Root-Controlled Accent in Cupeño*

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1. Introduction

A fundamental observation in the accent system of Cupeño (Uto-Aztecan)[1] is that inherent stress in roots overrides inherent stress 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 stress in inherently accented prefixes and suffixes. This is illustrated with the following forms.

(1) Accented Roots with Accented Affixes

a.	pəŋíypi	/pə́-ŋíy-pi/
	'He would go away'	3sg-GO-FUTURE
b.	ʔáyuqa	/ʔáyu-qá/
	'He wants'	WANT-PRES.SING

(2) Unaccented Root √yax with Accented Affixes

a.	nə́yax	/nə́-yax/
	'I said'	1sg-SAY
b.	nəʔən yaqáʔ	/nəʔən yax-qá/
	'I say'	1sg SAY-PRES.SING

The accented roots in (1) win out over the person marker, pə́-, and the singular present suffix, -qá, because affix stress is overridden by root stress. Inherent stress 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 stress in roots over inherent stress in affixes.

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

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[1]Cupeño, now extinct, was a Takic language spoken in Southern California. The data examined in this paper were 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(H), Hill & Hill 1968 (H&H), Hill & Nolasquez 1973 (given with page/sentence number), Crowhurst 1994 (C), and a set of unpublished fieldnotes provided for me by Jane Hill (JH).

roots, but stress in suffixes is limited to the first vowel of the suffix. Likewise, in the Athapaskan language Tahltan, the position of stress is contrastive in roots, but not contrastive in affixes, as the position of affix stress is predictable from the root stress. 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 paper, the connection between overriding root stress 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 stress 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 inherent ranking, overriding 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 overrides affix stress in Cupeño is treated as a special case of the cross-linguistic tendency for roots to license a wider range of contrasts that affixes.

One important goal of this paper, 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, 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 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 argue for the set of assumptions codified as 'The Richness of the Base' (Prince & Smolensky 1993 §9). Roughly speaking, this principle entails that there are no language-particular restrictions on underlying representations. The explanation of restricted stress inventories in general, and overriding root stress in Cupeño, relies on this fundamental assumption.

The rest of the paper is structured as follows. Section 2 lays out the theoretical background necessary for the analysis of Cupeño accent. Section 3 then examines stress in isolated roots and gives the constraint rankings necessary for the root stress inventory. In section 4, these rankings are incorporated in the larger analysis of stress in fully formed words. In section 5, two alternatives to the Faithfulness-based account are considered, namely the level-ordered account given in Crowhurst 1994 and a multi-stratal account along the lines of Halle & Vergnaud 1987. The last section summarizes the main results of the paper and discusses some of the implications of the core ideas.

2. Theoretical Background

This section begins with a statement of the representations assumed for lexical stress (§2.1). Then the Prosodic Faithfulness constraints are introduced (§2.2), and finally the theory of morphologically-dispersed Faithfulness is motivated (§2.3).

2.1 Representational Assumptions

Concerning the formal details of lexical stress, there is little consensus in the literature. Developing what appears to be the standard approach, some have encoded lexical stress as a syntagmatic relation between syllables (see for example Liberman & Prince 1977, Hayes 1980, Halle & Vergnaud 1987, Idsardi 1992). In these works, a strong position is lexically marked relative to a weak one, typically by positing fully formed prosodic feet in the underlying representation, and this is the position of stress which is inherited in surface forms. For others, accent is not a syntagmatic relation, but more like paradigmatic tone (Pulleyblank 1986, Blevins 1993, Zec 1994, cf. Clements & Goldsmith 1984). Applied to the analysis of lexical stress, this approach avoids postulating underlying feet by aligning tone structure with metrically strong positions. A more neutral position, however, is taken in Prince 1983, where lexical stress is represented as pure prominence. In particular, lexical stress is encoded as an intrinsic feature of an underlying sponsor, which has no necessary phonetic realization. These lexical prominences are then projected into grid structure in surface forms which is aligned with prosodic constituents if such structures are required.

While this is not a central issue here, the features of stress-accent in Cupeño seem to require the representation of lexical stress as pure prominence. First, stress is contrastive in roots, but stressed syllables are louder and longer than unstressed syllables, which complicates the analysis of this contrast in terms of tone structure. Second, certain morpho-accentual phenomena like pre-accentuation classify Cupeño with other pitch accent languages, calling into question the role of prosodic feet. I will therefore assume, without argument, that lexical stress is encoded underlyingly as inherent prominence, and that this prominence structure is faithfully mapped into surface forms. These lexical prominences then determine the position of stress feet in the output. This assumption accounts for contrastive stress without tonal correlates, and it is also helpful in the analysis of pre-accentuation.

Describing lexical stress as inherent prominence raises the question of how stress feet are motivated at all. The evidence for feet in surface representations, however, is abundant. First, Crowhurst 1994 argues that restrictions on the root stress inventory can be characterized as restrictions on prosodic feet (see discussion below). A second type of evidence comes from the relationship between the accent system and the prosodic morphology of the habilitative

construction, studied in detail in Hill 1970, McCarthy 1979, 1997, McCarthy & Prince 1986, 1990, and Crowhurst 1994. The finding here is that the prosodic structures representing stress are referred to directly by the morphology, thereby motivating the use of feet in surface forms. Lastly, Crowhurst 1994 argues that a bimoraic requirement on word size is explained as a requirement on prosodic feet, providing further support for the assumed metrical structures.

To summarize my assumptions regarding lexical and surface representations, consider the input-output mapping given below. Here, lexical stress is encoded as inherent prominence, represented with a grid mark in the underlying representation. This lexical prominence is faithfully mapped into the surface form and projected into a bracketed grid structure as the assumed metrical constituency.

(3) Underlying Representation Surface Form

x		(. x)	
təmál	→	təmál	'ground'

As a final point, the metrical structures have an additional role in the system, namely in accounting for the observed 'one stress per word' effect. Phonetically, accent is culminative in Cupeño; that is, words have a single stress peak.[2] The standard approach to this observation is to derive culminativity from inherent principles of prosodic organization (Selkirk 1980, Nespor & Vogel 1986, Hayes 1995). Concretely, the principles of Headedness and Strict Succession require words to have a single prosodic head at each level in the prosodic hierarchy. Therefore, since stress is a property of a unique prosodic head, there can only be one main stress per word.

2.2 Correspondence Theory and Prosodic Faithfulness

We require a set of constraints to govern the relation between lexical and surface stress. Prosodic Faithfulness must therefore make reference to the assumed prominence structure, which requires the notion of Correspondence developed in McCarthy & Prince 1995.

(4) 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 with $\alpha R \beta$.

[2]It is not clear from my sources whether secondary stress is assigned. While Bright and Hill 1967 clearly report secondary stresses in their description, it is implicitly assumed in more recent work (e.g. Crowhurst 1994) that phonetically there is a only a single word stress. The inconclusiveness of the data, therefore, precludes any further analysis.

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. The Prosodic Faithfulness constraints given below make direct reference to inherent prominences and require related strings to 'match' in prominence structure.

(5) Prosodic Faithfulness (see McCarthy 1997, Zoll 1996a, Yip 1996, and Bickmore 1996)

MAX-PROM
Every prominence in the input must have a correspondent in the output.

DEP-PROM
Every prominence in the output must have a correspondent in the input.

NOFLOP-PROM (after McCarthy 1997)
Let x_i be prominences, ζ_j be segments, S_k phonological representations,
$S_1 \ R \ S_2$,
x_1 and $\zeta_1 \in S_1$, x_2 and $\zeta_2 \in S_2$,
$x_1 \ R \ x_2$, and $\zeta_1 \ R \ \zeta_2$,
if x_1 is associated with ζ_1, then x_2 is associated with ζ_2.

The constraints above make an important distinction between two forms of Faithfulness: Faithfulness to a lexical prominence (MAX-PROM), and Faithfulness to the *position* of a lexical prominence (NOFLOP-PROM). Thus, MAX-PROM simply prohibits the deletion of a lexical prominence, while NOFLOP-PROM further refines this requirement by banning the migration of prominence beyond its underlying sponsor. This distinction is necessary to account for the pervasive phenomenon of Stress Shift in languages like English (Liberman & Prince 1977). Furthermore, the distinct Prosodic Faithfulness constraints allow for a lexical contrast between associated and unassociated accent: only the former kind of accent may violate NOFLOP-PROM. This contrast is instrumental in the analysis of pre-accentuation given in section 4.3. Finally, DEP-PROM is the symmetric counterpart to MAX-PROM; it outlaws the insertion of a stress prominence in the output without a corresponding prominence in the input. In the discussion which follows, I will refer to the Prosodic Faithfulness constraints collectively as 'PROS-FAITH' when there is no reason to distinguish among them.[3]

[3]The notion of Prosodic Faithfulness has also been employed as a constraint governing the relation between two morphologically related forms; it was used initially as a requirement that foot structure be preserved between different phonological levels (Inkelas 1994, Kenstowicz 1995), and then developed within parallelist models as an account of stress preservation and various circumscriptional effects (McCarthy 1995, 1997, Pater 1995, Itô, Kitagawa, & Mester 1996).

2.3 Root and Affix Faithfulness

Recent work in OT has enriched the theory of Faithfulness by formulating domain-specific Faithfulness constraints. In particular, distinct Root and Affix Faithfulness constraints are proposed to account for morphologically-determined differences in phonemic inventories (McCarthy & Prince 1995). The central observation is that roots tend to license a wider range of contrasts than affixes, and furthermore, they control certain morpho-phonemic alternations. As an example, consider the well-known case of root-controlled vowel harmony in Turkish. While [back] specifications are contrastive in root vowels, they are not contrastive in affixes. A similar asymmetry is observed in phonological alternations. In the forms below, the suffixes receive their [back] specification from the last vowel of the root.

(6) Root-Controlled Vowel Harmony in Turkish (Clements & Sezer 1982)

ip-in	kɪz-ɪn	yʉz-ʉn	pul-un
ip-ler	lɪz-lar	yʉz-ler	pul-lar
‘rope’	‘girl’	‘face’	‘stamp’

Because phonemic contrast is sanctioned by high-ranking Faithfulness, the observation that roots license a wider range of contrasts requires distinct Root and Affix Faithfulness constraints, with Root Faith always ranked above Affix Faith.

(7) Meta-Constraint on Constraint Rankings (McCarthy & Prince 1995)

Root Faith >> Affix Faith

Applying this formula to the Turkish example, McCarthy & Prince derive the asymmetric vowel inventories by placing the relevant featural markedness constraint between the two Faithfulness constraints specific to separate morphological domains.

(8) Morphologically-Dispersed Faithfulness for Turkish

IDENT-ROOT(back) >> *[back] >> IDENT-AFFIX(back)

With some additional assumptions, this also accounts for root-controlled [back] harmony. While the back/front contrast is not permitted in affixes independently, these features can be parasitically licensed in affixes by spreading from the last vowel in the root (see Beckman 1995 for discussion of the formal details).

In this paper, I develop a parallel to root-controlled vowel harmony in accent systems. As in Turkish, Russian and Tahltan license a wider range of accentual contrasts in roots than affixes. Dispersing the Prosodic Faithfulness constraints as shown below accounts for this fundamental asymmetry.

(9) Morphologically-Dispersed Prosodic Faithfulness

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

Applied to Cupeño, this ranking explains dominant root stress. In particular, this ranking entails that it is more harmonic to realize a lexical prominence in the root than one in an affix, exactly the observed pattern. In sum, the same constraints required for root and affix stress inventories are also involved in morphologically-governed de-accenting in Cupeño.

3. Root Stress Inventory

In this section, the observations characterizing the root stress inventory are presented (§3.1), and they are then analyzed in OT terms (§3.2). The goal of the analysis is to demonstrate how the Prosodic Faithfulness constraints account for lexical stress, and to briefly illustrate the advantages of the OT approach to restricted stress inventories.

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 (10) and conjugated verbs (11). Most of the roots in these examples are no longer than two syllables, which apparently reflects the canonical pattern.[4]

[4]It is rare to find roots composed of three or four syllables with post-peninitial stress, and 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 pišʔəmáy ‘just then’.

(10) a.

máasivə-t	grass C 185
xə́ənə	blow (wind) C 185
pə́əxwən	nothing but 10.57
náači	soon, quick 38.4
híimaʔay	donate goods to burning ceremony C 185

b.

təvxáa-qa	... is working C 185
ʔiyúunə	fast C 185
muháan	shoot with bow C 185

(11) a.

pəm-tə́əčiŋ-wən	They ordered ... 41.7
čəm-náaxčin	We passed on 21.9

b.

pəʔ-ičáay-wən	They did ... 24.51
taváan-pə-qal	He put him ... 58.13

Long vowel stress also has the effect of precluding stress on a short vowel. 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.[5]

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 in the nouns in (12) and the conjugated verbs in (13).

(12) 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
kʷíni-lʸ	acorns 29.1

b.

təmá-l	ground 29.4
atáxʔ-am	the people 29.1
savá-l	grass 29.4
kawí-š	rock 29.4
səvə́-l	wind 9.16
siʔáyi-š	cracked acorns 29.7

[5]Stress in Spanish loans, e.g., váaka-ʔam ‘cattle’ and kaváayu-ʔum ‘horses’, also conforms to this pattern of long vowel stress. But as pointed out by an anonymous reviewer, stressed vowels in both Spanish and English loans tend to be lengthened when borrowed into Cupeño. Considering the role of duration in signaling stress in these languages, the most sensible approach to this fact seems to be that stressed vowels in the source languages are perceived as long.

(13) a. pə-míʔawlu He came 9.1
čəm-yáyax We try to ... 9.7
pəm-híwən They stopped 21.9
pəm-náyxi They fought 1.15

b. pə-pulín-qal ... gives birth 43.5
čəm-təwáš We lost 125

While there may be a historical account of this, the initial-peninitial stress contrast is synchronically unpredictable. This 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.

To summarize, the inventory of stress patterns observed in roots (excluding monosyllables) is given in (14).

(14) Root Stress Inventory

CV́ VCV	CVCV́ V	CV́ CVC	CVCV́ C
xə́ənə	təvxáa	šúʔiš	təmál

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

3.2 Analysis

As mentioned in section 2, to account for certain correspondences between the accent system and the prosodic morphology, I assume essentially the same foot structures proposed in Crowhurst 1994. In particular, roots are consistently parsed into right-headed feet in the output, even if this results in a monomoraic foot because of Faithfulness to a lexical prominence. This is illustrated below.

(15) Uniform Right-Headed Feet

(x)	(. x)	(x)	(. x)
xə́ənə	təvxáa	šúʔiš	təmál

In constraint-based terms, uniform iambs entail a constraint ranking in which RHTYPE = IAMB dominates RHTYPE = TROCHEE. In addition, Foot Binarity must be ranked below the Prosodic Faithfulness constraints because the iambic requirement may have the effect of creating non-binary feet in cases like [(šú)ʔiš], as depicted in the following tableau.

(16) Emergence of Lexical Initial Stress

x /súʔiš/	PROS-FAITH	FTBIN
a. (. x) suʔíš	*!	
b. (x) ☞ súʔiš		*

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 winner, therefore, is the candidate which matches the input prosody exactly, at the expense of a FTBIN violation.

In this way, the constraint system accounts for the lexically determined stress contrast: variation in the position of stress is licensed by high-ranking Faithfulness. By the same reasoning, the surface restrictions on the stress inventory are achieved through the domination of Prosodic Faithfulness. In particular, predictable long vowel stress is derived by ranking the Weight-to-Stress Principle (Prince 1990) above PROS-FAITH. Assuming that only CVV syllables (and not CVC) are heavy (Crowhurst 1994), this correctly yields the observed pattern of long vowel stress.

It is useful to show this with a form that has an underlying prominence on a short vowel. For example, if a root such as √təvxaa has an inherent accent on the first vowel, an unfaithful mapping results because the WSP dominates PROS-FAITH.

(17) Predictable Long Vowel Stress

x /təvxaa/	WSP	PROS-FAITH
a. (x .) tə́vxaa	*!	
b. (. x) ☞ təvxáa		*

The loser above has stress on a closed syllable, leaving the subsequent heavy syllable unstressed. Since CVC syllables are not heavy, this incurs a fatal violation of the WSP, leaving the candidate which has undergone an accent shift as the optimal form.

Next recall that Cupeño lost contrastive vowel length in unstressed syllables. While not attested in synchronic alternations, this fact is an integral part of the root stress inventory, and must therefore come within the scope of the analysis. It turns out that this systematic gap receives a direct explanation by considering further the role of the WSP in the system. Any unstressed long

vowel constitutes a violation of the WSP, and hence vowel shortening can be induced by ranking the WSP above the Faithfulness constraint governing the realization of vowel length, WT-IDENT (McCarthy 1995, Urbanczyk 1996).

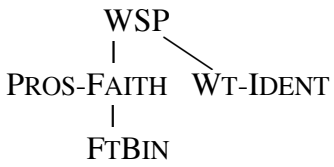
(18) Vowel Shortening by the WSP

/CVVCVV/	WSP	WT-IDENT
a. (CV́ VCVV)	*!	
b. ☞ (CV́ VCV)		*

The losing candidate suffers from a fatal WSP violation because it has an unstressed long vowel, so the form with shortening is the optimal output. In general, the WSP, in its top-ranked position, results in shortening of any unstressed long vowel.[6]

To summarize, the constraint rankings argued for thusfar are given below.

(19) Summary Ranking



The ranking in which PROS-FAITH dominates FTBIN accounts for distinctive stress in the inventory of accentual patterns observed in roots. With the assumed iambic requirement, this ranking means that initially-accented roots will surface with a non-binary foot. The domination of PROS-FAITH by the WSP, on the other hand, accounts for the predictable part of the stress system, namely the observation that long vowels are always stressed. Finally, the ranking of the WSP above WT-IDENT accounts for the absence of unstressed long vowels.

It is important to emphasize that all the requirements on root stress are characterized by the ordered set of constraints given above, and nothing more. That is, the analysis is consistent with the Richness of the Base, which does away with language-particular constraints on the input. This

[6]An anonymous reviewer points out that long vowels, though they are shortened on the surface, actually fail to delete in contexts where short vowels would drop by regular rules of syncope. Thus, shortening and syncope may be understood here as a kind of 'chain-shifting' phenomenon, as found, for example, in Woleaian (Micronesian), where final vowels are deleted but long final vowels are merely shortened. While formal treatment of this fact would lead us too far afield, the greater degree of faithfulness for long vowels can be handled straightforwardly in terms of locally-conjoined faithfulness constraints (see Kirchner 1996 for an approach to chain-shifting rules in these terms).

is shown by the following chart which lists an exhaustive set of input-output mappings for all the root types examined. ("H" and "L" stand for heavy and light syllables, respectively.)

(20) Deriving the Root Stress Inventory with the Grammar

a.	/ H L /	→	Ĥ L	› H Ĺ by WSP
	/ Ĥ L /	→	Ĥ L	› H Ĺ by WSP and PROS-FAITH
	/ H Ĺ /	→	Ĥ L	› H Ĺ by WSP >> PROS-FAITH
b.	/ L H /	→	L Ĥ	› Ĺ H by WSP
	/ L Ĥ /	→	L Ĥ	› Ĺ H by WSP and PROS-FAITH
	/ Ĺ H /	→	L Ĥ	› Ĺ H by WSP >> PROS-FAITH
c.	/ H H /	→	Ĥ L	› Ĥ H by WSP >> WT-IDENT
	/ Ĥ H /	→	Ĥ L	› Ĥ H by WSP >> WT-IDENT
	/ H Ĥ /	→	L Ĥ	› H Ĥ by WSP >> WT-IDENT
d.	/ L L /	→	Ĺ L	(Assigned by default.)
	/ Ĺ L /	→	Ĺ L	› L Ĺ by PROS-FAITH >> FTBIN
	/ L Ĺ /	→	L Ĺ	› Ĺ L by PROS-FAITH

In forms with a single heavy syllable, the heavy always surfaces with stress because the alternatives with stress on the light syllable are always less harmonic (20a-b). This reasoning applies equally to cases where a light syllable is underlyingly accented because the WSP dominates PROS-FAITH. Given the ranking WSP >> WT-IDENT, the WSP also conditions shortening in roots with two long vowels in the input (20c). Finally, in roots with no long vowels, lexical prominences are faithfully mapped to the related outputs, giving rise to the initial-peninitial contrast (20d). (Unaccented roots receive initial stress by default, which is accounted for in section 4.)

Abstracting away from specific tokens, every possible underlying structure is mapped onto a licit surface form. This result is not an effect of a requirement on underlying forms, therefore, and purely a product of the surface-evaluating constraint system.[7]

This approach to the analysis of lexical stress systems solves a significant problem in the description of 'restricted stress inventories'. It is a common observation in lexical stress languages that the full range of surface stress contrasts is restricted by certain over-arching constraints. For example, the position of stress is contrastive in Spanish nouns, but antepenultimate stress is completely ruled out when the penultimate syllable is closed (Harris 1983). In Cupeño, roots have an initial-peninitial contrast, but this contrast is neutralized in roots with long vowels because long vowels are always stressed. In classical generative phonology, restricted phonemic contrasts such

[7]As for the set of roots that is actually learned, this will of course not include the hypothetical inputs listed here. This fact is due to the principle of Lexicon Optimization (Prince & Smolensky 1993), which essentially chooses as the learned form the input whose input-output mapping fares best on Faithfulness. Thus, the restrictions on the learned lexicon are governed by the grammar on a whole and this principle of language acquisition.

as these were accounted for with so-called Morpheme Structure Constraints, which applied to underlying representations to restrict lexical forms in the required way. This approach has been criticized, however, because it leads to the 'Duplication Problem' (Kenstowicz & Kisseberth 1977, Kisseberth 1970). The finding is that the constraints active in the lexicon were also necessary in governing the output of phonological rules, leading to a problematic re-application of the same constraints in the surface phonology.

OT solves the Duplication Problem by eliminating all language-particular restrictions on the input. A restricted phonological contrast is thus derived by the same grammar which accounts for phonological alternations, i.e., the system of ranked constraints. The OT approach to Cupeño root stress therefore avoids the Duplication Problem because the restrictions on the inventory are encoded directly in the grammar per se, thereby distinguishing it from a more traditional account in terms of constraints on lexical forms (as in Crowhurst 1994). A further consequence of the Richness of the Base is that it paves the way for explaining dominant root stress, which is the topic of the next section.

4. Dominant Root Stress

In this section, the influence of inherent root stress is examined and analyzed in larger words. The section begins with a detailed empirical study of the interaction between root and affix stress (§4.1), followed by the proposed analysis (§4.2). The analysis is then extended in section 4.3 to account for pre-accenting suffixes and the special phonology of the nominalizer.

4.1 Data and Observations

Inherent accent in roots is dominant over accent in affixes. 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, root accent prevails. The behavior of the different classes of roots is illustrated directly 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 subject markers listed in (21), and the accented suffixes are listed in (22) (not including pre-accenting suffixes, which are treated in section 4.3).

(21) Accented Prefixes

1	nə́-	čə́m-
2	ʔə́-	ʔə́m-
3	pə́-	pə́m-
	Singular	Plural

(22) 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 H&H as unaccented.

(23) a. Accented Prefix Wins

náyax	/ná-yax/	I said JH
páyax	/pá-yax/	He says 1.15
čámyax	/čám-yax/	We say 21.6
pámyaxwən	/pám-yax-wən/	They said 42.28

b. Accented Suffix Wins

nəʔep neyaqál	/nəʔep né-yax-qál/	I was saying JH
nəʔən yaqáʔ	/nəʔən yax-qá/	I say JH
pəyaqál	/pá-yax-qál/	He was saying 1.9
miyaqáʔ	/mi-yax-qá/	He tells them 38.49

(24) a.

námaxʔə	/ná-max-ʔə/	(I) to give ... JH
čáʔmaxʔə	/čáʔ-max-ʔə/	(We) to give ... JH
ʔipáʔmax	/ʔi-pám-max/	They gave you ... JH

b.

maxqáʔ	/max-qá/	... giving ... JH
ʔinəmaxqál	/ʔi-ná-max-qál/	I was giving you JH
čimpəmaxqál	/čim-pá-max-qál/	He was giving us JH

(25) a.

náwən	/ná-wən/	I put JH
čámwən	/čám-wən/	We put JH
náwənəpi	/ná-wənə-pi/	(I) to put it in JH
čámwənəpi	/čám-wənə-pi/	(We) to put it in JH

b.

nəwənqál	/ná-wən-qál/	I was putting JH
wənqáʔ	/wən-qá/	... put (it) ... JH

As is evident from the above examples, when a word has more than one accented affix, it is the rightmost one in the word which surfaces with stress, e.g., /ná-wən-qál/ → [nəwənqál]. This pattern holds when the competition is between an accented prefix and suffix, and also when the competition is between two accented suffixes, as shown by the following examples.

(26) Rightmost Accented Suffix Wins

yəxqəlí	/yax-qál-í/	While ... was saying H&H 236
ʔəyaqalí	/ʔə́-yax-qál-í/	... what you said JH

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

(27) Default Initial Stress

a.	yáxəm	/yax-əm/	(You Pl) say! JH
	čəmčəmə yáxwə	/čəm-čəmə yax-wə/	We say JH
	nəʔq^{w}ən yáʔa	/nəʔq^{w}ən ya-ʔa/	I can say JH
b.	máxəm	/max-əm/	Give! (Pl) C 186
	máxan	/max-an/	Give it to me JH
	máxaʔəš	/max-aʔəš/	Give it to us JH
c.	wə́nəm	/wən-əm/	Put it in (Pl subj) JH
	wə́na	/wən-a/	Put it in (Sg) JH

It should be clarified that emergent prefix stress is not realized as default initial stress. As noted in H&H: 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.[8]

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

(28) Non-Initial Prefix Stress

a.	minə́təw	I saw them
	mipə́təw	He saw them
	mičə́mtəw	We saw them
b.	pipúkuṣ	/pi-pə́-kuṣ/
	'He ... took it'	3sg-3sg-TOOK
c.	pipə́wən	/pi-pə́-wən/
	'He put it'	3sg-3sg-PUT
d.	ʔipə́ʔmax	/ʔi-pə́ʔ-max/
	'They gave you ...'	2sg-3pl-GIVE
	minə́maxenpi	/mi-nə́-maxe-n-pi/
	'(I) to give them ...'	3pl-1sg-GIVE-X-FUT
	mipə́ʔmaxwən	/mi-pə́ʔ-max-wən/
	'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 individually (29), and with accented roots which combine with both accented prefixes and suffixes (30).

(29) Root Accent Overrides Affix Accent

a. Root-Controlled De-Accenting in Prefixes

pəŋíypi	/pə́-ŋíy-pi/	He would go away 1.15
pəŋə́yəyax	/pə́-ŋə́yə-yax/	It shakes 1.17
pəmíʔawlu	/pə́-míʔaw-lu/	He came 9.1
čəmnáačin	/čə́m-náačin/	We passed on 21.9
pəmŋíywən	/pə́m-ŋíy-wən/	They went out 29.2
pəmčáŋnu	/pə́m-čáŋnu/	They got angry 1.15
pəmčíʔlˠuwən	/pə́m-číʔ-lˠu-wən/	They went gathering 29.1

b. Root-Controlled De-Accenting in Suffixes

píqpəqal	/píq-pə-qál/	... touched him 43.31
mikʷáwpəqal	/mi-kʷáw-pə-qál/	He was calling them 44.1
nánvayaqa	/nánva-ya-qá/	... is done 44.9
ʔáyuqa	/ʔáyu-qá/	... (He) wants 23.31

(30) Root-Controlled De-Accenting

pəʔáyuqal	/pə́-ʔáyu-qál/	He was wanting 1.14
pətúlqa	/pə́-túl-qá/	He finished 42.22
pəháwpəqal	/pə́-háw-pə-qál/	He sang 42.22
pəpulínqal	/pə́-pulín-qál/	She gave birth 43.5
nəŋíyqalipə	/nə́-ŋíy-qál-í-pə/	When I go away 1.16

To summarize, the interaction between root and affix accent may be described as follows.

(31) Summary of Cupeño Accent

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

/ ... σ́ t ... / → [... σ́ t ...]

/pə́-túl-qá/ → [pə-túl-qa]

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

/ ... á f- ... -á f / → [... af- ... -áf]

/ pə́-yax-qál / → [pəyaqál]

/yax-qál-í/ → [yəxqəlí]

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

/ σ σ ... / → [σ́ σ ...]

/ yax-əm / → [yáxəm]

4.2 The Analysis

As mentioned in section 2.3, I follow McCarthy & Prince 1995 in assuming that Faithfulness constraints segregated into the morphological domains Root and Affix, and that Root Faith always outranks Affix Faith. This ordering applies to the set of Prosodic Faithfulness constraints, yielding PROS-FAITH$_{Root}$ >> PROS-FAITH$_{Affix}$. As will be shown below, this natural division in the PROS-FAITH constraints is necessary cross-linguistically, and what is more, it explains the interaction between root and affix stress in Cupeño.

Before delving into the facts of Cupeño, let us briefly consider the role of Root and Affix Faithfulness in stress inventories cross-linguistically. As stated in the introduction, it is often the case that roots sponsor a wider range of contrasts than affixes, and this applies with equal force when stress is responsible for the surface contrast. For example, in Russian, the location of accent is unpredictable in roots, giving rise to surface contrasts, but disyllabic accented affixes always have initial stess (Stankiewicz 1993). Likewise, in Tahltan, the position of stress is contrastive within roots, but predictable in affixes, basically falling on every other syllable counting from the

root stress (Cook 1972, Nater 1989). In both cases, therefore, the position of 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 (32). Because of the orderings established in these rankings, the limitations on surface prosody apply only to affixes.

(32) Restricted Affix Stress Inventories

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

b. Tahltan: PROS-FAITH$_{Root}$ >> *CLASH >> PROS-FAITH$_{Affix}$

These observations concerning morphologically-governed inventories motivate the introduction of Root and Affix Faithfulness on a cross-linguistic basis. Let us now examine how these same constraints apply to derive dominant root stress in Cupeño. The chief observation here is that whenever a word contains an accented root, the root always surfaces with stress, regardless of the accentuation of the affixes attached to it. This fact follows naturally from my basic assumptions. Because PROS-FAITH$_{Root}$ always outranks PROS-FAITH$_{Affix}$, the constraints within this family are also ordered in this way, hence MAX-PROM$_{Root}$ >> MAX-PROM$_{Affix}$. All things being equal,[9] therefore, it will always be more harmonic to realize a root accent than an affix accent. Interestingly, this is a different kind of effect than those observed in Russian and Tahltan, but it is explained in exactly the same way.

The following tableaux illustrate the basic result. As shown in (33), 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 (34).

(33) Root-Controlled De-Accenting in Prefixes: / á f-ŕ t ... / → [af-ŕ t ...]

Input: x x pə́-míʔaw-lu	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (x .) pə́-miʔaw-lu	*!	
b. (. x) ☞ pə-míʔaw-lu		*

[9]The effects of this meta-ranking can of course be mitigated by a higher-ranking Alignment constraint requiring stress at a designated edge. The interactions between Root and Affix Faith on the one hand and Alignment on the other, are discussed in section 6.

(34) Root-Controlled De-Accenting in Suffixes: / ... ŕ t- á f / → [... ŕ t-af]

Input: x x ʔáyu-qá	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (. x) ʔayu-qá	*!	
b. (x .) ☞ ʔáyu-qa		*

The same result obtains when an accented root combines with both an accented prefix and an accented suffix, as depicted in (35). Here again, the outcome is overriding root stress because of the universal ordering between Root and Affix Faithfulness.

(35) Root-Controlled De-Accenting: / á f-ŕ t- á f / → [af-ŕ t-af]

Input: x x x pə́-túl-qá	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (. x) pə-tul-qá	*!	
b. (x .) pə́-tul-qa	*!	
c. (. x) ☞ pə-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 some other constraint, which in this case is the lower ranking edge-orientation constraint, ALIGN-R(PK, PrWd) (formulated within Generalized Alignment Theory of McCarthy & Prince 1993b). This constraint picks the candidate with the rightmost affix stress, as shown below for a word with an accented prefix and suffix.

(36) Rightmost Affix Stress: / á f-rt-á f ... / → [af-rt-á f ...]

Input: x x pə́-yax-qál	MAX-PROM$_{Affix}$	ALIGN-R(PK, PrWd)
a. (x .) pə́-yax-qal	*	yax-qal !
b. (. x) ☞ pə-yax-qál	*	

The same result obtains in words with two stressed suffixes, e.g. /yax-qál-í/ → [yəxqəlí]. The correct outcome here is more harmonic than a form which stresses the penultimate suffix, e.g. [yəxqáli], because the former better satisfies ALIGN-R(PK, PrWd).

The fact in Cupeño that inherent accent can be realized non-finally 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).

(37) Non-Final Prefix Stress: / á f ... / → [á f ...]

Input: pə́-yax (x)	MAX-PROM$_{Affix}$	ALIGN-R(PK, PrWd)
a. (. x) pə-yáx	*!	
b. (x .) ☞ pə́-yax		**yax**

To complete the basic analysis, there is the issue of how to account for the conflicting edge-orientations of rightmost affix stress and default initial stress. Crowhurst 1994 compares this pattern to default-to-opposite edge orientation in unbounded stress systems. Because the analysis of this phenomenon is a matter of recent debate (see Kenstowicz 1994, Zoll 1996b, Walker 1996, Hewitt & Crowhurst 1996, and Crowhurst & Hewitt 1997), and since it does not really pertain to the main issues at hand, I will simply posit a structural solution which accounts for the observed data.

Invoking a mechanism developed in Prince 1983, I will distinguish two levels of metrical prominence, stress prominences and stress peaks, where the former is structurally subordinate to the latter. The Alignment constraint responsible for rightmost affix stress makes reference to stress peaks. We therefore require a different constraint, INIT-PROM, which refers to subordinate stress prominences to derive initial stress. Concretely, because lexical stress is identified as a stress peak, ALIGN-R(PK, PrWd) will only govern the distribution of lexical stress, and will hence be inoperative in forms which are completely unaccented.

(38) Default Initial Stress

Input: yax-əm	MAX-PROM$_{Affix}$	INIT-PROM
a. x (. x) yax-ə́m		*!
b. x (x .) ☞ yáx-əm		

To summarize the results of this section so far, the observations concerning root and affix stress in Cupeño are captured by the following constraint rankings.

(39)

Result	*Constraint Ranking*
Dominant Root Stress (33-5)	MAX-PROM$_{Root}$ >> MAX-PROM$_{Affix}$
Rightmost Affix Stress (36-7)	MAX-PROM$_{Affix}$ >> ALIGN-R(PK, PrWd)
Default Initial Stress (38)	MAX-PROM$_{Affix}$ >> INIT-PROM

Because of the intrinsic ranking between Root and Affix Faithfulness, MAX-PROM$_{Root}$ dominates MAX-PROM$_{Affix}$, and this accounts for the fundamental observation that root stress overrides affix stress. This ranking is shown to be necessary in two additional contexts explored in the next subsection. The remaining constraints, when ranked with respect to the Prosodic Faithfulness constraints, yield the conflicting patterns of edge-orientation.[10]

The explanation for dominant root stress, therefore, derives from the independently motivated division in the Faithfulness constraints. In particular, distinct Root and Affix constraints are necessary to account for cases in which roots sponsor a greater range of phonological contrasts than affixes. Moreover, these same constraints play a role in explaining the interaction between root and affix stress in Cupeño. In summary, the connection between dominant root stress and the privileged status roots enjoy in phonemic inventories is accounted for with the interaction between Root and Affix Faithfulness.

This argument, however, depends crucially on the assumption that there are no language-particular restrictions on underlying representations (Richness of the Base). If the limitations on affix stress are simply due to a stipulation on lexical forms, then Root and Affix Faithfulness is no

[10]René Kager (p.c.) points out an interesting prediction of the analysis, given the position of the WSP in the system: a long vowel in an affix could attract stress, even when attached to an inherently accented root. Unfortunately, the almost total lack of suffixes with long vowels does not permit us to investigate this prediction in more detail.

longer motivated on these grounds, and must be independently proposed for the interaction between root and affix stress. Without the Richness of the Base, therefore, the account of dominant root stress falls from the level of explanation to mere description.

4.3 Extending the Analysis

The discussion so far has focused squarely on the interaction between root and affix stress 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.[11]

(40) Pre-Accenting Suffixes

-ʔaawV	'at'
-či	'with, by means of' (WITH)
-maa	'diminutive' (DIM)
-nuukV	'punctual subordinator' (PUNCT)
-ŋə	'in'
-ŋəəʔawV	'on'
-ŋəəxV	'from'
-pə	'place of'
-wi	'augmentative' (AUG)
-i	'objective case' (OBJECT)
-yəkə	'to'

The examples below (from H: 191-192 and H&H: 239) illustrate the behavior of the pre-accenting suffixes -ˊči, -ˊnuk, -ˊŋe, -ˊi, and -ˊmaa. One consistent fact in these examples is that the accent contributed by the pre-accenting suffix always surfaces on the root-final syllable, even if this syllable is not adjacent to the pre-accenting suffix (42). Also, when the competition is between a stressed prefix and a pre-accenting suffix, as in (41b-c), the pre-accenting suffix wins, consistent with the pattern of rightmost affix accent. The final example in (43) shows that when the competition for word stress is between a root stress and a pre-accenting morpheme, the stress sponsored by the root wins.

[11]A distinction is made between the suffixes given in (40) and ones which are claimed to yield root-initial stress in unaccented forms, e.g. -wə 'present imperfect (plural subject)', -wəənə 'past imperfect'. The evidence given in H&H for this two-way distinction is largely based on theory-internal assumptions with regard to syncope, and for that reason I will only discuss the root-final accenting suffixes.

(41) a. wənánuk /wəna-´nuk/
'having put in' PUT-IN-PUNCT

b. nəmáči /nə́-ma-´či/
'with my hand(s)' 1sg-HAND-WITH

c. pemeyúŋə /pém-yu-´ŋe/
'on their heads' 3pl-HEAD-ON

(42) nəşuláʔai /nə́-şula-ʔa-´i/
'my fingernails (object)' 1sg-FINGERNAIL-POSS-OBJECT

(43) kəváʔməl /kəvaʔ-´maa-lə/
'pot, olla' ROOT-DIM-ABSO

tíviʔməl /tíviiʔə-´maa-lə/
'small round basket' ROOT-DIM-ABSO

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

The analysis assumes that there is a lexical difference between accented suffixes and pre-accenting suffixes, namely that with pre-accenting suffixes the lexical prominence is not directly associated with a segmental sponsor. Consistent with many autosegmental analyses of similar phenomena (e.g. Blevins 1993), the only difference between the two classes of suffixes is that accent is fixed with accented suffixes like -qál, and floating with pre-accenting suffixes like ´-nuk, as shown below.

(44) a. Accented Suffix b. Pre-Accenting Suffix

x x
|
-qál -nuk

We are now in a position to understand the role of the anti-migration constraint NOFLOP-PROM in the analysis, which is to distinguish these two classes of suffixes. Specifically, both suffixes must realize their inherent accent, which is governed by the Prosodic Faithfulness constraint MAX-PROM. But in the case of the pre-accenting suffixes, accent is not fixed underlyingly, and so it is not subject to NOFLOP-PROM. This leaves the realization of the underlying prominence to the surface-evaluating Alignment constraints, as illustrated in the tableau

below. To account for the alignment of the floating accent with the root-final syllable, an additional alignment constraint is needed, ALIGN-R(PK, Root), which gives root-final stress when ranked above ALIGN-R(PK, PrWd).

(45) Root-Final Stress in Pre-Accentuation: / ... rt-ˊ af / → [... ŕ t-af]

Input: wəna -nuk (x)	ALIGN-R(PK, Root)	ALIGN-R(PK, PrWd)
a. (. x) wəna | núk	*!	
b. ☞ (. x) wəná | nuk		*

The underlying prominence here is attracted to the root-final vowel because of the high-ranking alignment constraint ALIGN-R(PK, Root), which says that the stress peak must be aligned to the right edge of the root. Note that ALIGN-R(PK, Root) crucially dominates ALIGN-R(PK, PrWd) in order to account for the realization of the accent contributed by the pre-accenting morpheme root-finally.

This tack on root-final stress raises the issue of how the conflicting Alignment constraints will apply to affix stress when the underlying accent is directly associated to its segmental sponsor. In such cases, as we have seen above, the rightmost stressed suffix wins, not the one which is closest to the right edge of the root, e.g, /yax-qál-í/ → [yaxqalí]. I address this issue by employing an assumption argued for explicitly in Zoll 1996a and Gafos 1996, namely that the Alignment constraints can either be gradiently or categorically violated. The latter option is chosen for ALIGN-R(PK, Root), effectively nullifying this constraint in specifically this class of cases.

This result is illustrated in tableau (46) below. First, stress is limited to the inherently accented suffixes because these suffixes have fixed accent underlyingly. Therefore, any effort to realize accent on a root vowel, as in (46b) below, will be fatal because this leads to a violation of NOFLOP-PROM. Since violations of ALIGN-R(PK, Root) are metered categorically, neither of the remaining candidates satisfy this constraint, and so the decision between (46a) and (46c) falls squarely on the shoulders of ALIGN-R(PK, PrWd), which gives rightmost affix stress.

(46) Conflicting Edge-Orientation with Accented Suffixes

Input: x x yax-qál-í	NOFLOP-PROM	ALIGN-R(PK, Root)	ALIGN-R(PK, PrWd)
a. (. x) yax-qál-i		*	-i!
b. (x) yáx-qal-i	*!		
c. (. x) ☞ yax-qal-í		*	

Returning to the interaction between roots and pre-accenting suffixes, root accent overrides pre-accentuation, as it does with normal accented suffixes. The explanation of this fact is very much on a par with the explanation of dominant root stress given above. The competition for word stress is again resolved through constraint conflict between Root and Affix Faithfulness.

(47) Root-Controlled De-Accenting in Pre-Accenting Suffixes: / ... ŕ t-ˊ af / → [... ŕ t-af]

Input: x x tíviʔə ˊ-maa-lə	MAX-PROM$_{Root}$	MAX-PROM$_{Affix}$
a. (. x) tiviʔə́ | maa-lə	*!	
b. (x .) ☞ tíviʔə | maa-lə		*

This result truly shows the importance of Prosodic Faithfulness in the analysis. Here the competition is between two inherently accented morphemes, both of which yield stress on the root. Therefore, it is only by considering the lexical sources of accent, and its morphological affiliation, that the correct outcome is arrived at. In particular, the inherent root stress here wins not because stress surfaces within the root; the floating affix stress does as well. Rather, it is the affiliation with the root which leads to satisfaction of top-ranked MAX-PROM$_{Root}$.

As a final puzzle, let us examine the special phonology of the nominalizer *-í*, which is characterized by H&H as being intermediate between a root accent and an affix accent. The nominalizer is weaker than an root accent because its inherent accent is not realized when it combines with an accented root, as shown in (48a). But it is stronger than a suffix accent, as shown by the fact that it can cause deletion of a subsequent accent (48b), going against the pattern of rightmost affix accent winning.

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

a.	wíwiš	/wíwə-í-čə/
	'acorn mush'	ROOT-NOM-ABSO
	páčikiš	/páčiikə-í-čə/
	'leached acorn meal'	ROOT-NOM-ABSO
b.	yəxíqət	'one who is going to say' cf. yax 'to say'
	k^{w}əʔíš	'food' cf. k^{w}aaʔa 'to eat'

In the above analysis, the strength of an inherent accent is ascribed to the rank of the Faithfulness constraint responsible for its realization. The same line of analysis presents itself here, but in this context, the grammatical category targetted by the Faithfulness constraint is not a morphological one. A growing body of evidence, collected in large part by Jennifer Smith (Smith 1996, 1997), has motivated the formulation of a family of Faithfulness constraints which specifically targets nominals. For example, in Tokyo Japanese, the location of accent is contrastive in nouns, but not in verbs. Following the logic of ranking, this fact requires the following ranking: NOUN-FAITH >> ℂ >> VERB-FAITH, where ℂ stands for the constraint responsible for predictable accent in verbs. In sum, the evidence for this family is similar to the one motivating the division between Root and Affix Faithfulness: a wider range of contrasts is observed in nouns than in the complement set of syntactic categories.

I follow this work in employing a noun-specific Faithfulness constraint, and rank it above the affix-specific constraint, as shown below.

(49) Noun-Controlled De-Accenting in Pre-Accenting Suffixes: / ... ń - á f / → [... ń -af]

Input: yax-í-qát (x x)	MAX-PROM$_{Noun}$	MAX-PROM$_{Affix}$
a. [yax-i]-qát (. x)	*!	
b. ☞ [yax-í]-qat (. x)		*

Because the nominalizer is a noun-forming suffix, it is governed by MAX-PROM$_{Noun}$, but suffixes outside the noun are not. By ranking the noun-specific constraint above the affix-specific constraint, therefore, the nominalizer will win out over the other affix.

The nominalizer, however, does not have root-affiliation, and so when the competition is between it and a root accent, the root accent wins because MAX-PROM$_{Root}$ is ranked above MAX-PROM$_{Noun}$.

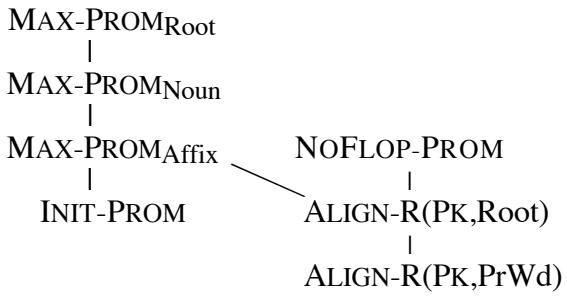
(50) Root-Controlled De-Accenting in the Nominalizer: / ... ŕ t- ń / → [... ŕ t-n]

Input: x x páčikə-í-čə	MAX-PROM$_{Root}$	MAX-PROM$_{Noun}$	MAX-PROM$_{Affix}$
a. (. x) pačikə-í-čə	*!		
b. (x .) ☞ páčikə-i-čə		*	*

This result further substantiates the distinction between Root and Affix Faithfulness in the analysis. The intermediate status of the nominalizer is directly characterized by ranking MAX-PROM$_{Noun}$ between Root and Affix Faithfulness.

To summarize the results of this section, the rankings shown below build on the constraint system of section 4.2 to account for pre-accentuation and the behavior of the nominalizer *í*.

(51) Summary Ranking



Distinguished lexically from the accented suffixes, the pre-accenting suffixes have a floating accent. Because this accent is not directly associated with a segmental sponsor, its surface position is determined by the highest ranking Alignment constraint, i.e., ALIGN-R(PK,Root), which gives root-final stress. Accented suffixes, on the other hand, have a fixed accent, and so they must be realized with their sponsor because NOFLOP-PROM dominates the Alignment constraints generally. 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 MAX-PROM$_{Noun}$ in the system.

To complete the analysis, the constraint rankings from section 3 must be incorporated into the system represented above. Specifically, the WSP is ranked above the Prosodic Faithfulness constraints MAX-PROM$_{Root}$ and NOFLOP-PROM, which in turn both dominate FTBIN. The former ranking accounts for predictable long vowel stress, and the latter accounts for the lexical contrast between initial and peninitial stress.

As a final point, the distinction between Root and Affix Faithfulness has two important functions in the analysis. First, it explains dominant root stress, even in subtle cases involving

pre-accentuation. Second, it is instrumental in the analysis of the nominalizer. Thus, these two independently established ranking arguments converge on the same result, providing strong evidence for Root and Affix Faithfulness.

5. Discussion of Alternatives

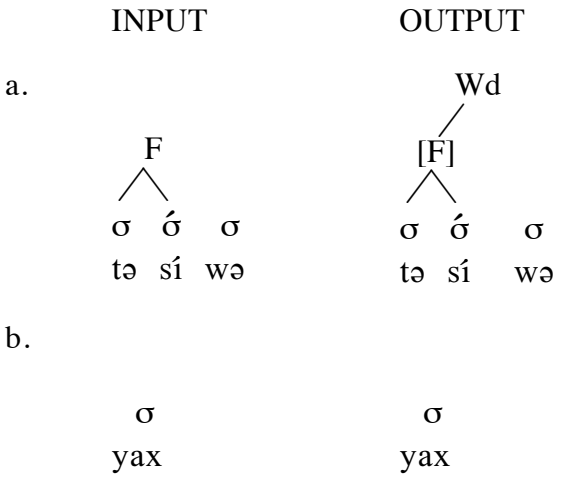
In this section, two alternatives to the Faithfulness-based analysis of dominant root stress are considered: the level-ordering analysis proposed in Crowhurst 1994 (§5.1), and a cyclic account along the lines of Halle & Vergnaud 1987 (§5.2).

5.1 A Level-Ordering Account

Crowhurst 1994 gives a level-ordering account of overriding 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.

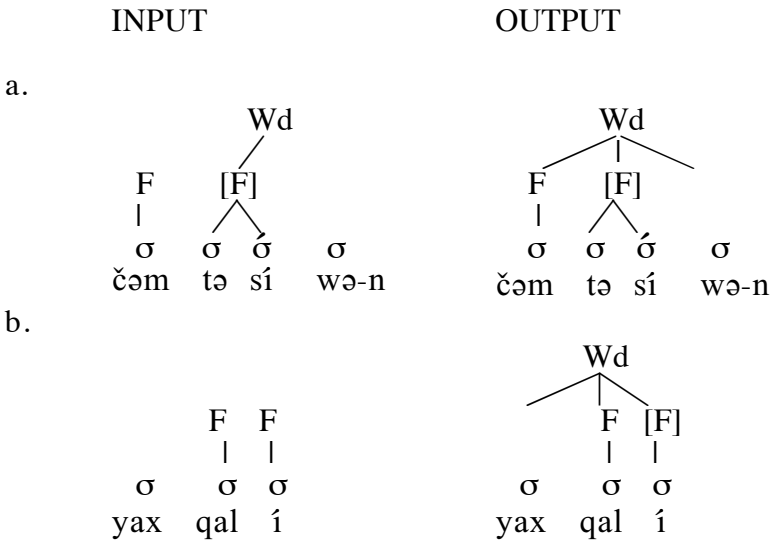
This analysis is depicted graphically in (52) below. The inputs to the Level 1 phonology differ in the presence of a lexical foot, and they are likewise distinguished in the output by the presence of a word-level category. The root syllable in (52b) cannot by parsed directly by the prosodic word because this option violates the principle of Strict Layering (Selkirk 1980), and furthermore, this form cannot be supplied with an epenthetic foot because this strategy is not available.

(52) Level 1 Phonology



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



In summary, the level-ordering analysis accounts for dominant 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 1982 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 the 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 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 specific 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.

5.2 A Cyclic Analysis

A different approach to dominant root stress can be modelled in the multi-stratal framework given in Halle & Vergnaud 1987. In this work, dominant morphemes are distinguished from recessive ones through cyclicity. In particular, dominant affixes are cyclic morphemes which are represented on a metrical plane which 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' (dat.sg.)
	/mitr+íṇ +e/	mitr+íṇ +e	'befriended' (dat.sg.)

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 (Halle & Vergnaud 1987)

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 dominant root stress in Cupeño. Suppose that the direction of copying can be parametrized 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 dominant root stress with the SEC. This is illustrated in the chart below.

(56) Dominant Root Stress in Cupeño

Cyclic Stratum	(Accented)	(Unaccented)	
Cycle 1	* təsíwə	yax	
Cycle 2	* čəm-təsíwə *	yax-qál-í * *	
OUTPUT	* čəm-təsíwə	* yáx-qal-i	Affix stress deleted by the 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.

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 1996) 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. The application of such a feature to account for dominant root stress in Cupeño, therefore, seems to make an empirical prediction for which there is no cross-linguistic support.

6. Summary and Implications

In this paper, 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 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) and other segmental processes like dissimilation (Holten 1995, Selkirk 1995b, Alderete 1997). 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 intricate language data with very limited resources.

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 some descriptive problems and loss of generalization. First, the level-ordering account was shown to rely on the assumption that bare bounded roots form cyclic domains, and this assumption was challenged on empirical grounds. Second, the cyclic alternative was shown to have a real 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 which are raised by the main ideas developed here. The first issue involves the examination of a set of languages which also encourage 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). A second case of predictable root stress is Chukchee, where stress typically falls on the rightmost vowel of the root (Krause 1979). 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 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 Athapaskan language Tahltan resolves 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-sé:h 'I talk', cf. hodéθi:-dé:h '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, the position of stress is contrastive in roots, leading to variation in stress in longer words, and furthermore, every root must have a stress. In this system, therefore, both a Faithfulness constraint requiring root stress is needed, and an over-arching constraint requiring every root to bear stress.

A second issue raised by the analysis proposed here has to do with sources of fixed stress within a paradigm. A basic result that follows from Root and Affix Faithfulness is that one source of fixed stress is root accentedness. That is, given the ranking of Root Faith above Affix Faith, all things being equal, accented roots should consistently override affix accent within a paradigm. This is certainly true in Cupeño: accented roots are always accented within their paradigms, and alternating accent is only found in words with unaccented roots. The validity of this approach in Cupeño raises the issue of how it will apply to other languages.

In this light, I think it will be fruitful to reexamine well-known lexical stress systems to see how this correlation is borne out. For example, a fundamental assumption in most analyses of Russian nominal stress (Halle 1973, 1996, Melvold 1990, Idsardi 1992) is that fixed noun stress is a property of words formed from acute stems, i.e. stems with inherently accented roots. Moveover, the overwhelming preference for suffixing morphology raises the question of whether fixed stress is due to an inherent property of roots, rather than something else.

In previous approaches to the problem, starting with Kiparsky & Halle 1977, morpho-accentual phenomena like this are captured by edge orientation. In particular, Russian stress is described with the Basic Accentuation Principle, which essentially states that the leftmost inherently accented morpheme surfaces with the unique word stress. Fixed stress in nouns is not due to root accentedness, therefore, but because accented roots are always leftmost in the word.

The thesis of Root-Controlled Accent does not eliminate edge orientation from the theory in general, but rather restricts it in a significant way. Succinctly, edge orientation should only have an effect when Faithfulness is not relevant. That is, for the edge orientation constraints to have any force, the Faithfulness constraints must either be (i) so low-ranking so as not to matter, or (ii) not relevant for the given tokens. A scenario exemplifying case (i) is verb accentuation in Tokyo Japanese: verbs contrast for accentedness, but this contrast is limited to the penultimate mora of the word (McCawley 1968, Poser 1984). Thus, the accentual contrast is tropic to a given position in the word, which shows that the set of constraints requiring penultimate accent must be ranked above Faithfulness. An example of the second case is Cupeño: unaccented roots are not affected by the Faithfulness constraints because they have no underlying accent to realize. Stress is thus assigned to an edgemost position, because Faithfulness is not relevant and a lower ranking Alignment constraint can take effect. In summary, the theory of morpho-accentual phenomena proposed here combines Root and Affix Faithfulness to characterize fixed and alternating stress, and reserves edge orientation for a limited set of cases.

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