounds given here do seem helpful in accounting for other morpho-accentual processes, and are therefore worth pursuing further.[20]

[20]One interesting problem which is not straightforwardly predicted here is the pattern of pre-antepenultimate accent in loans ending in either LLH or HLH (L = light, H

3.3.4 Influences of Prefixation on Word Accent[21]

Now that an analysis of compound accent has been proposed, some further implications of the Root-Controlled Accent hypothesis can be examined in more detail. In particular, the accentual behavior of prefixes will be studied, as the interaction between prefixes and the bases to which they attach is directly relevant for the RCA hypothesis. The basic empirical finding here is that prefixes in Japanese may be sorted into three well-defined classes with respect to their accentual behavior: (i) prefixes that behave like the first member of a compound, (ii) dominant post-accenting prefixes that delete the accent of the base and bring about stem-initial accent, and (iii) so-called 'Aoyagi prefixes' which induce a prosodic organization of the word such that it has two minor phrases. I will show in this subsection that the behavior of these prefix classes is consistent with the RCA hypothesis, and thus, that this restrictive hypothesis may be maintained.

At first blush, there seem to be a few examples that provide direct evidence against the RCA hypothesis. Thus, there are some examples that show that prefixation leads to the deletion of the accent of the stem, e.g., *sín-getsu* 'new moon' and *kó-bari* 'little needle', cf. *-gétsu* 'moon' and *hári* 'needle'. This deletion of the stem accent could be accounted for by assuming *ko-* is inherently accented: if this prefix is accented, the loss of accent on the stem can be explained by the same pattern of edge orientation observed in minor phrases, namely the 'leftmost inherent accent wins'. If this analysis is the correct one, then it constitutes a clear counter-example to the Root-Controlled Accent hypothesis, which states that edge effects such as these are restricted to contexts where Faithfulness is not relevant. Faithfulness is surely relevant here because this prefix-stem sequence provides a situation of constraint conflict between Root and Affix Faithfulness, on a par with the analysis of these same sequences in Cupeño.

The analysis that uses a principle of leftward edge orientation, however, is almost certainly incorrect for these examples, and many others like them. As I will argue directly below, an analysis based on the theory of compound accent presented above is superior in several ways. Thus, the words that have the

= heavy), a pattern which is uncovered and analyzed in Katayama 1995, 1998. The problem here is how to account for the variation between pre-antepenultimate, as in *herikóputaa* 'helicopter' and antepenultimate, as in *bitámiN* 'vitamin'. Katayama argues that this variation requires a gradient Alignment constraint for the ante-penultimate pattern, which is in different from the analysis of noun-noun compounds here because it relies on a categorical interpretation of Alignment violations.

[21]The examples presented in this section come from various Japanese dictionaries, namely Masuda 1974, NHK 1985, and Akinage 1981, and have been checked with at least two native speakers of Tokyo Japanese.

prefixes *sin-* and *ko-* behave exactly like compounds, according to an independently testable set of criteria. Therefore, the analysis in terms of compound accent is more explanatory than the alternative sketched above because it unifies this cluster of properties in a cogent analysis.

Before we can study the accentuation of prefixes, however, we require a set of criteria for diagnosing compounds. The following list is based on the criteria given in Otsu 1980 and Poser 1984, 1990a, modified to account for the new empirical generalizations clarified in Kubozono 1995.

(62) Properties of Noun-Noun Compounds

a. Semantic modification or complementation (MOD)

b. Rendaku Voicing (REND)

c. Distinction between short and long second members (S≠L)

d. Final syllable extrametricality (⟨σ⟩#)

e. Medial accent in N_2 (...σ σ́ σ...)

Noun-Noun compounds, ignoring *dvandva* compounds, involve the semantic modification or complementation of one member, distinguishing compounding from other types of morphological rules. This test is of course not a two-sided test, as non-compounds may also involve semantic modification, but I mention it here because this diagnostic correlates reasonably well with other test results. A second, more reliable test, is the existence of Rendaku voicing, i.e., the voicing of the first obstruent of the second member of the compound. I know of no other morphological rules that induce this pattern of obstruent voicing, so Rendaku is a very good test of the status of a derived form as a compound. Third, as exemplified in the above discussion, compounds are sensitive to the short/long distinction in the second position noun, and so differences in the accentual patterns dependent on this size distinction also provide a nice diagnostic for compoundhood. Compounds are also distinguished from (some) non-compounds by final syllable extrametricality effects, and so this feature constitutes a fourth test for the status of a form as a compound. To clarify the diagnostic pattern of this test, if the second member of a compound has final syllable accent that defaults to initial accent, then the compound shows extrametricality effects of the right type. A final criterion for compounds, which will be shown to distinguish compounding from simply the attachment of a dominant suffix, is the existence of an accentual prominence on a medial syllable in the second member. Thus, if N_2 has accent on a non-final, non-initial syllable, we cannot say that a prefix attached to this N_2 is accent-deleting, as is observed in dominant, post-accenting prefixes like *ma-* 'true' (examples given below), because this inherent accent would be lost in a word-medial position. With these

tests in hand, I will now show how many productive prefixes in Japanese clearly behave like compounds.

Starting with the prefix *sin-* 'new', consider the following data with the set of tests presented above in mind. The examples presented below, and throughout this discussion, are sorted by the accentual properties and prosodic size of the second member, as this organization is most revealing for our concerns. Specifically, compounds formed with an unaccented N_2 are opposed to compounds with accented N_2's, i.e., (a) and (c), versus the (b) and (d) examples. Also, compounds formed with short N_2's, the (a) and (b) examples, are contrasted with forms that have long second members, i.e., the (c) and (d) forms.

(63) Examples with *sin-* as the First Member of a Compound

a.	kao	sin-gao	'face'	(-acc, short N_2)
	kyoku	sin-kyoku	'song, music'	
	gara	sin-gara	'pattern'	
	iri	sin-iri	'enter, come'	
	-syo	sin-syo	'book'	
	kabu	sín-kabu	'stock'	
b.	án	sin-an	'idea'	(+acc, short N_2)
	géki	sin-geki	'play'	
	mé	sin-me	'bud'	
	katá	sin-gata	'style'	
	-gétu	sín-getu	'moon'	
	-nén	sín-nen	'year'	
	-réki	sin-reki	'year'	
c	kabuki	sin-kábuki	*'kabuki'*	(-acc, long N_2)
	kansen	sin-kánsen	*'kansen'*	
	keikoo	sin-kéikoo	'tendency'	
	kenzai	sin-kénzai	'material'	
	gakki	sin-gákki	'semester'	
	kiroku	sin-kíroku	'record'	
	zidai	sin-zídai	'time, period'	
	seikatu	sin-séikatu	'life'	
	tairiku	sin-táiriku	'continent'	
	hakken	sin-hákken	'discovery'	
	hatumei	sin-hátumei	'invention'	
	hossoku	sin-hóssoku	'start'	
	kufuu	sin-kúfuu	'device, gadget'	

d.	kénpoo	sin-kénpoo	'constitution'	(+acc, long N_2)
	zítai	sin-zítai	'situation'	
	syotái	sin-zyótai	'household'	
	séido	sin-séido	'regulation'	
	séifu	sin-séifu	'government'	
	kanazúkai	sin-kanazúkai	'kana usage'	
	yasúne, yasune	sin-yasúne	'low (finance)'	
	tísiki	sin-tísiki	'knowledge'	
	hikúne	sin-hikúne	'low (finance)'	
	takáne	sin-takáne	'high (finance)'	
	kígen	sin-kígen	'epoch'	
	kotengákuha	sin-kotengákuha	'(Neo-)Classical School'	

The finding here is that these forms pass all the tests for compounds. Thus, *sin-* clearly modifies the second member in a way that is consistent with other compounds. For example, the attachment of *sin-* to *kao* only changes the meaning of *kao* in that the resulting word *sin-gao* refers to those faces that are new. Furthermore, there are some examples showing Rendaku voicing, as in *sin-gao*, *sín-basi* in (63a), and an example from (63d), *sin-zyótai*. It is important to note here the existence of forms where Rendaku is not observed, but predicted on a purely phonological basis, e.g., *sin-kéikoo* in (63c), does not confound this result because Rendaku is actually not predicted here. As noted in Itô & Mester 1986, Rendaku is only observed in compounds formed with components from the Yamato stock, and so cases like these do not tell us anything, as *-keikoo* is a Sino-Japanese stem. The existence of native stems that undergo Rendaku, however, is revealing because they are only consistent with an analysis as the second member of a compound.

Moving now to the tests that assess accentual features, *sin-* passes all of these tests too. Hence, by comparing the forms in (63a) and (63b) with those in (63c) and (63d), one observes a clear contrast in the accentual patterns which is dependent on the short/long distinction: the compounds with short N_2's are either unaccented or have accent on the prefix, whereas the forms with long second members always have a non-final accent on N_2. Furthermore, these patterns are clearly consistent with a treatment in terms of the accentual defaults observed above in compounds. The forms with short N_2's have a default word-final accent in N_1, or no accent at all, which is also an independently observed pattern with compounds of this type. In the forms with long second members, on the other hand, the default position is clearly the initial syllable of N_2, as shown by the examples in (63c) with unaccented bases and one form in (63d), which has final accent on the base but initial accent in the compound, e.g., *sin-zyótai* from *syotái*. This last fact is evidence for final syllable extrametricality, the fourth test for compounds. Finally, it is clear that *sin-* is not simply a dominant prefix, which would destroy the inherent accent of the second word, as

there are several examples in (63d) with a non-initial accent in both the base and the derived form, e.g., *sin-takáne* from *takáne*. If *sin-* was a dominant prefix, we would expect either accent on the prefix if the prefix itself was accented, or accent on the initial syllable if it were dominant, post-accenting. However, neither of these patterns are observed, and so it is clear that *sin-* behaves like the first member of a compound.

Many of the features of compounds, like those found in words with *sin-*, overlap with words formed with dominant post-accenting prefixes, so it is worthwhile contrasting what appears to be a case of the latter with the *sin-* words from above, in an effort to tease these two patterns apart. Consider the data below for the prefix *ma-* 'true', which is argued in Poser 1984 to be a dominant (i.e., accent-deleting), post-accenting prefix.

(64) Dominant Post-accenting *ma-* (examples from Poser 1984: 57, with some additions)

a.	kura	'darkness'	ma-kkúra	'total darkness'	(-acc, short)
	ura	'back'	ma-ura	'right in back'	
	saki	'front'	ma-ssáki, ma-ssakí	'foremost'	
	siro	'white'	ma-ssíro	'snow white'	
	maru	'circle'	ma-mmaru, má-mmaru	'a perfect circle'	
	ue	'top'	ma-ué	'right on top'	
	yoko	'side, flank'	ma-yoko	'just beside, abeam'	
b.	áka	'red'	ma-kká	'deep red'	(+acc, short)
	kúro	'black'	ma-kkúro	'pitch black'	
	fuyú	'winter'	ma-fuyu	'dead of winter'	
	náka	'center, box'	ma-nnaka	'dead center, box'	
	kita, kitá	'north'	ma-kitá	'due north'	
	áo	'red'	ma-ssáo	'deep red'	
	máe	'front'	ma-mmáe	'right in front'	
	súgu	'at once'	ma-ssúgu	'straight ahead'	
	hirú	'noon'	ma-hiru	'high noon'	
c.	futatu	'two'	ma-ppútatu, -futátu	'exactly half'	(-acc, long)
	hadaka, hadáka	'naked'	ma-ppádaka	'stark naked'	
	hiruma	'noon'	ma-ppíruma	'high noon'	
	minami	'south'	ma-mínami	'due south'	
	mukai	'opposite'	ma-múkai	'directly opposite'	
	mukoo	'opposite'	ma-múkoo	'directly opposite'	
	sakari	'zenith'	ma-ssákari	'in full bloom'	
	sakasama	'head over heels'	ma-ssákasama	'topsy-turvy'	

d.	sikakú	'rectangle'	ma-ssikáku, -ssíkaku, -sikáku, -síkaku	'perfect square' (+acc, long)
	syoozíki, syoozikí	'honesty'	ma-ssyóoziki	'downright honesty'
	syooméN	'front'	ma-ssyóomeN, ma-syooméN	'straight ahead'
	yonaká	'midnight'	ma-yónaka	'dead of night'
	kokóro	'heart'	ma-gókoro	'sincerity'
	tadánaka, tadanaka	'in the middle'	ma-ttádanaka	'right in the middle'
	atarasíi	'new'	ma-atarasíi	'truly new'
	itimónzi	'straight line'	ma-itimónzi	'in a straight/direct line'

First off, the absence of any examples showing Rendaku voicing is suggestive that these words are not compounds. Furthermore, several examples have accent on the final syllable, e.g., *ma-kitá* in (64b) and *ma-atarasíi* in (64d), which is another clue that these cannot be compounds because compounds are subject to final syllable extrametricality. This last fact is also not consistent with *ma-* as a dominant post-accenting morpheme, as the analysis predicts stem-initial accent across the board, but as noted by Poser, there are some exceptions that show that this prefix vacillates between being recessive or dominant. Finally, there is one form in (64d), namely *ma-gókoro* from *kokóro*, which shows deletion of a medial accent, that is only consistent with an analysis in terms of a dominant prefix, a conclusive piece of evidence. Together with the other body of facts, this fact shows that words with *ma-* are not compounds, but rather the result of dominant post-accentuation.

Much of the discussion that follows provides further evidence for the type of prefixes exemplified above with *sin-*; the reader more directly interested in the argument for the RCA hypothesis may press on to the chart below in (69) which summarizes this evidence.

Two additional prefixes that exhibit precisely the accentual behavior observed in compounds are the diminutive prefix *ko-* and the augmentative prefix *oo-*. Both cases involve simple modification of the base to which they attach, and as can be seen from the examples in (65) and (66) below, both cases of prefixation correlate with instances of Rendaku voicing. Moreover, both *ko-* and *oo-* correlate with the accentual alternations predicted by the principles of compound accent. Starting first with *ko-*, there is a clear contrast between the forms with a short second member (65a-b) and those with a long second member (65c-d). The former cases have the defaults characteristic of this type of compound, namely final accent in the first component or they are unaccented.[22] In contrast, the (65c-d) forms show the accentual patterns characteristic of their

[22]This is the main exceptional pattern in words with short second members. Though not treated in the previous section, this outcome is not unexpected given the role of DEP-PROM in yielding unaccented words.

type, i.e., faithfulness to the lexical accent, unless the form is unaccented or accented on the final syllable, in which case you get initial accent in the second member.

(65) Examples with *ko-* as First Member of Compound

a.	hati	kó-bati	'bowl'	(-acc, short N_2)
	kabu	kó-kabu, ko-kabu	'radish'	
	hako	kó-bako	'box'	
	age	ko-age	'unloading /dockhand'	
	eda	ko-eda	'twig'	
	sika	ko-zika	'deer/fawn'	
	sima	ko-zima	'island'	
	nami	ko-nami	'wave'	
b.	áyu	ko-ayu	'sweetfish'	(+acc, short N_2)
	áza	ko-aza	'(sub)section of village'	
	té	ko-te, kó-te	'hand'	
	isí	ko-isi	'rock'	
	imó	ko-imo	'potato'	
	kikú	ko-giku	'mum'	
	báka	ko-baka	'look down on'	
	hán	kó-ban	'stamp/small oval gold coin'	
	hári	kó-bari	'needle'	
	táti	kó-dati	'sword'	
	áme	ko-same	'rain'	
c.	atari	ko-átari	'hit/beat around the bush'	(-acc, long N_2)
	hanasi	ko-bánasi	'story'	
	hasira	ko-básira	'pillar'	
	saiku	ko-záiku	'workmanship'	
	temari	ko-démari	'hand ball/spirea'	
	doogu	ko-dóogu	'stage props'	
	eguri	ko-éguri	'scooping/cavetto'	
	kasira	ko-gásira	'(sub-)foreman'	
	katana	ko-gátana	'knife'	
	kitte	ko-gítte	'postal stamp/check'	
	kizami	ko-kízami	'chopping'	
	mawari	ko-máwari	'turn'	
	modosi	ko-módosi	'recovery'	
	musubi	ko-músubi	'closing/3rd ranking *sumo*'	
	musume	ko-músume	'girl'	
	segare	ko-ségare	'son'	

d.	akínai	ko-ákinai, -akínai	'retail business'	(+acc, long N_2)
	bóozu	ko-bóozu	'bonze'	
	hyaku-shóo	ko-byáku-shoo	'farmer'	
	takái	ko-dakái	'high'	
	kárei	ko-gárei	'dap, plaice'	
	génso	ko-génso	'(daughter) element'	
	hítuji, hitúzi	ko-hitúzi	'lamb, hogling'	
	zyóoki	ko-zyóoki	'steam (launch)'	
	nímotu	ko-nímotu	'parcel'	
	nínzuu	ko-nínzuu	'people'	
	tutumí	ko-zútumi	'package'	
	tuzumí	ko-túzumi	'type of drum'	

Likewise, words formed with *oo-* show the accentual patterns found in compounds, though there are a few exceptions. Thus, while words with long N_2's clearly have the predicted accentual default, as shown in (66c) and forms like *oo-átama* in (66d), the pattern is less transparent in forms with short second members. For example, a few forms in (65a) have initial accent on N_2, despite the fact that they are unaccented, and should therefore either be unaccented or have accent on *oo-*. In sum, while the distinction is not perfect, there is a clear contrast between short and long second position nouns here, and this conclusion is consistent with the other facts, pointing in the direction that *oo-* is the first member of a compound in these forms.

(66) Examples with *oo-* as First Member of Compound

a.	kaze	oo-káze	'wind'	(-acc, short N_2)
	azi	oo-azi	'insipid (taste)'	
	atu-atu	oo-átu-atu	'in love/deeply in love'	
	mozi	oo-mozi	'letter/capital letter'	
b.	áme	oo-áme	'rain'	(+acc, short N_2)
	áse	oo-áse	'sweat'	
	aná	oo-ana	'hole'	
	asi	óo-asi, oo-asi	'foot'	
	húne	oo-bune	'ship'	
	kóe	oo-góe	'voice/loud voice'	
	hári	oo-hari	'needle'	
	hasí	óo-hasi	'bridge/large bridge'	
	íki	oo-iki	'breath/deep sigh'	
	matá	oo-mata	'long stride'	
	kído	oo-kído	'gate (of town)'	
	mesí	óo-mesi	'meal/hearty meal'	
	monó	oo-mono	'man/great man'	

	túbu	oo-tubu	'drop'	
	uké	oo-uke	'success'	
c.	akubi	oo-ákubi	'yawn'	
	atari	oo-átari	'hit'	
	hurosiki	oo-búrosiki	'*furoshiki*'	(-acc, long N_2)
	tigai	oo-tígai	'difference'	
	harai	oo-hárai	'purification'	
	hazure	oo-házure	'failure'	
	sikake	oo-jíkake	'device'	
	matsuri	oo-mátsuri	'festival'	
	mawari	oo-máwari	'detour'	
	midasi	oo-mídasi	'headline'	
	mikurai	oo-mikurai	'(Imperial) throne'	
	sooji	oo-sóoji	'house cleaning'	
	tatimawari	oo-tátimawari	'tumble/rough tumble'	
	tokage	oo-tókage	'lizard'	
	yasuuri	oo-yásuuri	'bargain'	
d.	arasi	oo-árasi	'storm'	(+acc, long N_2)
	atamá	oo-átama	'head'	
	toorí	oo-dóori	'street/main street'	
	hánabi	oo-hánagi	'fireworks'	
	híroma	oo-híroma	'hall'	
	ibiki	oo-íbiki	'snore'	
	medamá	oo-médama	'eye'	
	mooké	oo-móoke	'profit'	

Another case exemplifying the same pattern is *su-*, which applied to a stem gives the meaning 'bare *X*'. As the following data show, there is a clear contrast between forms with short and long second members, (67a-b), cf. (67c-d), which accords generally with the predicted patterns. The abundant instances of Rendaku voicing and final syllable extrametricality effects in (67d) further point in the direction of the analysis of words with *su-* as compounds.

(67) Examples with *su-* as First Member of Compound

a.	asi	sú-asi	'foot'	(-acc, short N_2)
	kao	sú-gao	'face'	
	kaki	su-gaki	'to draw/animation'	
	yaki	su-yaki	'to fire/unglazed pottery'	

b.	té	su-dé, sú-de	'hand'	(+acc, short N_2)
	hosí	su-bosi, su-bosí	'dry'	
	utá	su-uta	'soup'	
	háda	sú-hada	'skin'	
c.	hadaka	su-ppádaka	'naked'	(-acc, long N_2)
	toori	su-dóori	'go through'	
	tomari	su-dómari	'stay'	
	odori	su-ódori	'dance'	
	roonin	su-róonin	'roonin'	
	utai	su-útai	'singing'	
	zyooruri	su-zyóoruri	'*zyooruri*'	
	toonin	su-tóonin	'townsman'	
	katari	su-gátari	'to talk/recital of *zyoruri* music'	
d.	awasé	su-áwase	'a kind of clothes?'	(+acc, long N_2)
	hanasí	su-bánasi	'speech'	
	modorí	su-módori	'to return/return empty handed'	
	mogurí	su-móguri	'diving'	
	hayái	subayái[23]	'quick'	

Another prefix that may form compounds is *han-*, which attaches to nouns and results in a derived noun meaning 'anti-*X*'. *Han-* may be used either as an Aoyagi prefix or a non-Aoyagi prefix, and we focus here on non-Aoyagi usage (which means the morphological word forms a single minor phrase). In support of *han-* as a component of a compound, there appears to be a contrast between words formed with short and long second members; contrast *han-kaku, káku* '(anti-)nuclear power' with the derived word *han-táisei* 'anti-regime', from the long base *taisei* 'regime'. My sample, however, is inconclusive, as there are no examples showing Rendaku voicing[24], nor are there cases showing extrametricality effects or medial accent. Thus, prefixation of *han-* is consistent with either treatment of it as a compound, or as a dominant, post-accenting prefix. Focusing more squarely on the issues at hand, while there are cases in which *han-* itself is accented, e.g., *hán-so* 'Anti-Soviet' and *háN-i* 'against one's will', these facts are consistent with an analysis in terms of compound accent, and since this analysis is still viable, it may be entertained as an alternative to the obvious analysis in terms of edge orientation.

[23]The lack of default initial accent here may be related to the fact that this derived form does not look like a straightforward case of modification.

[24]The lack of forms showing Rendaku may be due to a morphological restriction which blocks attachment of *han-* to native stems, a restriction that is observed in many Sino-Japanese affixes.

Several other prefixes, typically Sino-Japanese in origin, may also be compound-like, but again, the results are inconclusive given the lack of data.[25] For example, *hi-* 'non-' consistently induces accent on the following stem when the stem is long, e.g., /hi + toosei/ → *hi-tóosei* 'uncontrolled' and /hi + nínzyoo/ → *hi-nínzyoo* 'inhuman(ity)'. Further, there is one example in which the stem accent is lost in favor of accenting *hi-*, /hi + ún/ → *hí-un* 'unluckiness', which is again consistent with an analysis in terms of default accent on the first member in words with short second members. Thus, while these facts are consistent with an analysis in terms of compound accent, there are no instances of Rendaku voicing or final syllable extrametricality effects in my sample, and so the results are inconclusive. Likewise, the prefixes *hu-* 'non-', *mu-* 'lacking, un-', and *mi-* 'not yet ...' all present the same pattern: they are consistent with an analysis in terms of the first member of a compound, but we lack the facts which would show this conclusively. The results of my findings for all of these prefixes are summarized in the chart in (69) below.

Another prefix of interest is *zi-*, which is used in making reflexives, because it shows that prefixes which are not simple modifiers of the base to which they attach can behave like an element of a compound. Thus, a clear contrast is observed between derivatives formed with short bases (68a-b) and those formed with long ones (68c-d): the former are mostly unaccented, while the latter all have accent on the first syllable of the stem.[26] Also, the form *zi-hénsuu* in (68d) shows that final syllable extrametricality is in force, as this form is derived from a base with final accent.

(68) Examples with *zi-* as First Member of Compound

a.	kyoo	zi-kyoo	'confession'	(-acc, short N_2)
	-ri	zí-ri	'self-interest'	
	saku	zi-saku	'work/one's own work'	
	syo	zi-syo	writing/one's own writing'	
	-taku	zi-taku	'one's own home'	
	-ei	zi-ei	'defense; run (e.g. a shop)'	

[25]See Martin 1975: 389 ff. for a long list of examples of these prefixes, and the details of their semantic and morphological features.

[26]An interesting fact here is that almost all of the forms in (68a-b) with short bases are unaccented, which is supposed to be the marked accentual default in compounds of this type. However, this fact may simply be an effect of sampling, as most of the examples here are derived from bound stems, which may account for this apparent aberration.

b.	kóku	zi-koku	'country/one's own country'	(+acc, short N_2)
	máe	zi-mae	'front/geisha living on her own'	
	-mán	zi-man	'pride, boasting'	
	-méi	zi-mei	'self-evidence'	
	-métu	zi-metu	'natural decay, self-destruction'	
	-món	zi-mon	'one's own family'	
	-nén	zi-nen	'spontaneous conbustion'	
	-nín	zi-nin	'self-acknowledge, admission'	
	-réi	zi-rei	'self-excitation'	
	-ríki	zi-riki	'one's own strength'	
	-rítu	zi-ritu	'self-reliance'	
	séi	zi-sei	'self-control; self-examination'	
	-séki	zi-seki	'self-reproach'	
	-sén	zi-sen	'self-election'	
c.	doosi	zi-dóosi	'verb/intransitive verb'	(-acc, long N_2)
	daraku	zi-dáraku	'slovenliness, untidiness'	
	syookai	zi-syóokai	'introduction'	
	isiki	zi-ísiki	'consciousness'	
	senden	ziko-sénden	'advertisement'	
	saimin	ziko-sáimin	'hypnosis'	
	toosui	ziko-tóosui	'absorption'	
d.	hensúu	zi-hénsuu	'(independent) variable'	(+acc, long N_2)
	kén'o	ziko-kén'o	'hatred'	
	mánzoko	zi-mánzoko	'contentment'	

A second example of a non-modifying prefix, but one which clearly behaves like the first member of a compound, is *hi-*, which is used in forming 'passive' nouns. The accentuation of *hi-* depends on the size of the base to which it attaches. If the base is short, the result is loss of accent, as in /hi + koku/ → *hi-koku* 'defendant', or accent on *hi-*, e.g., /hi + gi/ → *hí-gi* 'suspect'. But if the base is long, the result is medial accent in bases with non-final accent, as in /hi + senkyóken/ → *hi-senkyóken* 'right to be elected', cf. *senkyóken* 'right to vote', or default initial accent, as for example in /hi + zyoosúu/ → *hi-zyóosuu* 'dividend'. Indeed, as shown by the following paradigm, one finds the two different accentual default patterns when affixation to the base alters its size, *hí-gai* 'damage', but *hi-gáisa* 'victim' and *hi-gáiti* 'place damaged'. Since these facts are only consistent in terms of compound accent, I conclude that *hi-* is the first member of a compound in these examples, on a par with many others.

The following chart summarizes the basic findings for the prefixes discussed above.

(69) Summary of Results[27]

Prefix	Result	MOD	REND	S ≠ L	⟨σ⟩#	...σ σ́ σ...	*n* =
sin- 'new'	comp	Y	Y	Y	Y(1/12)	Y(5/12)	41
ma- 'true'	dom	Y	N	—	Y/N	Y/N	32
ko- 'little'	comp	Y	Y	Y	Y	Y(3/12)	49
oo- 'big'	comp	Y	Y	Y	Y	—	42
han- 'anti-'	comp	N	N	Y	—	—	22
su- 'bare'	comp	Y	Y	Y	Y	—	22
hi- 'non-'	comp	N	N	Y(?)	—	—	12
hu- 'non-'	comp	N	Y(?)	Y(?)	Y(3/11)	—	12
mu- 'un-'	comp	N	N	Y(?)	Y	—	8
mi- 'no yet'	comp	N	N	Y(?)	Y(?)	—	10
zi- Reflexive	comp	N	N	Y	Y(?)	—	30
hi- Passive	comp	N	N	Y	Y(?)	—	15

Working with a substantial corpus of facts, the finding is that most of the nominal prefixes examined here exhibit patterns that are characteristic of the first member of a compound. This finding is significant because it strongly suggests that these prefixes should be treated in terms of the analysis presented above for noun-noun compounds. An analysis that treats these prefixes as the first member of a compound goes a long way towards explaining the complex and varied set of patterns here. When compared with the alternative analysis in terms of edge orientation sketched at the onset of this subsection, it is clear that the compound analysis is superior because it gives a unified analysis of these patterns.

Moreover, the compound analysis is fully consistent with the Root-Controlled Accent hypothesis. If these prefixes are treated as the first member of a compound, then their accentuation is predictable by the principles governing accentual defaults and not their underlying prominence specifications. The inherent accent of the prefix is irrelevant to the accentuation of the larger compound because, as argued above, the first member of a compound is consistently de-accented in this word-formation process. Thus, the prefix-stem sequences do not bring about a situation of constraint conflict between Root and

[27]In this chart, if a test result is only supported by one or two examples, a 'Y(?)' appears in the appropriate cell. Also, the number of examples for each prefix is given in the last column, and where possible, the percentages of prefixes testing positively for a given diagnostic is shown. For example, 'Y(1/12)' for *sin-* under ⟨σ⟩# means that one out of twelve relevant words with this prefix show final syllable extrametricality effects.

Affix Faithfulness. The various edge effects observed in compounds, therefore, are compatible with the RCA hypothesis because Faithfulness is irrelevant here.

As for dominant, post-accenting prefixes such as *ma-*, this prefix type is also consistent with an analysis of Japanese accent in terms of root-control. As shown in detail in §4.1, dominant, i.e., accent-deleting affixes, do not counter the RCA hypothesis because they do not compete for prominence with a root accent. Dominant affixes may be accented or unaccented, as is the case with *ma-*, and therefore the deletion of a stem accent cannot always be attributed to a competition between a root accent and an affix accent: dominant unaccented affixes do not have an accent to participate in such a competition. Dominance effects therefore require some additional principles to account for the observed deletion of base prosody, and chapter 5 is dedicated to the development of these principles. The important point for the matters at hand, however, is that dominant affixes do not contradict the RCA hypothesis because they do not compete for prominence with a stem accent.

The last type of prefix that has an influence of word accentuation are the so-called 'Aoyagi prefixes' (after Aoyagi 1969; see Poser 1990b and Martin 1975: 751 for a list of these prefixes). In a detailed study of these prefixes, Poser 1990b points out two peculiar properties of these prefixes. These properties are exhibited in the data below, which appear to represent exceptions to the basic principles of accent in Japanese words. (The horizontal lines above and below the segments below represent approximations of the f0 profiles.)

(70) Words with Aoyagi Prefixes

a.	moto-	'former'	móto-dáiziN	'former minister'
	han-	'anti-'	hán-shákai	'anti-social'
b.	zeN-	'former'	zéN-syusyoo	'former Prime Minister'
	ki-	'your (honorific)'	kí-syookeN	'your letter'

First, words with Aoyagi prefixes may have two pitch accents, as exemplified in (70a) above in the words with the HLHL pitch excursions, apparently contradicting the general pattern of one accent per word. The second important property is that these words may have a fall in pitch, followed by a rise after the stem-initial mora, as shown by the forms with the HLH profiles in (70b). This last pattern is of course aberrant as well because Japanese words typically have a level low tonal pattern after a fall in pitch (see §3.3.1 for background discussion).

Clearly, unless some special provision is made for these prefixes, the basic descriptive assumptions underlying the analysis of Japanese accent must be called into question. The approach to these two problems taken in Poser 1990b is that Aoyagi prefixes, through a pair of subcategorization requirements, bring about a parse of the larger word which has two minor phrases, as illustrated below.

(71) Word-Internal Phrase Boundaries (Poser 1990b)

{__ } {__ }MinP	{__ } { ___}MinP
a. móto - dáiziN	b. zéN - syusyoo

To give a brief sketch, Aoyagi prefixes have subcategorization requirements that refer to both morphological and prosodic structure (an idea inspired by the dual structures proposed in Inkelas 1989). Thus, they must attach to stems in the morphology, but, in their prosodic analysis, these prefixes select a minor phrase, in effect inducing the word-internal phrase boundaries shown above. This analysis therefore explains the apparently aberrant properties of words with Aoyagi prefixes in terms of the special phrasing required by said prefixes. Words with accented stems may have a second accentual prominence because it is parsed by a minor phrase which excludes the prefix (71a); words with unaccented stems have a rise after the first mora because this profile is typical of minor phrases which do not have an inherent accent (71b).

The importance of this analysis is that it demonstrates that the accentuation of words with Aoyagi prefixes is fully consistent with the Root-Controlled Accent hypothesis. The logic of the argument runs as follows. The RCA hypothesis favors retention of a root accent when it competes with an affix accent for the unique word prominence. In Poser's analysis, words with Aoyagi prefixes have two separate minor phrases — this assumption is absolutely crucial to account for the HLHL and HLH tonal contours found in these words. From this it follows that an accent in the prefix does not compete for prominence with the stem accent because the prefix and the stem are in different minor phrases. The up-shot then is that the unusual accentual patterns brought about by Aoyagi prefixes are consistent with the analysis that accent in Japanese words is root-controlled, on a par with root-controlled accent in Cupeño.

To summarize the above discussion, three sets of prefixes were examined and all of them were shown to be consistent with the thesis that accent in Japanese is root-controlled. First, prefixes that act as the first member of a compound are consistent with the RCA hypothesis because their accentuation is predicted by the principles of compound accent and not their inherent prominence specifications. Second, dominant post-accenting prefixes do not contradict RCA because dominant affixes do not compete for prominence with a root accent (chapter 4 and 5 continues the development of this argument). Finally, Aoyagi prefixes are fully compatible with a RCA analysis of Japanese

accent because their special behavior requires the introduction of word-internal phrase boundaries that separate the prefix and the stem. This phrasing of the word has the effect of parsing the prefix and stem into separate prosodic domains and hence they too do not compete for the unique word prominence.

In conclusion, an apparent challenge for the restricted theory of edge effects developed in §3.1 turns out to lend some support to the analysis of Japanese accent in terms of root-control. The prefixes that are known to have an effect on word accent were classified into three distinct types, and it was shown that all of these types are in fact compatible with the RCA-driven analysis. Considering the number of prefixes in the study, approximately 50 when the Aoyagi prefixes from Poser 1990b and Martin 1975 are included, the absence of a class of prefixes that uniformly override root accent supports the Root-Controlled Accent hypothesis and casts serious doubt on an analysis in terms of edge orientation. In addition to this empirical argument, there are at least two theoretical arguments in support of approaching Japanese accent in terms of root-control. First, the system can be treated on a par with Cupeño and so predominant root accent can be explained as a general pattern of root privilege. Second, this analysis is consistent with a restrictive theory of edge effects which significantly reduces the patterns of edge orientation in accent systems. In chapter 5, additional motivation for the RCA analysis is given which involves showing the role of root accentedness in blocking the application of accentual processes like pre- and post-accentuation and accentual shifts.

3.4 Summary and Conclusion

Accent Resolution (AR), the deletion of all but one lexical accent, is root-controlled if it shows a preference for retention of a root accent over an affix accent. This pattern of accent retention is distinct from directional AR, where it is the accent which appears closest to a designated edge that is retained. The intrinsic ordering of Root and Affix Faithfulness that underlies the analysis of root-controlled AR, namely $\text{MAX-PROM}_{\text{Root}}$ >> $\text{MAX-PROM}_{\text{Affix}}$, makes a prediction concerning the scope of directionality in AR. In systems with an accentual contrast in both roots and affixes, directional AR only emerges in contexts where the Prosodic Faithfulness constraints are not decisive.

Two systems previously described in terms of directional AR, Russian and Japanese, were studied with this prediction in mind. A close examination of these systems showed that there is no crucial evidence that necessitates an analysis described solely in terms of directionality. In both Russian and Japanese, a stem accent generally takes precedence over accent in a following suffix, which is consistent with both root-controlled and directional AR (where the latter type set for leftward edge orientation). Furthermore, it was found that accent is predictable in the affixed structures which can distinguish these two

analyses, namely prefix + root sequences. Thus, in both of these systems, there is an absence of a class of prefixes that consistently override accent in the following stem. This finding casts doubt on the analysis of AR in Russian and Japanese with phonological directionality. This gap is fully consistent, however, with an analysis of these systems with root-controlled AR because, if roots take precedence over affixes in AR, this is exactly the predicted pattern. At the very least then, the notion of root-controlled accent has some currency outside the analysis of predominant root accent in Cupeño; it is crucial in explaining this distributional gap.

In addition to this empirical issue, there are further reasons to extend the scope of root-controlled accent. First, the analysis of root-controlled accent obtained via the intrinsic ordering of Root and Affix Faithfulness makes a substantive restriction on the range of edge effects in accent systems. If this theory is correct, certain logically possible patterns of edge orientation are systematically ruled out. Second, as suggested in §3.1, the analysis of AR with morphologically-dispersed Faithfulness may make sense of an apparent directional asymmetry in AR. The pervasiveness of systems described with a principle of 'the leftmost accent wins' may be explained as a general preference for suffixing morphology; the apparent pattern of leftward edge orientation is really due to the privileged faithfulness status for roots, which tend to be word-initial. Third, the analysis of AR with root-control explains the observed pattern of root retention in terms of a general pattern of root privilege. Thus, the analysis of RCA in Cupeño, and by extension, Russian and Japanese, makes a connection to segmental phenomena like root-controlled vowel harmony. Fourth, as demonstrated in Cupeño (see §2.4.3), this approach to AR clarifies a role for root accentedness in the analysis of morpho-accentual processes like pre- and post-accentuation. The imperative to preserve a root accent may have the effect of blocking morphological processes which change the prosody of the base, a very common pattern which is discussed in detail throughout chapter 5. From these considerations, there is reason to entertain the hypothesis that root-controlled accent is indeed a universal property; it explains a host of properties that appear to be consistent with all the languages examined here.

As for restricted edge effects, further typological work is still needed to determine the scope of directionality in accent systems. While it has been shown that two cases, formerly analyzed with directional AR, are in fact consistent with the restricted edge effects, a cross-linguistic study of AR has yet to be done. However, if it turns out that further investigation turns up a system with an unrestricted type of directional AR, which completely ignores word structure, it is important to emphasize that this finding would not necessitate a re-analysis of root and affix accent in Cupeño, Russian, and Japanese. Root-controlled accent in these systems can be analyzed in a way that has all of the advantages of this analysis listed above, but without restricted directionality. In particular, such a finding would support a more recent instantiation of Root Faithfulness in Prince

1997, Beckman 1997 [1998]. In this approach, the privileged status of roots is characterized by a set of Root Faithfulness constraints, but there are no corresponding Affix Faithfulness constraints. Thus, Root Faithfulness is not inherently ordered, and it may be ranked on a language particular basis in relation to context-free Faithfulness, or Faithfulness that is sensitive to whole words. Directional AR, then, is the result of Prince's 'Anti-Paninian' ranking, where the general or context-free Faithfulness constraint outranks the specific Root Faithfulness constraint, and the edge orientation constraint LEFTMOST is ranked between these two Faithfulness constraints, as shown below.

(72) Directional Accent Resolution with Anti-Paninian Ranking

Input		Output	MAX-PROM	LEFTMOST	MAX-PROM$_{Root}$
a. /áf + róot/	→	áf-root	*		*
		*af-róot	*	*!	
b. /af + róot/	→	af-róot		*	
		*áf-root	*!		*

In such a constraint system, the general constraint is only active in contexts where a lexical accent is not in competition with another accent that would be faithfully parsed word-initially (72b). In words with more than one inherently accented morpheme, the leftmost one wins, regardless of whether it is in a root or an affix (72a).

It is clear, therefore, that it is possible to describe directional AR in a theory that assigns privileged Faithfulness to roots. The findings of this chapter, however, question whether AR is ever governed by directionality alone. The ultimate answer to this question will bear directly on the formulation of the special Faithfulness status of roots, as restricted directionality effects are only accounted for in a theory with distinct Faithfulness constraints for roots and affixes.