

5.3 Pre-/Post-Accentuation as Transderivational Anti-Faithfulness

In this section, the affix-controlled phenomenon of pre- and post-accentuation (PPA) is examined and analyzed in terms of Transderivational Anti-Faithfulness, on a par with the analysis of dominance effects presented in the previous section. The discussion begins with an introduction to the problem, and then moves to an analysis of pre-accenting suffixes in Cupeño in §5.3.2 as an illustration of the basic analysis. Next, some further implications of the overall approach are examined (§5.3.3) and used as a means of contrasting the TAF theory of pre- and post-accentuation with some plausible alternatives (§5.3.4).

5.3.1 The Problem

An affix may trigger the insertion of an accent into the stem to which it is attached. When this insertion of an accent happens at the same time as prefixation, as exemplified in (56), it is referred to as POST-ACCENTUATION. When this morpho-accentual process correlates with suffixation, as shown by some familiar examples from Cupeño in (57), it is referred to as PRE-ACCENTUATION. The Cupeño examples illustrate a further property commonly found with PPA, namely that this process may not apply when the affix combines with an inherently accented root, as shown in (57b). (The pre-accenting suffixes in Cupeño are lexically marked with a subscript ‘pre’; roots are underlined.)

(56) Post-Accenting *ma-* in Tokyo Japanese (Poser 1984)

a.	/ma + futatu/	→	ma-ppútatu	‘exactly half’
	/ma + usiro/	→	ma-úsiro	‘right behind’
b.	/ma + yonaká/	→	ma-yónaka	‘dead of night’
	/ma + súgu/	→	ma-ssúgu	‘straight ahead’

(57) Pre-Accenting Suffixes in Cupeño (Hill 1967, Hill & Hill 1968)

a.	/w <u>ena</u> + nuk _{pre} /	→	w <u>ená</u> -nuk	‘having put in’
	/né + <u>ma</u> + č i _{pre} /	→	<u>nemá</u> -č i	‘with my hand(s)’
	/né + s <u>ula</u> + ?a + i _{pre} /	→	ne-s <u>ulá</u> -?a-i	‘my fingernails (object)’
b.	/ʔ <u>ísi</u> + lʔe + i _{pre} /	→	ʔ <u>ísi</u> -lʔ-i	‘coyote (objective case)’
	/m <u>éme</u> + yke _{pre} /	→	<u>méme</u> -yke	‘to the ocean’
	/t <u>ívii</u> ?e + maa _{pre} + le/	→	<u>tívi</u> ?-me-l	‘small round basket’

In Item-and-Arrangement-style frameworks, PPA is commonly analyzed as a floating auto-segment that is sponsored by the affix with which it co-occurs, but for various reasons ends up on a neighboring syllable. Assuming that pitch accents in Japanese are represented tonally, post-accenting *ma-* can be treated as a floating H tone in the lexical representation of this prefix; when this prefix combines with other morphemes, the result is an association of the H to a favored position in the word, for example stem-initially, as shown below.

These problems with the Floating Feature analysis bring to the fore two important questions that an adequate theory of pre- and post-accentuation must address:

1. Why is the affected syllable typically a neighbor to the triggering affix?
2. Why is pre- and post-accentuation always base-mutating?

The tack taken directly below is to develop an alternative to the Floating Feature analysis which makes crucial use of Transderivational Anti-Faithfulness constraints. As I show in this section, the analysis of PPA in TAF theory provides principled answers to these questions.

On a par with dominant affixes, pre- and post-accenting affixes subcategorize for a given correspondence relation, and upon this relation, high-ranking Transderivational Anti-Faithfulness constraints are formulated. Further, the anti-insertion constraint, DEP-PROM, has a counterpart in the set of Anti-Faithfulness constraints, namely \neg DEP-PROM, which specifically forces insertion of a prominence in the base. The basic features of PPA are thus explained as the negation of an existing Faithfulness constraint, together with the assumption that Anti-Faithfulness effects must be felt in the neighboring environment of the triggering affix. One of the locality requirements defined in §4.3 prescribed an alternation on an adjacent syllable, which, when applied to the Anti-Faithfulness constraint demanding an insertion of accent, triggers an epenthetic accent on the syllable directly following or preceding the affix involved, as sketched below. The square brackets indicate the scope of the Anti-Faithfulness effect.

(59) Pre- and Post-Accentuation as the Negation of DEP-PROM

Base	/ma + futatu/	\neg OO-DEP-PROM $_{\sigma}$	OO-DEP-PROM
a. futatu	ma-[ppu]tatu	*!	
b. futatu	ma-[ppu]tátu	*!	*
c. → futatu	ma-[ppú]tatu		*

Thus, the last candidate *ma-ppú*tatu is the winner because only it mutates the base by inserting an accent on a syllable close enough to the triggering affix.

From this brief sketch, it is clear how the TAF approach to PPA addresses the two questions given above. First, the locality conditions on PPA are accounted for in a general theory of locality effects, namely the set of locality conditions which are attested in one form or another in all affix-controlled processes. Second, PPA is base-mutating because it is affix-controlled, and all affix-controlled accentual processes must conform to Strict Base Mutation (see §4.3.3). Rather on a par with the treatment of these same properties found in dominance effects, therefore, the basic properties of PPA are explained with a unified theory of Transderivational Anti-Faithfulness. The overall cohesiveness of the theory is a further important advantage and will be used in the final subsection as a means of contrasting the TAF theory of pre- and post-accentuation with some previous approaches to the problem.

5.3.2 The Proposal: Pre- and Post-Accentuation as Negation of DEP-PROM

The Transderivational Anti-Faithfulness constraint, \neg OO-DEP-PROM, will be employed below in the formal analysis of morphologically conditioned accent insertion, or pre- and post-accentuation. Specifically, I will argue that the symmetric counterpart to \neg OO-MAX-PROM in the TAF constraints has a role in the analysis of affix-controlled accentual processes. To illustrate the basic features of this theory, we examine pre-accentuation in Cupeño in more detail, complementing the analysis presented in chapter 2 with a complete account of this important morpho-accentual process. A review of the data comes directly below, followed by the analysis within TAF theory.

Accent is culminative in Cupeño, and so when more than one inherently accented morpheme combines in word formation, only one of the accents can be realized. Like many morphologically governed accent systems, Cupeño shows a preference for realizing inherent accent in roots over affixes, as shown by the input-output mappings in (60a). Inherent affix accent is therefore only observed in words with unaccented roots, as exemplified in (60b). Finally, in words with more than one accented affix, the rightmost inherently accented affix surfaces with stress (60c).

(60) Cupeño Accent (Hill & Hill 1968, Crowhurst 1994, Alderete 1996)

a. Overriding Root Accent

/né + <u>Níy</u> + qál + í + pe/	→	ne- <u>Níy</u> -qal-i-pe	‘When I go away’
/pé + <u>Níy</u> + pi/	→	pe- <u>Níy</u> -pi	‘S/he would go away’

b. Inherent Affix Accent with Unaccented Root

/pé + <u>yax</u> /	→	pé- <u>yax</u>	‘S/he said’
/pé + <u>yax</u> + qál/	→	pe- <u>yax</u> -qál	‘S/he was saying’

c. Rightmost Inherent Accent Wins

/ <u>yax</u> + qál + í/	→	<u>yex</u> -qel-í	‘While s/he was saying’
/né + <u>wen</u> + qál/	→	ne- <u>wen</u> -qál	‘I was putting’

This last fact illustrates the rightward orientation of inherent accent. In the absence of any inherently accented morphemes, however, words receive initial stress, e.g., /yax + em/ → *yáx-em* ‘Speak (2nd Plural)’. In chapter 2, this pattern of conflicting edge orientations is analyzed in terms of conflicting Alignment constraints at different levels of analysis in the prosodic hierarchy. Words with no inherently accented morphemes are analyzed as lacking a level 3 grid mark, and as a result, receive default initial stress. I maintain this assumption in the assessment of base-output relations, but as explained below, this assumption is not crucial to the analysis of pre-accentuation in Cupeño.

Cupeño also has a set of pre-accenting suffixes which impose root-final stress. For example, the words in (61a) have pre-accenting suffixes (which are marked with the subscript ‘pre’), and these words all have root-final stress (see §2.4.3 for further exemplification).² Importantly, pre-accentuation is blocked in words with accented roots

²It appears that these suffixes do not simply require accent on the syllable directly preceding them, as Hill 1967 and Hill & Hill 1968 describe a pattern of pre-pre-accentuation in cases where the pre-accenting suffix is separated from the base by another affix, e.g., /né + s ula + ?a + i_{pre}/ → ne-s ula-?a-i ‘my fingernails (obj.)’. Because the conditions on this pattern are still unclear descriptively, I address it in a speculative way at the end of this subsection.

(61b). Thus, consistent with the general pattern in the language, inherent accent in roots impedes the realization of accent contributed by the pre-accenting suffixes.

(61) Pre-Accentuation in Cupeño (Hill 1967, Hill & Hill 1968)

a. Inherent Affix Accent with Unaccented Root

/né + <u>ma</u> + č i _{pre} /	→	ne- <u>má</u> -č i	‘with my hand(s)’
/ <u>wena</u> + nuk _{pre} /	→	<u>wená</u> -nuk	‘having put in’

b. Overriding Root Accent

/ <u>méme</u> + ‘y _e ke _{pre} /	→	<u>méme</u> -yke	‘to the ocean’
/ <u>tívi</u> ?e + ‘maa _{pre} -le/	→	<u>tívi</u> ?-mel	‘small round basket’

While pre-accenting suffixes are abundant in the language, not all of the suffixes are pre-accenting. Suffixes may be unaccented, and therefore they do not surface with accent, as in the plural imperative suffix *-em* in *yax-em* ‘Say! (2nd Plural)’. Alternatively, they may be accented, and therefore surface with stress when they attach to unaccented roots, e.g., *pe-yax-qál* ‘He was saying’. In summary, the pre-accenting suffixes differ from other affixes in the language in that the former trigger insertion of an accent into an unaccented stem.

The analysis of the first body of data given in chapter 2 is that Root Faith generally outranks Affix Faith (McCarthy & Prince 1995); as a result, this ordering is respected in the MAX-PROM constraints, as shown below.

(62) Accent in Cupeño

MAX-PROM_{Root} >> MAX-PROM_{Affix} >> ALIGN-R(PK, PrWd)

The above ranking correctly accounts for the observed patterns: a root accent takes precedence over an affix accent because the Prosodic Faithfulness constraint for roots is top-ranked. The rightmost inherently accented affix is realized only in the absence of accented roots.

The pre-accenting suffixes induce an insertion of accent somewhere in the root to which they attach. The phonological operation observed in pre-accentuation is therefore the insertion of an accent which is not present in the related form. The observed phonological pattern may be explained in terms of an Anti-Faithfulness constraint which negates the logical statement of DEP-PROM, as shown below.

(63) ¬DEP-PROM: For x a prominence, ¬[∀x ∃x', [x ∈ S₂ → x' ∈ S₁ & xRx']]
 ‘It is not the case that every prominence in S₂ has a correspondent in S₁.’

Satisfaction of ¬DEP-PROM entails the appearance of (at least) one epenthetic prominence. Formulated as a TAF constraint, ¬OO-DEP-PROM requires accent insertion in morphologically related words. On par with the analysis of dominance effects, therefore, the contrast between pre-accenting and non-pre-accenting affixes is established through constraint ranking, as shown below with two schematic rankings.

(64) Accent Insertion/No Accent Insertion through Constraint Ranking

a. Accent Insertion: $\neg\text{OO-DEP-PROM} \gg \text{OO-DEP-PROM}$

b. No Accent Insertion: $\text{OO-DEP-PROM} \gg \neg\text{OO-DEP-PROM}$

With $\neg\text{OO-DEP-PROM}$ ranked above OO-DEP-PROM , affixation will trigger an insertion of prominence in the base, as observed with the attachment of *-nuk* in [wena] \approx [wená-nuk]. On the other hand, if $\neg\text{OO-DEP-PROM}$ is ranked below OO-DEP-PROM , then affixation does not bring about a change in the base, as we have seen with the suffix *-em*, e.g., [yax(e)] \approx [yax-em]. Conflating these rankings in a single hierarchy yields the following constraint system.

(65) Pre-Accentuation in Cupeño

$\text{MAX-PM}_{\text{Root}} \gg \neg\text{OO}_{\text{Dom}}\text{-DEP-PM} \gg \text{OO-DEP-PM} \gg \neg\text{OO}_{\text{Rec}}\text{-DEP-PM}$

In this system, the same mnemonics from §5.2.2 are used. The pre-accenting suffixes trigger OO_{Dom} -correspondence, and because the Anti-Faithfulness constraint defined on this relation is high-ranking, these suffixes will bring about overt effects in base-derivative pairs. In contrast, words with non-pre-accenting suffixes are assessed by $\neg\text{OO}_{\text{Rec}}\text{-DEP-PROM}$, which, because of its low-ranking position in the constraint system, accounts for the lack of accent insertion. Finally, in this ranking, $\neg\text{OO-DEP-PROM}$ is ranked below the Root Faithfulness constraint, $\text{MAX-PROM}_{\text{Root}}$, and as a result, words with accented roots will always be faithful to the accentuation of the root.

The following lexical entries distinguish the pre-accenting suffixes and non-pre-accenting suffixes through the subcategorization of correspondence relations discussed above.

(66) Lexical Entries for Pre-Accenting and Non-Pre-Accenting Suffixes in Cupeño³

a.	<i>-nuk</i>	V_{Punc}	[[Verb] OO_{Dom} ___]	[Pre-Accenting]
	<i>-č i</i>	N_{Instr}	[[Noun] OO_{Dom} ___]	
	<i>-ye</i>	N_{Obj}	[[Noun] OO_{Dom} ___]	
	<i>-yeke</i>	N_{Dir}	[[Noun] OO_{Dom} ___]	
b.	<i>-qál</i>	$\text{V}_{\text{Past-dur}}$	[[Verb] OO_{Rec} ___]	[Non-Pre-Accenting]
	<i>-em</i>	$\text{V}_{\text{Imper (Pl)}}$	[[Verb] OO_{Rec} ___]	

With the contrast between the two affix classes established in the lexicon, the various patterns of Faithfulness and Anti-Faithfulness for accent may be modelled in terms of familiar types of constraint interaction, which I now illustrate.

Words with the suffix *-nuk* are sensitive to OO_{Dom} -correspondence. Therefore, because of the rank of $\neg\text{OO}_{\text{Dom}}\text{-DEP-PROM}$ in the system, this suffix brings about an insertion of accent in the derived form, specifically in the interval of the word which is also

³The morphological restrictions given in these entries are based on the grammatical sketch in Hill & Nolasquez 1973.

present in the base, as illustrated below (see §4.2.1 for discussion of the role of Stem-to-Stem correspondence in DEP-type constraints).⁴

(67) Pre-Accentuation with Suffix *-nuk*

Base	/wena + nuk _{pre} /	-OO _{Dom} -DEP-PROM	OO-DEP-PROM
a. wena	wena-núk	*!	
b. → wena	wená-nuk		*

The winner here is thus the base-derivative pair which achieves an overt opposition by inserting a non-lexical accent into the base, similar to the opposition realized as a deletion of accent found in words with dominant morphemes.

Pre-accenting suffixes must affect the base, but if the base of affixation is greater than one syllable, how is the site of prominence insertion predicted? As noted in §5.3.1, in many cases, the insertion site may be predicted from the locality requirements inherent to the process, e.g., Japanese pre-accenting suffixes must affect a neighboring syllable, and so these suffixes posit a threshold on the scope of Anti-Faithfulness (achieved through Local Conjunction in the domain of the syllable — see the analysis in §5.3.3.1 below). In Cupeño, however, the locality restrictions are less stringent (see footnote 19), and so the precise pattern of base mutation becomes an empirical issue. In such a context, lower-ranking constraints in the system, which are needed on independent grounds, become active and predict a specific pattern of Anti-Faithfulness, as illustrated below.

(68) Grammar Dependent Pre-Accentuation

Base	/wena + nuk _{pre} /	-OO _{Dom} -DEP-PM	OO-DEP-PM	ALIGN-R
a. wena	wena-nuk	*!		
b. wena	wéna-nuk		*	**!
c. → wena	wená-nuk		*	*

The fully faithful candidate (68a) is ruled out because the suffix *-nuk* is evaluated by -OO_{Dom}-DEP-PROM, and thus, words with *-nuk* must mutate the base by inserting a prominence. The remaining two candidates satisfy the Prosodic Anti-Faithfulness constraints in this way, and since they both violate OO-DEP-PROM equally, a different constraint is needed to separate them. The required constraint is the independently needed Alignment constraint, ALIGN-R, which favors final accent over non-final accent in the root, as this option better satisfies the gradient Alignment constraint. In sum, the inserted accent must appear in the base because TAF constraints always require base mutation, and the inserted accent must be stem-final because of the independently attested edge orientation for word accent.

⁴For ease of exposition, I assume that the bases here are not marked for an accent, i.e., a grid mark at the level on the grid where lexical accent is given (see §2.4.3 for discussion). While these unaccented words do have a prominent syllable (at level 2), they do not have a stress-accent (at level 3), which is the level upon which the Faithfulness and Anti-Faithfulness constraints operate. If it turns out there is a better analysis in which the bases here are in fact phonologically accented on the initial syllable, this would not affect the ranking argument here because the high-ranking Anti-Faithfulness constraint will still require an inserted accent, different from the one present in the base.

This last result highlights an important feature of the analysis, namely the treatment of grammar dependent morpho-accentual processes. Paralleling the treatment of dominant suffixes, pre-accenting suffixes in Cupeño require a change in the base, but the independently needed grammar of accent helps, in some contexts, to predict the overall character of the accentual change. In Russian, for example, the TAF constraint \neg OO-MAX-PROM requires a loss of accent in the base, but the dominated constraint POST-STEM-PROM determines the stress of de-accented words. Likewise, in Cupeño, \neg OO-DEP-PROM requires an insertion of accent in the base, but the lower-ranking constraint, ALIGN-R, is responsible for predicting where this epenthetic accent is placed in the base. Thus, there is a symmetry in the patterns of morphologically triggered Anti-Faithfulness in that they are both grammar dependent.

Returning to the details of the analysis, a different set of suffixes subcategorize for OO_{Rec} -correspondence, and as a result of the rank order of \neg OO_{Rec}-DEP-PROM, these suffixes do not condition pre-accentuation. The imperative plural suffix *-em* is one such suffix, and as illustrated in the following tableau, derivatives with this suffix are like their simplex bases.

(69) Lack of Pre-Accentuation with *-em*

Base	/yax + em/	OO-DEP-PROM	\neg OO _{Rec} -DEP-PROM
a. yax(e)	yáx-em	*!	
b. → yax(e)	yax-em		*

Because *-em* is itself unaccented, the larger word surfaces without an accent as a means of satisfying the Transderivational Prosodic Faithfulness constraints.

The next fact of interest here concerns the combination of a pre-accenting suffix with an accented root. As exemplified above, the inherent accent of the root wins out over the pre-accenting suffix, and this fact is also correctly predicted through constraint domination. Thus, employing the well-motivated distinction between Root and Affix Faithfulness, the constraint which requires realization of inherent accent in roots, namely $MAX-PROM_{Root}$, is ranked above the constraint which calls for pre-accentuation in pre-accenting suffixes, i.e., \neg OO_{Dom}-DEP-PROM. As illustrated below, the result of this ranking is that it is more harmonic to realize root accent than to mutate the base with an insertion of accent, even with the suffixes which are sensitive to \neg OO_{Dom}-DEP-PROM.

(70) Blocking Effect of RCA

Base	/mémé + yeke _{pre} /	IO-MAX-PM _{Root}	\neg OO _{Dom} -DEP-PM
a. mémé-t	memé-yke	*!	
b. → mémé-t	mémé-yke		*

The loser here satisfies the Anti-Faithfulness constraint, as the accentuation of the base is changed in base-output pairs, but this pattern is of little help because base-mutation in this context requires being unfaithful to the root accent on the IO-dimension. The winner is thus the candidate which fails to change the base as a means of satisfying high-ranking Root Faith.

Non-uniformity effects such as this were mentioned as a conceptual possibility in chapter 4: the demands placed on an affixed form by a TAF constraint can be stymied by

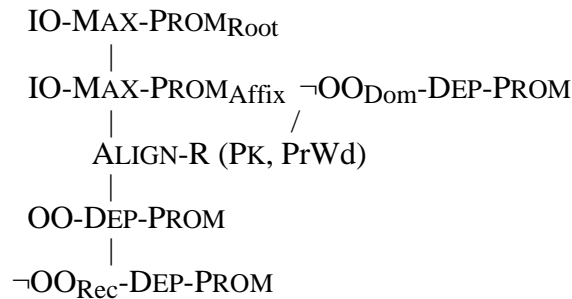
the force of an higher-ranking constraint. Pre-accentuation in Cupeño is thus a real life example of such an effect, providing empirical evidence for the approach taken here where constraint ranking plays a crucial role. Interestingly, many systems which have pre-accentuation exhibit this type of blocking effect. For example, in Getxo Basque, there are several pre-accenting suffixes, but these suffixes only trigger an insertion of accent in words with unaccented stems, again showing a role for Root Faithfulness in pre-accentuation. Another relevant example is metatony, or ‘pattern D mobile stress’ in Russian. As argued in §5.2.3, this pattern is best treated as a case of pre-accentuation; if this analysis is correct, it is significant that this pattern of mobile stress is only available in words with unaccented roots because only such forms will be able to insert a new accent into the stem.

Returning to the locality restriction on the site of accent insertion noted above, as this type of effect is one of the stated goals of this section, it is necessary to consider how to analyze this restriction. Unfortunately, the available evidence is rather inconclusive, so I can only make a speculative hypothesis at this time. Starting with my primary source, Hill & Hill 1968: 236 discuss a morphological restriction on the range of pre-accentuation, namely that the pre-accenting suffix may not be separated from the base by more than one affix. Megan Crowhurst (personal communication) suggests that this apparent morphological restriction may in fact be phonological. Given that almost all of the suffixes are monosyllabic at the surface, it may be possible to state this restriction in terms of a two syllable window: the accent contributed by the pre-accenting suffix must not be farther than two syllables from the triggering suffix. This kind of restriction would not come as a surprise, because, as noted in the introduction, there are a number of languages with PPA which exhibit a two syllable threshold.

The observed disyllabic threshold on pre-accentuation invites a foot-based interpretation: the inserted accent must appear in the foot directly preceding the pre-accenting suffix. To make this proposal more concrete, I assume that there is a relatively high-ranking constraint in the grammar which aligns a stress foot at the right edge of the stem (excluding the pre-accenting suffix). This constraint is of course subordinate to the Prosodic Faithfulness constraints which may bring about non-right-aligned feet and the Alignment constraint governing the edge properties of affix accent (see §2.4.3). In words with unaccented roots, however, this foot will always be right-aligned, providing the basis for the following restriction: the accent contributed by the pre-accenting suffix must be in the foot which abuts this suffix. In a case like the one given above, pre-pre-accentuation places an accent on the head of a trochaic foot, as in: [ne-[su(lá-?a)]_{Stem-i}], while pre-accentuation inserts an accent into the head of an iambic foot, as in [(wená)]_{Stem-nuk}. However, the inserted accent cannot be pre-penultimate in the stem because such a pattern would put an accent outside of the stress foot: [[$\acute{\sigma}$ (σ σ)]-af_{pre}]. Within the framework for locality effects developed in §4.3, this type of restriction is described by locally conjoining the TAF constraint with an Anchoring constraint in the domain of the prosodic foot, i.e., (\neg OO-DEP-PROM & ANCHOR(Stem, PrWd, R)_{Foot}). In the case study of Aguaruna presented in §5.4.3, there appears to be a similar type of restriction on accent shifts, namely that the shifted accent must be within the foot directly preceding the accent-shifting suffix. Thus, while there are still some formal details to be worked out, the facts here seem to pattern with other types of affix-controlled processes.

The following constraint hierarchy summarizes the ranking arguments given above in the analysis of pre-accentuation in Cupeño.

(71) Summary Ranking⁵



Reviewing the essential features of the analysis, with the IO-Root Faithfulness constraint top-ranked, words with accented roots will always be paired with derived forms which are faithful to this root accent. However, in derived words with an unaccented root and a pre-accenting suffix such as *-nuk*, the result is insertion of accent in the base, because the TAF constraint $\neg\text{OO}_{\text{Dom}}\text{-DEP-PROM}$ outranks OO-DEP-PROM. The constraint ranking here predicts a very specific pattern of base mutation, namely insertion of accent in the root-final syllable, as this pattern fares better on the relatively low-ranking Alignment constraint, ALIGN-R. Furthermore, suffixes such as *-em* subcategorize for OO_{Rec} -correspondence, and because the Anti-Faithfulness constraint defined on this relation is low-ranking, specifically ranked below the Transderivational Prosodic Faithfulness constraints, these suffixes contrast with the pre-accenting suffixes in not causing insertion of accent into the base. Finally, inherently accented affixes, such as *-qál*, may realize their inherent accent because $\text{IO-MAX-PROM}_{\text{Affix}}$ dominates the Anti-Faithfulness constraint sensitive to this non-pre-accenting suffix.

Now that I have constructed an analysis of a particular language, it is possible to establish more explicitly the relation between the TAF analysis of PPA and the analysis presented in the previous section for another type of affix-controlled accentual process, dominance effects. First, in the analysis of both dominance effects in Russian and of pre-accentuation in Cupeño, the affix-controlled process is lexically specified through subcategorization of correspondence relations. Thus, dominant suffixes and pre-accenting suffixes select a correspondence relation upon which a high-ranking Anti-Faithfulness constraint is defined, and as a result, only these suffixes trigger the process. Furthermore, in the TAF analysis for both types of affix-controlled processes, the observed processes are morphologically triggered and base-mutating. That is, in both analyses, the observed accentual change is a response to an OO-Anti-Faithfulness constraint, and because of their transderivational nature, the constraints only affect base-derivative pairs. The observed changes always affect the base, consistent with Strict Base Mutation.

An additional parallel between the TAF analyses of these two affix-controlled phenomena is that in both cases the morpho-accentual process is grammar dependent. That is, a TAF constraint requires an accentual change between a base and its derivative, and other constraints operative in the system play a role in predicting the precise nature of the

⁵The ranking of ALIGN-R above OO-DEP-PROM, though not apparent from the above discussion, is required to account for the fact that the base accent is not preserved in the base-output pair, *pé-yax/pe-yax-qál* ‘He says, was saying’; if the reverse ranking held, then prefix accent would be preserved in the derivative, instead of the observed pattern of rightward edge orientation.

change. In Russian, the constraint POST-STEM-PROM was responsible for the fact that de-accented words always surface with ending stress. In Cupeño too, the constraint ALIGN-R had a say in the pattern of Anti-Faithfulness observed in derived forms, namely that the inserted accent must be rightmost in the root. In both analyses, therefore, independently attested constraints on the distribution of accent have a formal role in characterizing the outcome of the morpho-accentual process.

Another important similarity between the TAF approaches to dominance effects and PPA, though not made explicit in these particular analyses, is that both approaches account for certain locality conditions on the range of an Anti-Faithfulness constraint. Thus, in the analysis of phrases with *no* in Tokyo Japanese (§5.2.4), the observed locality condition on de-accentuation is handled with the same machinery employed in characterizing locality effects in pre-accenting suffixes and post-accenting prefixes (discussed in more detail below). In both cases, accent deletion or accent insertion only affects a prosodic category which is adjacent to the relevant affix. This fact is described by locally conjoining a TAF constraint with an Anchoring constraint within the domain of the relevant prosodic unit. On this count too, therefore, TAF theory gives an integrated analysis of a related fact.

To conclude this subsection, I have shown in the context of a set of problems in Cupeño that the TAF theoretic analysis of pre- and post-accentuation accounts for all of the formal properties observed in other affix-controlled processes. This result is significant because it is the second step in establishing a fully integrated theory of ACA, a program which is to be continued in the next section. Furthermore, this result will also enable us to distinguish the TAF approach to PPA from other possible alternatives, which are studied in the last subsection.

5.3.3 Implications

5.3.3.1 Strict Base Mutation in Pre- and Post-Accentuation

Before we study to approaches pre- and post-accentuation in a wider theoretical context, I would like to flesh out some further implications of the TAF approach which will serve to distinguish it from various plausible alternatives. The first point involves the treatment of locality conditions and how the account in TAF theory extends to languages like Tokyo Japanese which have both pre-accenting suffixes and post-accenting prefixes. As I show below, the apparent bi-directional orientation for the accents introduced by these affixes follows quite naturally as an effect of Strict Base Mutation.

As illustrated with the following examples, Japanese has both prefixes which give stem-initial accent and suffixes which cause stem-final accent.

(72) Pre- and Post-Accentuation in Tokyo Japanese (Poser 1984: 54 ff.)

a.	/ma´ + futatu/	→	ma-ppú-tatu	‘exactly half’
	/ma´ + yonaká/	→	ma-yón-aka	‘dead of night’
b.	/yosida + ´ke/	→	yosidá-ke	‘the Yoshida family’
	/nisímura + ´ke/	→	nisimurá-ke	‘the Nishimura family’

The two patterns above are clearly connected by the fact that they are both base-mutating and subject to a locality requirement dictating that the insertion of accent be in an adjacent syllable.

How are these two related facts to be accounted for? The only mechanism for characterizing locality conditions in TAF theory is through Local Conjunction defined within certain morphological or prosodic categories, and thus the locality conditions on Japanese PPA must fall out from this theory. Consistent with the set of assumptions developed in §4.3, therefore, the observed locality conditions here may be characterized through local conjunction in the domain of the syllable, as in the constraint below.

- (73) $(\neg\text{OO-DEP-PROM} \ \& \ \text{ANCHOR-R/L}(\text{Stem}, \text{PrWd}))_{\sigma} \equiv \neg\text{OO-DEP-PROM}_{\text{Edge-}\sigma}$
 In base-derivative pairs, a prominence which is not present in the base must be inserted in the derived form in the syllable which is de-aligned through affixation.

$\neg\text{OO-DEP-PROM}$ is violated in a pair of related words where the derived word does not have an inserted accent in the base, while ANCHOR-R/L is violated in all affixed words because such words introduce material which stands in the way of perfect Stem-to-PrWd Alignment. On a strictly formal level, ANCHOR-R/L is a combination of two constraints, so the conjoined constraint here actually involves a conjunction of $\neg\text{OO-DEP-PROM}$ with an already conjoined constraint; since the two Anchoring constraints have the same overall effect, I refer to them jointly as ANCHOR-R/L .⁶ The conjunction of the TAF and Anchoring constraints in the domain of the syllable therefore entails that it is not allowed to de-align the stem through affixation and at the same time fail to insert an epenthetic prominence into the stem at the de-aligned edge. The effect of this complex constraint is illustrated in the following two sets of tableaux.

(74) Post-Accentuation in Tokyo Japanese

Base	Output	$\neg\text{OO-DEP-PROM}_{\text{Edge-}\sigma}$	OO-PROS-FAITH
a. futatu	≈ <u>ma</u> -[ppú]tatu		*
	*ma-[ppu]tatu	*!	
b. yonaká	≈ <u>ma</u> -[yó]naka		*
	*ma-[yo]naká	*!	
c. yosida	≈ <u>yosi</u> [dá]-ke		*
	*yosi[da]-ke	*!	
d. nisímura	≈ <u>nisimu</u> [rá]-ke		*
	*nisímu[ra]-ke	*!	

In the candidates above, the bracketed syllable identifies the locus of the Anchoring violations, and hence, the syllable in which the TAF constraint is active. As can be seen from each base-output pair, this constraint always rules out the fully faithful form in favor of a pattern of Anti-Faithfulness with insertion in a neighboring syllable. For example, in the losing base-output pairs in (74a) and (74b), failure to insert an accent in the first syllable of the stem results in a violation of the Anti-Faithfulness constraint $\neg\text{OO-DEP-PROM}$. Since this constraint violation is local to the violation of Anchoring incurred by

⁶Perhaps the combined force of these two constraints can be achieved with the Wrap constraints developed in Truckenbrodt 1995 and applied specifically to word-level units in Peperkamp 1997. The idea behind these constraints is the edge of the morphological stem must be ‘wrapped’ by, or co-extensive with, the edge of the PrWd (see also McCarthy & Prince 1994 for a related idea in the analysis of recursive stem structure in Diyari).

prefixation, these pairs are ruled out. The same holds with the pre-accenting suffixes shown in (74c) and (74d), except the insertion of a suffix in the derived form calls for accent insertion in the final syllable of the stem. As illustrated with the losing candidates, failure to insert an epenthetic accent in this context leads to a violation of the conjoined constraint, which effectively eliminates these base-output pairs as well.

To summarize the result here, the conjunction of the two constraints in the domain of the syllable requires a breach of Faithfulness in the syllable which is adjacent to the relevant affix. With this approach to the locality condition, the fact that prefixes are post-accenting and suffixes are pre-accenting is explained as an effect of Strict Base Mutation. Since TAF constraints require a mutation of the base of a morphological process, the directionality effects of the two types of affixes are explained by the subcategorization requirements which define the edge properties of the individual affixes. In this theory, therefore, there can be no pre-accenting prefixes nor post-accenting suffixes because, without a rather non-standard morphological analysis, such morpho-accentual processes are not base-mutating. This following statement foregrounds this prediction, which is a special type of SBM, and hence does not need to be stipulated in the analysis of PPA.

(75) Strict Base Mutation in Pre- and Post-Accentuation

Morphologically triggered insertion of accent always affects the base of affixation.

This prediction can be counter-exemplified in two logically possible scenarios: (i) an affix which causes insertion of an accent into a non-base affix, and (ii) a stem which inserts an accent into a neighboring non-base affix. The constraint behind the scenario in (i) is at work in the explanation of the two patterns of base-mutation in Japanese PPA. Concerning scenario (ii), however, it is interesting to review the stress system in Russian inflected nouns, as a common approach to the analysis of stress in Russian involves recognizing a set of ‘post-accenting stems’, so-called because they are claimed to trigger a shift of accent to the following vowel in the inflectional ending (see e.g. Melvold 1990 and references therein). If such a category was indeed required in the analysis of Russian stress, this system would constitute a clear counter-example to the restrictive claim established above. It turns out that this approach is unsatisfactory for several reasons, and so it does not refute the application of SBM to pre- and post-accentuation, as I will now show.⁷

Russian has two productive patterns of stress in nominal paradigms (which is mirrored in verbs and adjectives as well, as discussed in §3.2.3). These two patterns are exemplified below with two second declension nouns.

(76) Stress in Russian Noun Paradigms

a. Fixed Stem Stress	b. Fixed Inflection Stress	
kómnat-a	č 'ert-á	Nominative Singular
kómnat-e	č 'ert-é	Dative Singular
kómnat-am	č 'ert-ám	Dative Plural

⁷Another interesting case in regard to SBM is the Hare dialect of Slave, which, according to Rice 1989, 1990 has a two-way contrast between unmarked stems and stems which trigger the insertion of tone into the preceding syllable in verbs; in nouns, the marked tone stays on the stem. Following Rice 1990 (see also Gessner 1999), however, the retraction of tone specifically in verbs can be accounted with the special prosody characteristic of this word class, whereby the stem tone shifts to the preceding syllable to appear in the head of a trochaic foot.

‘room’

‘characteristic’

The first pattern, which is by far more common, is fixed stress on a stem vowel (76a). The second pattern, shown in (76b), constitutes roughly six percent of the total noun inventory and has fixed stress on the first vowel of the inflection ending (which is disyllabic in instrumental forms). Also, there are two minor stress patterns which involve mobile stress, but since they are unproductive, they will be treated later.

The analysis alluded to above, which I will call the Post-Accenting Analysis, accounts for these two basic patterns by assuming that the stems which form these paradigms are both inherently accented. Further, stems which give fixed ending stress are accented on the final syllable and lexically marked for the feature [+Post-Accenting], which systematically yields ending stress by triggering a rule of stress shift. Thus, a stem like *vkómnat* is accented on the first syllable which is preserved in surface inflected forms (because this stem is not post-accenting); the stem *vč'ért* is likewise inherently accented, but because it is post-accenting, its inherent accent always ends up on the first vowel of the inflectional ending.

This analysis is of course one among many, and the alternative analysis developed in §3.2 has a number of advantages over this approach. This alternative analysis is quite simple: paradigms with fixed stem stress have an inherently accented stem which is consistently preserved in surface forms because of high-ranking Root Faithfulness (on a par with Cupeño); paradigms with fixed inflection stress have unaccented stems and receive ending stress by default because there is a constraint in the grammar, POST-STEM-PROM, which actively requires stress in this position. I will refer to this analysis as the Root-Controlled Accent (RCA) analysis.

One advantage of the RCA analysis is that the constraint needed in the characterization of the default position for stress, POST-STEM-PROM, provides the right tool for explaining other stress patterns in which the post-stem vowel is the default position for stress. First, certain inflectional categories in some declension classes do not have an ending, e.g., the nominative and accusative singular in I and III declension nouns. In such contexts, if the noun has fixed inflection stress throughout the rest of the paradigm, these inflectional categories have stem-final stress, e.g., *topór*, cf. *topor-ú* ‘axe (nominative/dative singular)’, showing that POST-STEM-PROM sets the post-stem vowel as a target that is approximated in these forms.

The second form of evidence for the post-stem vowel as a default position involves the analysis of the two patterns of mobile stress in words with unaccented stems. One pattern, often called ‘pattern D’, has ending stress in the singular, but stem-final stress in the plural, e.g., *kolbas-á* ‘sausage (nom. sg.)’, cf. *kolbás-y* (nom. pl.). Another mobile pattern (‘pattern C’) involves initial stress in the singular, but ending stress in the plural, e.g., *kólokol* ‘bell (nom. sg.)’, cf. *kolokol-á* (nom. pl.). In §5.2.3, I explain both of these mobile stress patterns as an effect of an Anti-Faithfulness constraint requiring an overt difference between singular and plural forms. In particular, the plural suffixes are analyzed as pre-accenting and the change brought about in the plural is thus due to the base-mutating effects of the TAF constraint yielding pre-accentuation. For example, in the pattern D mutation, the singular form has default ending stress, as in *kolbas-á*, because that is the default position for stress in words with unaccented stems, as determined by POST-STEM-PROM. The TAF constraint therefore requires a minimal difference in the plural, which correctly predicts stem-final stress in *kolbás-y* as a minimal violation of POST-STEM-PROM. The same principles of morphological opposition are at work in the analysis of pattern C mobile stress, except this pattern is treated as a dominance effect. The singular

has lexically specified initial stress, as in *kólokol*, and the TAF constraint –OO-MAX-PROM therefore requires a deletion, with the result of giving ending stress in the plural, e.g., *kolokol-á*, as a means of satisfying POST-STEM-PROM. To summarize, the same constraint which is operative in the analysis of default ending stress also has a role in the analysis of these unproductive patterns of mobile stress, which provides further support for the RCA approach.

In contrast to the RCA analysis, the connection between the accentual defaults in the productive and unproductive stress patterns is unexplained within the Post-Accenting analysis. For example, pattern D mobile stress is analyzed as evidence for an additional rule, Stress Retraction, which targets an accent shifted to the inflectional ending, and moves it back to its lexical stem-final position, a ‘Duke of York’ derivation in the sense of Pullum 1976. The derivation for the plural form *kolbás-y* runs as follows: /kolbás + y/ → [kolbas-ý] → [kolbás-y]. Why is stress retracted specifically in the plural, and why is it retracted only one syllable? These are questions which arise in the Post-Accenting analysis but receive no explanation. In contrast, a straightforward response to these questions is given in the RCA analysis sketched above. The stress is mutated in the plural as a means of supporting a morphological contrast; the shift is only one syllable because this shift minimally violates POST-STEM-PROM.

The overall argument here is thus that the Post-Accenting analysis is inferior to the Root-Controlled Accent analysis because the latter explains a wider range of data with a cogent analysis. The superiority of the RCA analysis therefore vitiates the assertion that Russian counter-exemplifies the application of the thesis of Strict Base Mutation to pre- and post-accentuation. Since there is an alternative to the Post-Accenting analysis which is superior, it does not follow that Russian must be analyzed as having post-accenting stems.

5.3.3.2 Dominant/Recessive Pre-Accentuation in Tokyo Japanese

The next set of implications to be examined involves the treatment of dominant pre- and post-accenting affixes. The languages studied thus far, namely Cupeño, and tangentially Russian, all involve a non-uniform pattern of pre-accentuation in which the pre-accenting suffixes only induce an accentual change in words with unaccented roots. However, PPA may apply across the board in some instances, causing deletion of a stem accent in derived forms. Thus, one finds cases of dominant, pre-accenting suffixes, such as the suffix *-ke* in Tokyo Japanese,⁸ where both accented and unaccented stems receive an epenthetic accent.

⁸There is a possible analysis of dominant pre-accenting suffixes as the second member of a compound: short second members typically give final accent in the first member (see chapter 3, section 3 for data and analysis), which is consistent with the observed pattern here. Recessive pre-accenting suffixes, however, cannot be treated this way, as compounding is generally insensitive to the accentuation of the first member, i.e., it deletes the accent if there is one. Since this fact shows that there are at least some pre-accenting suffixes, I follow Poser 1984 in assuming that dominant pre-accentuation is a linguistically significant morpho-accentual pattern in Japanese.

(77) Dominant Pre-Accenting suffix *-ke* (Poser 1984: 55)

- a. /yosida + ke/ → yosidá-ke ‘the Yoshida family’
 /ono + ke/ → onó-ke ‘the Ono family’
 /matumoto + ke/ → matumotó-ke ‘the Matsumoto family’
- b. /nisímura + ke/ → nisimurá-ke ‘the Nishimura family’
 /ándoo + ke/ → andóo-ke ‘the Ando family’
 /sátoo + ke/ → satóo-ke ‘the Sato family’

The introduction of dominant pre-accenting *-ke* leads to a situation of constraint conflict that must be resolved through constraint interaction. Thus, it is a consistent fact that accent is culminative in Tokyo Japanese in that every minor phrase has at most one pitch accent. In §3.3, this fact is treated as a consequence of the building up of prominence structure, but here we will simply refer to the generic constraint CULMINATIVITY to account for the ‘one accent per phrase’ fact (see §1.2.2.3 for the formal details). Because this constraint is undominated in the language, attachment of *-ke* leads to the following question: should accented stems preserve their inherent accent, or should this accent be lost in favor of the epenthetic accent called for by the pre-accenting suffix? As illustrated below, this competition for the unique word accent can be successfully resolved by ranking $\neg\text{OO}_{\text{Dom}}\text{-DEP-PROM}_{\text{Edge-}\sigma}$ (an abbreviation of the complex constraint in (73)) above the IO-Faithfulness constraint calling for faithful realization of stem accent.

(78) Dominant Pre-Accenting *-ke* (with accented base *nisímura*)

/nisímura + ke/	CULMIN	$\neg\text{OO}_{\text{Dom}}\text{-DEP-PROM}_{\text{Edge-}\sigma}$	IO-MAX-PM _{Root}
a. nisímurá-ke	*!		
b. nisímura-ke		*!	
c. → nisimurá-ke			*

The loser in (78a) attempts to satisfy both of the constraints which call for a surface accent, but by doing so, this candidate violates the high-ranking constraint in the language requiring a unique accent. The remaining two candidates have a single accent, but only the form in (78c) satisfies the TAF constraint requiring an accent adjacent to the pre-accenting suffix, and since this constraint is ranked above the IO-Faithfulness constraint, this candidate is the winner.

Applying the same logic, pre-accentuation is predicted in forms with unaccented stems. Thus, if the TAF constraint outranks the anti-insertion constraint in roots, an inserted accent will appear on the stem-final syllable, despite the fact that this candidate violates a different form of Root Faithfulness.

(79) Dominant Pre-Accentuation with *-ke* (with unaccented base *yosida*)

/yosida + ke/	$\neg\text{OO}_{\text{Dom}}\text{-DEP-PROM}_{\text{Edge-}\sigma}$	IO-DEP-PROM _{Root}
a. yosida-ke	*!	
b. → yosidá-ke		*

This ranking is of course crucial in the account of pre-accentuation with accented stems because stems receive an inserted accent in these contexts as well.

The summary ranking for dominant pre-accentuation is given below, which will later be subsumed in a larger ranking accounting for recessive pre-accentuation.

(80) Dominant Pre-Accentuation in Tokyo Japanese

CULMIN, \neg OO_{Dom}-DEP-PROM_{Edge-σ} >> IO-MAX-PROM_{Root}, IO-DEP-PROM_{Root}

In this ranking, words may only have one surface accent, and since the TAF constraint is ranked above the two Root Faithfulness constraints, pre-accentuation is predicted across the board.

A different pattern of pre-accentuation is observed with the suffix *-si*, which is characterized as recessive pre-accenting because it fails to insert an accent in words with accented stems. Consider the following examples, which are organized by accentual type.

(81) Recessive Pre-Accenting suffix *-si* (Poser 1984: 54)

- | | | | | |
|----|-----------------|---|-------------|-----------------|
| a. | /yosida + si/ | → | yosidá-si | ‘Mr. Yoshida’ |
| | /ono + si/ | → | onó-si | ‘Mr. Ono’ |
| | /matumoto + si/ | → | matumotó-si | ‘Mr. Matsumoto’ |
| b. | /nisímura + si/ | → | nisímura-si | ‘Mr. Nishimura’ |
| | /ándoo + si/ | → | ándoo-si | ‘Mr. Ando’ |
| | /sátoo + si/ | → | sátoo-si | ‘Mr. Sato’ |

The different phonological behavior observed with *-si* is further evidence that affix classes may be defined by OO-correspondence relations. Thus, the distinction between pre-accenting and non-pre-accenting suffixes in Cupeño involves subcategorization of distinct OO-correspondence relations. Here too, it appears that different correspondence relations define two affix classes, both of which happen to be pre-accenting. Thus, in contrast to the dominant pre-accenting suffixes such as *-ke*, which subcategorize for OO_{Dom}-correspondence, there pre-accenting suffix *-si* selects OO_{Rec}-correspondence. When properly ranked in relation to the IO-MAX-PROM_{Root}, the TAF constraint sensitive to words with *-si* will give the correct output. As shown in the following tableau, only derived words with unaccented stems will receive an epenthetic accent (82a), cf. (82b) (the base forms here correspond to the underlying forms for each stem).

(82) Recessive Pre-Accentuation with *-si*

Base	Output	IO-MAX-PROM _{Rt}	\neg OO _{Rec} -DEP-PROM _{Edge-σ}
a. yosida	≈ yosidá-si		
	*yosida-si		*!
b. nisímura	≈ nisímura-si		*
	*nisimurá-si	*!	

Thus, on a par with the analysis of a parallel set of facts in Cupeño, the domination of a TAF constraint by IO-MAX-PROM_{Root} gives the recessive behavior of the pre-accenting suffixes. Thus, the root-controlled nature of Japanese surfaces here as well, as Root Faithfulness also has a role in blocking pre-accentuation in some forms.

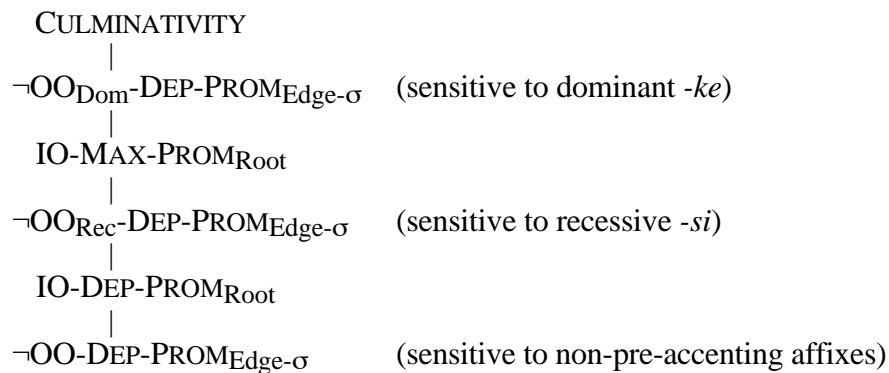
To summarize, the ranking for recessive pre-accentuation is given below.

(83) Recessive Pre-Accentuation in Tokyo Japanese

CULMIN, IO-MAX-PROM_{Root} >> \neg OO_{Rec}-DEP-PROM_{Edge- σ} >> IO-DEP-PROM_{Root}

Incorporating the subhierarchies argued for above gives the following totally ordered ranking.

(84) Summary Ranking



The suffix *-ke* triggers OO_{Dom}-correspondence, and as a result of the rank of \neg OO_{Dom}-DEP-PROM_{Edge- σ} , above IO-MAX-PROM_{Root}, this suffix is dominant pre-accenting. The suffix *-si* subcategorizes for OO_{Rec}-correspondence, and thus, because of the intermediate rank of the TAF constraint defined on this relation, *-si* is recessive pre-accenting. Finally, some affixes subcategorize for a generic OO-correspondence relation, and since \neg OO-DEP-PROM_{Edge- σ} is so low in the constraint system, these affixes do not trigger accent insertion in any environments.

5.3.3.3 Factorial Typology

It is worth considering a wider range of possible rankings at this time to see what kinds of patterns TAF theory actually predicts. It turns out that we have already encountered all of the predicted patterns in the discussions developed thus far in this section and in §5.2. To prove this assertion, however, it is necessary to construct a factorial typology with all of the relevant Faithfulness and Anti-Faithfulness constraints, which we turn to below.

To simplify the constraint permutations, I will limit the re-rankings to four constraints, namely OO-DEP-PROM and OO-MAX-PROM, and their corresponding Anti-Faithfulness constraints \neg OO-DEP-PROM and \neg OO-MAX-PROM. While certainly the relative ordering of other prosodic well-formedness constraints is relevant in predicting the precise character of an accentual process, the rank of these constraints will only give the default patterns (or possibly certain kinds of blocking effects), which are not the focus of this experiment. The Prosodic Faithfulness constraint OO-NO-SHIFT-PROM and its corresponding TAF constraint are also relevant to studying the range of affix-controlled

accentual processes. Because of the nature of these constraints, however, they do not interact crucially with the MAX and DEP constraints examined here. Concretely, accentual shifts are only possible when a lexical accent has been preserved; since reversals of MAX-PROM and DEP-PROM require deletion of accent and insertion of a non-lexical accent, constraints on the migration of a base accent do not enter into the factorial typology of these constraints. Thus, these two sets of constraints can be studied separately.

A factorial typology with four constraints yields twenty-four possible grammars. It is unnecessary to examine each grammar in detail, however, as there are certain regular patterns which emerge with the constraint rankings we have already examined. Thus, the schematic rankings for pre- and post-accentuation and dominance effects discussed previously are given in (85a) and (85b) below. The remaining rankings order an Anti-Faithfulness constraint relative to MAX-PROM, which determines whether or not an Anti-Faithfulness effect is found in a word with a lexical accent. Thus, a process is characterized as dominant if MAX-PROM is dominated (85c), and hence, the lexical accent is deleted. By contrast, if MAX-PROM is ranked above a TAF constraint (85d), the process is recessive, and accordingly is blocked by the presence of a lexical accent. Of course, if the Anti-Faithfulness constraint in (85d) is \neg MAX-PROM, then there is no process at all, but the affix in question is still characterized as recessive in this typology. As all Anti-Faithfulness effects are derived in surface-to-surface correspondence, I will leave out ‘OO-’ because it is redundant.

(85) Decisive Rankings for Prosodic Faithfulness and Anti-Faithfulness

- a. \neg DEP-PROM >> DEP-PROM → Accent Insertion
- b. \neg MAX-PROM >> MAX-PROM → Accent Deletion
- c. \neg F >> MAX-PROM → Process is Dominant
- d. MAX-PROM >> \neg F → Process is Recessive

With these characteristic rankings, we may describe all of the patterns predicted in the factorial typology, which are shown in the following implicational statements.

(86) Typology of Morpho-Accentual Processes

- a. If (85a) and (85c) → Dominant PPA
- b. If (85a) and (85d) → Recessive PPA
- c. If \neg (85a), and (85b) → Dominant Default
- d. If \neg (85a), and \neg (85b) → Faithful Mapping

Starting with (86a-b), if the ranking for accent insertion holds, namely \neg DEP-PROM >> DEP-PROM, then in all the grammars generated in this theory, the result is pre- and post-accentuation. This statement holds, even if \neg MAX-PROM is top-ranked in the constraint system. The reason for this is that \neg DEP-PROM demands an insertion of a non-lexical accent, while \neg MAX-PROM requires a deletion. In a language where both are top-ranked, the two constraints work together to achieve a deletion in words with a lexical accent in the base, as shown in (87a) below. Furthermore, in a language in which (85a) holds, unaccented bases will receive an epenthetic accent in the derived form, as shown in

(87b). The indices here show the correspondence relations between prominences in base-output pairs.

(87) Obligatory Accent Insertion with \neg DEP-PROM and \neg MAX-PROM Top-Ranked

Base	Output	\neg DEP	\neg MAX	DEP	MAX
a. x ₁ root	≈ x ₂ root + af			*	
* x ₁ root	x ₁ root + af	*!	*		*
* x ₁ root	root + af	*!			*
b. root	≈ x ₂ root + af			*	
* root	root	*!			

Examination of the base-output pairs in (87) reveals an interesting property of the constraint interaction with these two TAF constraints: a violation of \neg MAX-PROM always entails a violation of \neg DEP-PROM. Thus, the rank of the Anti-Faithfulness constraint \neg MAX-PROM is not relevant in distinguishing the different types of PPA as the effects of \neg MAX-PROM are eclipsed by \neg DEP-PROM, a point which will be returned to below. The differences in the type of PPA thus derive exclusively from the rank of \neg DEP-PROM relative to MAX-PROM. If MAX-PROM is ranked above \neg DEP-PROM, then a recessive pattern of PPA is predicted (86b), as we have seen in the case study of Cupeño and with certain suffixes in Japanese. If, on the other hand, the reverse ranking holds (86a), the predicted outcome is dominant PPA, as with pre-accenting *-ke* in Japanese. In sum, if \neg DEP-PROM \gg DEP-PROM, then an accent is inserted in the base, and the rank of MAX-PROM determines the dominant or recessive nature of the affix triggering the insertion.

The remaining twelve grammars have DEP-PROM \gg \neg DEP-PROM, and as a result, an accent is not obligatorily inserted. As shown in (86), there are basically two types of patterns which can result in such a scenario. First, if the accent deletion ranking holds (85b), then the result is a ‘dominance effect’, i.e., deletion of an accent with the emergence of a default pattern, as we have encountered in Russian and Japanese in §5.2. In this type of system, the rank of DEP-PROM is irrelevant because \neg DEP-PROM is crucially dominated, so new accents do not have to be introduced (though they may, for phonological reasons). Furthermore, the dominance effect here is the deletion of an accent, so the anti-insertion constraint has no role in defining the morpho-accentual process. Of the twelve remaining grammars, six will have \neg MAX-PROM ranked above MAX-PROM, and all of these grammars will exhibit dominance effects.

In the last six grammars, both of the Anti-Faithfulness constraints are dominated by their related Faithfulness constraints, and so these grammars will always give faithful treatment of the prosody of the base form. Thus, the remaining quarter of the rankings have no process at all. The following chart summarizes the patterns which are possible by the typology developed here and relates them to particular examples that we have seen so far.

(88) Typology of Morpho-Accentual Processes

- a. Dominant PPA Japanese *-ke* (§5.3.3)
- b. Dominant Default Russian *-ač* (§5.2.2) , Japanese *-kko* (§5.2.3)
- c. Recessive PPA Cupeño *-nuk* (§5.3.2), Japanese *-si* (§5.3.3)
- d. Faithful Mapping Russian *-ic* (§5.2.3), Cupeño *-em* (§5.3.2)

The first pattern examined above is dominant PPA, as exemplified by Japanese *-ke*. This type of affix-controlled process is analyzed as the result of a grammar with \neg DEP-PROM ranked above the related constraint DEP-PROM, and MAX-PROM is crucially dominated. The second affix-controlled accentual process involves de-accentuation with an accentual default, i.e., dominance effects as observed with some derivational suffixes in Russian. This pattern of Anti-Faithfulness is accounted for by a grammar in which \neg MAX-PROM dominates MAX-PROM, and additionally, \neg DEP-PROM is ranked below DEP-PROM (if the reverse ranking holds, the result is dominant PPA). The third affix-controlled process is recessive pre- and post-accentuation, as observed with many suffixes in Cupeño. This non-uniform pattern of Faithfulness and Anti-Faithfulness is approached as a consequence of a ranking \neg DEP-PROM above DEP-PROM, but below MAX-PROM, an interspersing of constraints which is unavoidable in this theory. Lastly, the final kind of morpho-accentual phenomena is not a process at all, but rather a fully faithful mapping from the base to its derivative; this common pattern of output-to-output Faithfulness is accounted for with the complement set of rankings, i.e., those rankings in which the both Faithfulness constraints outrank their related Anti-Faithfulness constraint.

5.3.4 Discussion of Alternatives

Now that the implications of the TAF theory of affix-induced accent insertion has been outlined, we may consider a set of alternatives to this theory. Two important issues in the discussion that follows concern how these alternative theories account for grammar dependence and Strict Base Mutation effects. Also, while some alternatives successfully account for these properties of ACA, they do so in a way that fails to make the connections with other affix-controlled accentual processes. Thus, similar to the conclusion reached in §5.2.5, the TAF theory of pre- and post-accentuation (PPA) prevails over the alternatives on theoretical grounds, relating a heterogeneous body of facts with an integrated theory.

A common approach to accent-inserting morphemes in metrical stress theory is that they are lexically specified for a structure that would cause a stress (or a tonal accent indirectly) to appear on a nearby syllable. This general mode of analysis is assumed by many (HV, Kager 1989, Halle & Kenstowicz 1991, Idsardi 1992, McCarthy 1995, Itô, Kitagawa, & Mester 1996, among others), and since each implements the basic idea differently, it is necessary to examine a particular theory in order to develop a careful argument. Therefore, I will discuss the Lexical Edge Marking (LEM) theory of Idsardi 1992 as the representative of this group, though the same basic arguments can be made for the other approaches.

In Idsardi 1992, lexical edge markings for certain morphemes conspire with other rules which assign metrical constituency to give the effect of PPA. In particular, a lexical bracket is posited for pre-accenting suffixes, which guides the construction of other higher level metrical constituents, assigned by other rules of edge marking and head specifications. Applying these ideas to Cupeño, the pre-accenting suffixes *'-nuk* and *'-č i* are pre-specified for a left bracket to their left. Considering the example in (89a), root-final stress is derived by building a right-headed constituent at the next level, as shown in (90).

Furthermore, an example like that in (89b), with an inherently accented prefix and a pre-accenting suffix, shows that an additional layer of structure is needed in order to derive the preference for stress on the rightmost head, as shown below.

- (89) a. /wena + ´nuk/ → wená-nuk ‘having put in’
 b. /né + ma + ˇč i/ → ne-má-č i ‘with my hands’

(90) Cupeño Pre-Accentuation with Lexical Edge Marking (after Idsardi 1992)

LEM	x x) x wena + nuk	x) x) x ne + ma + ˇč i
Head: Right	x x x) x wena + nuk	x x x) x) x ne + ma + ˇč i
Edge: RRR Head: Right	x x) x x) x wena + nuk	x x x) x) x) x ne + ma + ˇč i
Output Form	[wená-nuk]	[ne-má-č i]

The assumption that metrical constituents are right-headed, together with a final pass of End Rule Right (= the edge marking parameter RRR), correctly describes the observed facts.⁹

A significant problem with LEM theory is that it does not account for Strict Base Mutation effects. Thus, if pre- and post-accentuation is the result of a lexical edge marking, nothing stands in the way of positing a bracket at the edge of a stem, yielding a post-accenting or pre-accenting stem (as is employed in the analysis of Russian oxytones, Idsardi 1992 §4.2; see arguments in §3.2 and §5.3.3.1 in the present work, however, that Russian post-accenting stems are spurious). Such effects are ruled out in TAF theory as a matter of principle, and so this theory makes a substantive restriction on this morpho-accentual process that is not made in LEM theory. To develop this point further, consider the assumptions that need to be made to account for pre- and post-accentuation in Japanese. Recall from §5.3.3.1 that the post-accenting prefix *ma-* yields an accent on the first syllable of the stem, as in *ma-ppútatu* ‘exactly half’, while the pre-accenting suffix produces stem-final accent, e.g., *yosidá-ke* ‘the Yoshida family’. Assuming the necessary lexical edge markings shown below, it is impossible to describe both pre- and post-accentuation in the same system without extra derivational steps.¹⁰ Thus, if right-headed constituents are built at the next level, then *ma-* incorrectly yields stem-final accent (as indicated with the “↓” arrows); conversely, if a left-headed constituent is built, then *ke-* yields stem-initial accent (shown by the “↑” arrows), contrary to fact.

⁹I will ignore the problem posed by overriding root accent here, which introduces an additional wrinkle, because it is orthogonal to the argument

¹⁰And further, other lexical edge markings will not bring more straightforward results here; if a right bracket is switched for a left bracket, or vice versa, this will not bring about the desired effect of placing an accent on the stem.

(91) Pre- and Post-Accentuation in Japanese with Lexical Edge Marking

LEM	x (x x x ma + pputatu	x x x) x yosida + ke
Head: Right	*↓ x (x x x ma + pputatu	↓ x x x) x yosida + ke
Head: Left	↑ x (x x x ma + pputatu	*↑ x x x) x yosida + ke

Succinctly, since pre- and post-accentuation is a combination of the edge markings of a particular morpheme and the head parameters of higher level structure, a single specification for the head parameter cannot account for the conflicting edge properties of these affixes. It is of course true that additional mechanisms can be introduced to rectify this situation. For example, a bounded constituent can be built at the next level with an opposite specification for the head parameter at the level below it; or alternatively, these affixes could be handled with additional representational levels, making different metrical constituents possible. However, the analysis of Strict Base Mutation effects such as these in TAF theory presents a simpler alternative. As shown by the account given in §5.3.3.1, both affixes must mutate the base of affixation, so the fact that accent appears on the stem in both cases, follows from the assumptions inherent to TAF theory. The only additional step needed in this analysis is to limit this mutation to the syllable neighboring the base-mutating affix. The tool for describing this type of locality effect, Local Conjunction, is shown in §4.3 to apply to a variety of affix-controlled processes, both accentual and non-accentual ones, and thus it is clear that this mechanism is needed independently. To summarize, LEM theory does not account for Strict Base Mutation as the assumptions of this theory do not rule out pre- and post-accenting stems, nor does it give a principled account of post-accenting prefixes and pre-accenting suffixes in the same language.

A different approach, which solves some of the problems clarified above, involves the assignment of the property of Invisibility to a morpheme, making it outside the domain of an accentual process (see Poser 1982, 1984, cf. Archangeli & Pulleyblank 1984 and Barker 1989). As shown in Poser 1984, this mode of analysis provides a means of characterizing processes which apply specifically to the base of affixation, in effect deriving what I am calling Strict Base Mutation effects. Thus, suppose that the pre-accenting suffix *ke-* and the post-accenting prefix *ma-* discussed above are invisible to processes assigning accent. The insertion of accent triggered by these affixes — however this is achieved — must be base-mutating, because the affix itself is invisible, as illustrated below.

(92) Pre- and Post-Accentuation in Japanese with Invisibility

- a. /⟨ma⟩ + futatu/ → ⟨ma⟩-ppútu
- b. /yosida + ⟨ke⟩/ → yosidá-⟨ke⟩

Some further details are needed to account for the fact that the inserted accent appears on a neighboring syllable, but if the affixes themselves are inherently accented, then substantive restrictions on the migration of this lexical accent will account for the observed locality effects (see Myers 1997a, Bickmore 1996, and the case study of Aguaruna in §5.4.4 for some leading ideas). To summarize, there is an interesting point of intersection here between the TAF theory of PPA and a theory which espouses Invisibility; both derive base-mutating accent insertion from their inherent assumptions.

The role of Invisibility does not extend to Strict Base Mutation in dominance effects, however. As discussed in detail in §5.2.4, the TAF theory of dominance effects

rules out the possibility of a root idiosyncratically triggering a deletion of accent in a nearby affix; since TAF constraints are transderivational, accent deletion must be within the base of affixation. In contrast, the observation that the base is always targeted in dominance effects does not follow from the lexically idiosyncratic assignment of Invisibility. Concretely, lexical assignment of Invisibility will not preclude a deletion of affix accent caused by a root; to do so would entail marking every affix as invisible, which is clearly not a valid option.¹¹ From these considerations, it appears that Invisibility does make an interesting connection with base-mutating TAF constraints, but it does not provide the basis for a restrictive theory of affix-controlled accentual processes in general, excluding certain logically possible insertion or deletion processes.

As discussed throughout this section, pre- and post-accenting affixes tend to show locality effects: the inserted accent is often on a nearby syllable.¹² A recent approach to pre- and post-accentuation derives this fact from the alignment of prosodic and morphological categories (McCarthy & Prince 1993a). In particular, Kager 1996 proposes that pre-accentuation is due to a lexical marking for an alignment property, namely alignment to a base-final stressed syllable. Spelling out these assumptions for Cupeño entails a complex constraint like the one given below.

- (93) PRE-ACCENT \equiv ALIGN(Affix_{pre}, L, Root, R) &_{or} ALIGN(Affix_{pre}, L, PROM, R)
 The left edge of pre-accented suffixes (a lexically marked class) must coincide with both the right edge of the root and the right edge of a prominent syllable.

In addition to being suffixes, i.e., affixes which appear to the right of a root, pre-accenting suffixes must be aligned to the right edge of a prominent syllable.¹³ When ranked properly in the constraint hierarchy (see §2.4.3 for more details), this constraint derives the desired result of ensuring the attachment of pre-accenting suffixes to a root with final stress, as depicted below.

(94) Pre-Accentuation in Cupeño through M_{Cat}-P_{Cat} Alignment

/wena + nuk _{pre} /	PRE-ACCENT	ALIGN-R(PEAK, PrWd)
wéna-nuk _{pre}	*!	
→ wená-nuk _{pre}		*

The Alignment theory therefore accounts for one of the basic properties of PPA, namely that the inserted accent appears on a syllable close to the affix. Furthermore, a natural extension of this idea can account for pre-pre-accentuation, as is found in Japanese (Poser 1984) and some limited contexts in Getxo Basque (see Hualde & Bilbao 1993); requiring the affix to attach to a trochaic foot gives the effect of pre-pre-accentuation.

The Alignment theory therefore seems to have a possible advantage over the TAF theory of PPA because it derives locality effects with its most basic premise, namely that morphological and prosodic categories must coincide (though the Alignment theory has some problems with non-local morpho-accentual phenomena, discussed below). Furthermore, the Alignment theory makes do with constraints that are independently

¹¹Though certain cases can be ruled out as Extended Invisibility effects — see the discussion of Turkish stress in Poser 1984 for details.

¹²Thanks to John Kingston for encouraging me to consider this alternative.

¹³The combination of requirements here is the meaning of the ‘or’ in the conjunction of these two constraints; if either of the two constraints are violated, the conjoined constraint is too (Hewitt & Crowhurst 1996, Crowhurst & Hewitt 1997, cf. Smolensky 1993).

needed elsewhere in morpho-phonology. For example, the subcategorization-type Alignment constraints are needed in the characterization of the alignment properties of affixes. Likewise, the second MCat-PCat Alignment constraint appearing in the complex constraint, ALIGN(Affix_{pre}, L, PROM, R), is also motivated by the existence of infixes which seek out the stressed syllable in a word, as found in Samoan (Broselow & McCarthy 1982) and the Nicaraguan language Ulwa (see McCarthy & Prince 1993b for discussion and analysis). The Alignment theory is therefore equal to the TAF theory of pre- and post-accentuation in this respect (see §4.3 for motivation of Anti-Faithfulness outside the domain of accentual systems).

The Alignment theory does not account for two basic properties of pre- and post-accentuation, however, which distinguishes it from the TAF theory. First, Alignment does not exclude pre- or post-accenting stems or roots. The distinction between pre-accenting and normal affixes in this theory is established with a lexical marking for the two affix classes. The assumptions inherent to this theory, therefore, do not rule out the same lexical distinction in the analysis of pre- or post-accenting roots or stems. Indeed, such a constraint is employed in §3.2 in the analysis of stress in Russian inflections, though the effects of this constraint are not lexical. Thus, while the Alignment theory can describe base-mutating PPA by specifying the proper arguments in an Alignment constraint, the theory does not provide a basis for ruling out certain unattested types of PPA, as TAF does, which is a major flaw of this theory.

Second, the Alignment theory does not account for grammar dependent accent insertion. The site of accent insertion in this theory is purely the result of the forced alignment of an affix with a root-final stressed syllable. The connection with other constraints in the grammar is not made, as it is in TAF theory through the use of independently needed constraints on the distribution of accent. In the analysis of Cupeño pre-accentuation sketched above, it is an accident that the accent contributed by the pre-accenting suffix is rightmost in the root. In other words, PPA has very limited scope in the Alignment theory, essentially restricted to an adjacent prosodic category, or two units from the accent-inserting affix through the use of metrical structure discussed above. If there is an overlap between the location of the inserted accent and the Alignment properties of accent found elsewhere in the language, this result does not follow from the assumptions inherent to the theory, and this constitutes a major problem for this approach as well.

In connection to this last point, there is a clear dividing line between the Alignment theory, on the one hand, and the three other theories discussed here, namely, TAF, LEM, and Invisibility. The former does not provide a means of describing non-local accentual insertions, i.e., affixes which trigger an insertion of accent in a unit which is not restricted to the morpheme boundary separating the base and affix. If PPA is due to the alignment of an affix and a prosodic category, then the affix in question must be bound by that prosodic category. This requirement does not hold, however, of the other three theories, though in the TAF theory, non-local accent insertions occur under very special circumstances. Specifically, if an accentual change is not subject to locality conditions, then it will arise as a consequence of the independently motivated constraints on the distribution of accent. Thus, a logical possibility in this theory, as with LEM and theories with Invisibility, is a suffix which triggers an insertion on an initial syllable, regardless of the size of the base. Other possibilities are prefixes which trigger insertion of an accent on the penultimate or final syllable. It is crucial, however, in the TAF theory that the site of insertion be default positions in some sense; this is because when affix-controlled accentual processes are not local, they must be grammar dependent.

At present, a robust set of examples in accent systems showing the ‘opposite-edge’ effects described above is not forthcoming. There are a few relevant examples, however, which suggests that further investigation may turn up a larger set of examples. For example, Hill & Hill 1968: 236 mention two suffixes, namely *-wee* ‘present imperfect (plural subject)’ and *-weene* ‘past imperfect (plural subject)’ which specifically trigger an insertion of stress into the first syllable of the root. Also, Melvold 1990 discusses one unproductive suffix, *-En*, which is claimed to bring about stem-initial stress (though see discussion in §5.3). While these examples are not solid, one clear case of an opposite-edge effect brought about through affixation involves certain length alternations commonly found in Wakashan languages. In Nuucha’anulh, for example, certain suffixes trigger a lengthening of the word-initial syllable, regardless of the distance separating them from the beginning of the word. As suggested to me by Douglas Pulleyblank and Darin Howe (personal communications), it appears that this pattern of lengthening makes sense in the system as a whole because independently needed constraints on initial prosodic feet dictate that a long vowel on the initial syllable is a preferred quantitative pattern. It seems, therefore, that a more careful look at the edge effects brought about by special affixes may lead to the discovery of the predicted patterns here, and I so leave this empirical issue for future research.

5.4 Accent Shifts as Transderivational Anti-Faithfulness

Up to this point, we have studied two patterns of Anti-Faithfulness: dominance effects brought about by the TAF constraint \neg MAX-PROM and accent insertion due to \neg DEP-PROM. The proposal is thus that two of the Prosodic Faithfulness constraints have corresponding Anti-Faithfulness constraints, and that these constraints explain the properties of two known morpho-accentual processes. If the TAF theory of affix-controlled processes is fully symmetric, meaning there is an Anti-Faithfulness constraint for every Faithfulness constraint, it follows that there should be a third pattern of Anti-Faithfulness, namely a shift in accent predicted by the negation of the remaining Prosodic Faithfulness constraint, NO-FLOP-PROM. In this section, I show that some accent systems do indeed exhibit this pattern, and that this type of affix-induced accentual process therefore provides further empirical confirmation of the overall approach taken here.

5.4.1 The Problem

Affixes may trigger a shift of the accent in the base to which they attach. For example, in Tokyo Japanese, certain suffixes require a shift of the base accent, as shown by the words in (95a) formed with the suffix *-mono* ‘thing’. In (95b), the same suffix is used with an unaccented stem and the result is an unaccented word, showing that the suffixes specifically shift a lexical accent.

(95) Accent Shift in Tokyo Japanese (McCawley 1968, Poser 1984)

a.	/káki + mono/	→	kakí-mono	‘scroll’
	yómi + mono/	→	yomí-mono	‘reading matter’
b.	/nori + mono/	→	nori-mono	‘vehicle’
	/wasure + mono/	→	wasure-mono	‘forgotten item’

A second example of this morpho-accentual process is found in the Jivaroan language Aguaruna. This language has a large number of ‘accent-shifting’ suffixes that shift the lexical accent of the stem one mora to the right in the derived form. The accusative and possessive forms in (96) illustrate this morphologically triggered shift, which can be seen by comparing the position of accent in these derivatives with its position in the related nominative base forms.

(96) Accent Shift in Aguaruna (Payne 1990)

Nominative	Accusative	Possessive	
núka	nuká-n	nuká-nuu	‘leaf’
kawáu	kawaú-n	kawaú-nuu	‘parrot’
kaš ai	kaš ái-n	kaš ái-nuu	‘paca’

The accent shifts illustrated above in Japanese and Aguaruna have all of the properties of affix-controlled accentual processes laid out in §5.1. First, the accent shifts are lexically idiosyncratic: certain suffixes trigger the shift, while others do not, e.g., the negation suffix *-č uu* in Aguaruna is not accent-shifting: *núka-č uu* ‘not a leaf’. Second, the accentual shift is morphologically triggered; it correlates with the application of the morphological process of affixation. Thus, these shifts differ from stress shift in English

which is governed purely by phonological principles. Third, they are base-mutating in that they shift the accent of the base. Fourth, Aguaruna provides good evidence for a locality requirement on accent shift. As noted in Payne 1990: 181, the base accent must be ‘close enough’ to the suffix in order to trigger the shift; compare the forms above with the nominative-accusative pair, *ámuntai* and *ámuntai-n* ‘buzzard’, where the base accent does not shift because it is further from the suffix than is acceptable to condition the process.

A fifth important property of accent shift in these languages is that it is grammar dependent. In Japanese, the shift is to the rightmost syllable of the stem, which is the default edge for accent, as the analysis of noun-noun compounds given in §3.3 demonstrates. Likewise, in Aguaruna, the direction of the shift triggered by suffixation is to the right, and there is additional evidence in the language that accent is oriented to the right edge of the word. Thus, when accented vowels are deleted by the regular rules of syncope, the accent typically shifts to the right, as in /uNuš í-numi-š akam/ → *uNuš -núm-š akam* ‘tree species’. The fact that accent shift in the derived words above patterns with accent shift under syncope shows that the same principles are at work, which is the definition of grammar dependence.

These facts show that the morphologically triggered accent shifts in Japanese and Aguaruna have all of the formal properties of other affix-controlled processes like dominance effects and pre- and post-accentuation, and the central goal of this section is to provide a principled explanation of this finding. The larger theoretical framework for achieving this result is already in place: morphologically conditioned shifts are due to Transderivational Anti-Faithfulness. The only new element in the theory is to propose that the Prosodic Faithfulness constraint NO-FLOP-PROM has a counterpart in the set of TAF constraints, which is clearly an expected consequence of the theory of Anti-Faithfulness. The application of this new constraint to Aguaruna sketched below.

(97) Accent Shift in Aguaruna as Transderivational Anti-Faithfulness

Base	/kawáu + na/	–OO-NO-FLOP-PM	OO-P-FAITH	ALIGN-R
a. kawáu	kawáu-n	*!		
b. kawáu	káwau-n		*	**!
c. → kawáu	kawaú-n		*	

The accusative suffix is accent-shifting, and thus triggers an OO-correspondence relation upon which high-ranking –OO-NO-FLOP-PROM is defined. This high-ranking TAF constraint rules out the fully faithful base-output pairing in (97a) because the two related outputs have identical prosody. The remaining two candidates therefore satisfy –OO-NO-FLOP-PROM by shifting the accent in the derived form, but only the form in (97c) satisfies this constraint at the same time that it satisfies the lower-ranking constraint ALIGN-R. Since this constraint also has a role in the analysis of shift under syncope, the outcome here is predicted by an independently motivated constraint in the grammar. In this way, the analysis of morphological accent shifts in TAF theory explains the properties of this affix-controlled process on par with the same explanation offered for other grammar dependent affix-controlled processes.

The remainder of this section is structured as follows. In the next subsection, a peculiar pattern of tone retraction in Limburg Dutch is studied and used as a means of motivating the basic constraint formula that is at work in accent shifts. Subsequently, §5.4.3 looks at various accent-shifting suffixes in Tokyo Japanese, and it is argued that this case provides additional empirical support for the overall approach because of the

grammar dependent nature of the morpho-accentual process. Finally, an extended case study of accent in Aguaruna is given in §5.4.4, and an analysis of grammar dependent accent shift is presented as further support for the TAF approach.

5.4.2 Dragging Tone Mutation in Limburg Dutch: Evidence for –NO-FLOP

The two examples sketched above involve rightward accentual shifts which are triggered by suffixation. While a purely phonological account of these shifts is highly problematic (discussed in detail below), this perhaps more standard approach is not totally ruled out. In the case study that follows, an affix-controlled process in Limburg Dutch is examined which actually involves a retraction of an accent with suffixation. I show that this pattern of accentual mutation is an expected pattern of accent shift, given that the TAF constraint responsible for accent shifts does not specify a direction for the shift. I then discuss the problems which arise if one treats this pattern in purely phonological terms and compare this pattern with some other types of accentual shifts that can be attributed to negations of NO-FLOP constraints.

The morpho-accentual process in Limburg Dutch is clearly tonal in nature, and so the analysis requires the use of Faithfulness and Anti-Faithfulness for tone structure, which is independent of prominence structure. However, the same basic principles are at work in this case as those which will be employed in Japanese and Aguaruna below, and so it is appropriate to compare these different accentual systems. A final word before we begin; all of the data and many important analytical insights into the system come from Hermans 1991, which presents and analyzes the results of extensive fieldwork on the Maasbracht dialect of Dutch Limburg.

5.4.2.1 Data and Observations

Most dialects of Limburg Dutch (LD), including the Maasbracht dialect discussed here, show a contrast between a ‘falling tone’ and a ‘dragging tone’, which is exemplified in (98). Phonetically, the falling tone has a high tonal target at the onset of its syllable, which falls swiftly. The realization of the dragging tone is context-dependent. Utterance-medially, it is a level high; but utterance-finally it has a ‘concave’ structure, meaning that the first component is falling, while the second component is rising.

(98) Contrastive Accent in the Maasbracht dialect of Limburg Dutch

a. Falling Tone	b. Dragging Tone
bíi ‘bee’	bíi ‘at’
vríi ‘to court’	vríi ‘free’
zúa ‘right!’	zúá ‘like that’
báe l ‘to ring’	báé l ‘last name’
dáe n ‘fir’	dáé n ‘then’
píip ‘to squeak’	pííp ‘pipe’
wíis ‘melody’	wíís ‘wise’

The main constraint on the distribution of this tonal contrast which is relevant here is that falling tones only contrast with dragging tones if the syllable has at least two sonorants beyond the onset cluster. In the examples above, the contrast is observed in syllables with two vowel slots or in syllables with a vowel plus a sonorant, but not in syllables with a

single sonorant. Hermans therefore characterizes LD as a ‘mora-accenting’ language like Lithuanian because the distribution of accent in moraic subconstituents of the syllable is distinctive.¹⁴

In underived words, therefore, one observes a contrast between falling and dragging tones which is subject to certain phonological restrictions. This contrast is also governed by a morphological restriction. As exemplified below in (99a), certain suffixes cause the dragging tone of the base to become a falling tone. These suffixes include the masculine singular suffix *-ð* (a schwa-like vowel) which is added to adjectives (Masc.), the feminine counterpart to this suffix (Fem.), which is often segmentally null, and the comparative suffix *-ðr*. The mutation affecting the dragging tone is blocked, however, when the stem-final consonant is (underlyingly) a voiceless obstruent, as shown by the examples in (99b).¹⁵

(99) Accent Shift in Derived Environments

		Masc.	Fem.	Comp.	
a.	wíís	wííz-ð	wíís	wííz-ðr	‘wise’
	stííf	stíív-ð	stííf	stíív-ðr	‘stiff’
	káál	káal-ð	káal	káal-ðr	‘bald’
	láám	láam-ð	láam	láam-ðr	‘paralyzed’
	brúún	brúun-ð	brúun	brúun-ðr	‘brown’
	fíín	fíin-ð	fíin	fíin-ðr	‘refined’
	táám	táam-ð	táam	táam-ðr	‘tame’
b.	ríík	ríík-ð	ríík-ð	ríík-ðr	‘rich’
	záát	záát-ð	záát-ð	záát-ðr	‘drunk’

An important point is that this mutation is one-way. That is, while the dragging tone becomes a falling tone in this morphological context, the falling tone does not become the dragging tone, or a different tone, in the same context. Also, Ben Hermans (personal communication) points out that there is a locality restriction on the dragging tone mutation: in inflected nouns, the dragging tone only mutates to the falling tone if it appears in the stem-final syllable. Thus, in disyllabic nouns such as *vóóXðl* ‘bird’ and *káámðr* ‘room’, inflected forms retain the dragging tone because it is not stem-final.¹⁶ This observation is

¹⁴In addition to this restriction, there are a number of distributional gaps which show certain segmental restrictions on the different tones. For example, the falling tone is not found in syllables ending in consonant clusters in which the final member is a (voiceless) obstruent. As these restrictions do not bear directly on the matters at hand, I refer the readers to Hermans’ discussions, pp. 300, 302 ff., 312 ff.

¹⁵While many of the endings in this dialect trigger the tonal mutation exemplified here, it is not a consistent property of inflectional suffixes. For example, Ben Hermans (personal communication) states that the two overt allomorphs of the plural suffix do not trigger the change from a dragging to a falling tone, as shown by the word pairs: *bláát/blááj-ðr* ‘leaf (singular/plural)’ and *búúr/búúr-ð* ‘peasant (singular/plural)’. So, it appears that whether or not an affix triggers the mutation is a property that must be lexically specified.

¹⁶Though there are some noun-verb pairs which show tonal slip on a non-final syllable; for example, the minimal pair *vÁÉrs’Il* ‘difference’ and *vÁÉrs’Il* ‘to differ’ contrasts only in the tonal event in the stem-initial syllable. This morpho-accentual process is clearly distinct, however, from the cases involving

significant because it classifies the morpho-accentual process here with other affix-controlled accentual processes which may also exhibit locality effects. To summarize the larger set of patterns, the inventory of underived words countenances a contrast between falling and dragging tones. This contrast is, however, neutralized in certain derived environments because of the mutation of the dragging tone in stem-final syllables.

5.4.2.2 Tone in Monomorphemic Words

Hermans' analysis of this mutation assumes that the accent-shifting suffixes have a underlying low tone which shifts to the second mora of the preceding syllable, effectively accounting for the loss of the dragging tone in exactly these contexts. While Hermans' analysis has its merits, especially in the analysis of the segmental restrictions on the mutation, I will pursue an alternative to this analysis here which establishes a relationship between the dragging tone mutation and the accent shifts found in Japanese and Aguaruna. Furthermore, there is another, more substantive, reason for developing this alternative. I seek to develop an analysis of LD accent which does not require a lexical contrast for low (L) tones, with the obvious advantage that lexical accent in LD would be comparable to other pitch accent languages which are described purely in terms of the distribution of a high (H) tone (as argued in Pulleyblank 1986, Myers 1987a, Blevins 1993, among others). The analysis I develop here makes crucial use of a TAF constraint which requires an overt 'flop' of a tone as observed in the mutation of the dragging tone. Since this analysis is transderivational in nature, however, it requires first an analysis of the falling/dragging tone contrast. I present this analysis directly below, followed by the analysis of the dragging tone mutation.

In the analysis of the tonal inventory, I assume that the basic contrast is represented through the association of a H tone. Thus, following Blevins' 1993 analysis of Lithuanian, the falling tone has a H tone over the first sonorant, as shown below. On the other hand, the dragging tone is represented as a doubly-linked H tone, a structure argued for in many Bantu languages (see Odden 1995 and references therein) and for the Kyungsang dialects of Korean (Kim 1996). The tone-bearing units (TBUs) here are moras, and so I assume that sonorants which receive a H tone are moraic.

(100) Tonal Inventory in Underived Words

Falling Tone	Dragging Tone
$\begin{array}{c} \text{H} \\ \downarrow \\ \text{C}\acute{\text{V}} \text{VC} \end{array}$	$\begin{array}{c} \text{H} \\ / \quad \backslash \\ \text{C}\acute{\text{V}}\acute{\text{V}} \text{C} \end{array}$

Concerning the context-dependent realization of the dragging tone, I assume that the observed concave structure utterance-finally is due to a boundary tone, presumably a phrase-final H, which accounts for the elevated pitch curve phrase-finally.

One type of accentual pattern commonly found in mora-counting languages such as Greek and Lithuanian is missing in LD, namely a 'rising' accent in which an H target appears only on the second TBU of an accented syllable. The following constraint, formulated in the theory of Generalized Alignment (McCarthy & Prince 1993a), accounts for this distributional gap.

inflectional suffixes examined here, as it is derivational. Further, it does not involve overt affixation, so the difference in the locus of the mutation does not come as a surprise.

(101) ALIGN-L(H, σ)

The left edge of every H tone must coincide with the left edge of some syllable.

The representations for the falling and dragging tones will not violate ALIGN-L(H, σ) because both accentual types have a left-aligned H tone. On the other hand, rising tones such as CVV́C are systematically ruled out because they require an initial mora without a H tone. This same constraint is probably at work in Tokyo Japanese, where accented syllables always have accent on the initial mora. In mora-accenting languages which have rising tones, I assume that this constraint is dominated by the relevant Tone Faithfulness constraints.

The tonal specifications yielding the contrast here are tropic to a single syllable in a word — call it the tonic — and so in polysyllabic forms there is only one contrast between falling and dragging tones. While this issue is not central to our chief concerns here, I follow Hermans in assuming that there is a separate constraint in the language which requires an accent (realized tonally) on the tonic, which is the head of the main stress foot. Thus, within the framework of ideas in Hermans 1991, accent in Limburg Dutch is ‘composite’ in nature; an independent constraint requires the head position in the word to have a tonic, but the actual realization of the accent is characterized by the tonal structure of the head position. Also, it is clear that there is also a role for head syllable Tonal Faithfulness here (see Alderete 1995, 1997a, and Beckman 1997 [1998]), in order to account for the fact that specifically this syllable supports a tonal contrast, but non-head syllables do not. Following Yip 1996, who accounts for a related pattern of tonal reduction in Chinese dialects, I assume without argument that the Tonal Faithfulness constraints are relativized to the head of a stress foot, and that this accounts for the privileged Faithfulness properties of these positions in the word.

The analysis as it has been sketched thus far is consistent with a number of analyses of Bantu languages (see e.g., Pulleyblank 1986, Myers 1987a, 1997a, Bickmore 1996, 1997, Zoll 1996b) in which the tone structure of a form is described purely in terms of high tonal targets, with L tones, if needed at all, being filled in ‘by default’. Conceived in terms of Markedness and Faithfulness constraints, a language with only surface H tones entails that L tones are more marked than H tones, as derived by the following Markedness subhierarchy.

(102) Tonal Markedness Subhierarchy (see Zoll 1996b and Myers 1997a)

*L >> *H

The grammar of a tone system with only surface H’s is constructed by ranking the Tone Faithfulness constraints between these two Markedness constraints (illustrated below for LD). The Tone Faithfulness constraints (TONE-FAITH) which are ranked relative to these markedness constraints are given below, following some leading ideas in McCarthy 1997’s formulation of Moraic Faithfulness constraints.

(103) Tone Faithfulness (see Myers 1997a, Yip 1996, Zoll 1996b, Bickmore 1996)

MAX-TONE: ‘No deletion’

Every tone in S_1 has a correspondent in S_2 .

DEP-TONE: ‘No insertion’

Every tone in S_2 has a correspondent in S_1 .

NO-FLOP-TONE: ‘No loss of links’

$\forall x \forall y \forall z, x \in \text{tone}, y \in \text{sponsor}, z \in \text{link}$, if x and y are associated by z in S_1 , then $\exists x' \exists y' \exists z'$ s.t. $(x, y, z)R(x', y', z')$ and x' and y' are associated by z' in S_2 .

NO-SPREAD-TONE: ‘No insertion of links’

$\forall x \forall y \forall z, x \in \text{tone}, y \in \text{sponsor}, z \in \text{link}$, if x and y are associated by z in S_2 , then $\exists x' \exists y' \exists z'$ s.t. $(x, y, z)R(x', y', z')$ and x' and y' are associated by z' in S_1 .

The first three constraints are familiar since they have counterparts in the family of Prosodic Faithfulness constraints used throughout this thesis. A substantive difference between prominence structure and tonal structure, namely that tones may spread and be doubly linked, requires an additional constraint, NO-SPREAD-TONE, which militates against the spreading of a tone.

The rankings of these constraints required from Limburg Dutch are given below.

(104) Rankings for Limburg Dutch

- a. *L >> MAX-TONE: no lexical contrast for L tones.
- b. MAX-TONE, NO-FLOP-TONE >> *H: lexical associations for H tones are faithfully mapped onto output forms (in head syllables).
- c. ALIGN-L(H, σ) >> NO-FLOP-TONE: H tones not linked to the first mora of syllable will be linked to the first more in the output.

The effects of these constraint rankings are illustrated in the large tableau in (105). First, with the Tonal Markedness constraint *L ranking above TONE-FAITH, specifically above MAX-TONE, surface forms only have H tones. Therefore, if an input has a lexical L tone, as in (105a) below (L tones here are marked with a grave accent), then this tone is deleted in the output because of high-ranking *L. Second, the Alignment constraint ALIGN-L(H, σ) rules out syllables without an initial H tone, as shown in the IO-mapping in (105c). Finally, the ensemble of TONE-FAITH constraints outrank *H, and as a result, doubly associated H tones (i.e., the dragging tones), are faithfully mapped onto related outputs. In particular, because NO-FLOP-TONE dominates *H, the association of the lexical H to the second TBU is lost in the surface form, as shown in (105b).¹⁷

¹⁷This last ranking argument assumes that multiple associations of a single feature can lead to multiple violations of the related Featural Markedness constraint. If Beckman 1997 is right, and this type of association leads to a single violation of Featural Markedness, then this constraint ranking is unnecessary. A different constraint ranking is nonetheless required, in which the Tone Faithfulness constraints outrank the constraint prohibiting double association.

(105) Illustration of Results for Inventory of Underived Words

Input	Output	ALIGN-L(H, σ)	*L	TONE-FAITH	*H
a. /bî/ →	bíí			*(MAX-TONE)	
	*bî		*!		*
b. /bíí/ →	bíí				**
	*bíí			*(NO-FLOP-TONE)!	*
c. /bíí/ →	bíí			*(NO-FLOP-TONE)	*
	*bíí	*!			*

To give an interim summary, an accent is required in the head syllable of the main stress foot, which accounts for the observed distribution of accent. The realization of this accent tonally is governed further by ALIGN-L(H, σ), the Tonal Markedness constraints, and a set of Tone Faithfulness constraints. The interaction of these constraints, shown in (105) above, accounts for the inventory of tonal contrasts in the head position of the word.

5.4.2.3 Tonal Mutation in Derived Environments as \neg NO-FLOP-TONE

Now that I have given the constraint rankings necessary for the tonal inventory in underived words, we can move to the treatment of derived forms, which is relevant to the character of the Anti-Faithfulness constraint employed in accent shifts. As illustrated below, the tonal inventory in certain derived words is more restricted because of the mutation of the dragging tone.

(106) Tonal Inventory in Derived Words (with Accent-Mutating Suffixes)

- a. ĆV́ C ≈ ĆV VC-V (Mutation: Dragging → Falling)
- b. ĆV VC ≈ ĆV VC-V (No Mutation)

Any analysis of accent in LD will therefore need to account for the observed neutralization of contrast in these derived forms.

The phonological operation observed in the dragging tone mutation is the obligatory loss of an autosegmental link. Since NO-FLOP-TONE governs Faithfulness to this tone to sponsor affiliation, it follows that the negation of NO-FLOP-TONE will give the desired outcome, as spelled out below.

(107) \neg NO-FLOP-TONE

\neg [$\forall x \forall y \forall z, x \in \text{tone}, y \in \text{sponsor}, z \in \text{link}$, if x and y are associated by z in S_1 , then $\exists x' \exists y' \exists z'$ s.t. $(x, y, z)R(x', y', z')$ and x' and y' are associated by z' in S_2 .]

While \neg NO-FLOP-TONE can be satisfied by a complete shift of a tone to a neighboring TBU, this constraint is also satisfied when a doubly-linked structure loses a link, which is

exactly the observed pattern in LD. This result is illustrated below with explicit representations of the base-derivative mapping.

(108) Structural Characteristics of Dragging Tone Mutation



The second mora (dominating the second vowel) in the base stands in correspondence with the second mora of the derivative. The H tones likewise stand in correspondence; thus, since the base H is associated with the second mora, the loss of a link to the corresponding mora in the derivative violates NO-FLOP-TONE as defined above. Therefore, this loss of a link to a base H tone satisfies the negation of this Tone Faithfulness constraint, \neg NO-FLOP-TONE. Another important role for correspondence of links is that it allows for non-overt satisfaction of a TAF constraint, as needed in the analysis of accent shifts in Japanese (discussed in §5.4.3).

Formulated as a TAF constraint, \neg OO-NO-FLOP-TONE will operate on base-derivative pairs. Using the usual ranking logic, the following schematic rankings predicts the presence or absence of a tone flop mutation.

(109) Schematic Rankings

- a. Obligatory Tone Flop: \neg OO-NO-FLOP-TONE >> OO-NO-FLOP-TONE
- b. No Tone Flop: OO-NO-FLOP-TONE >> \neg OO-NO-FLOP-TONE

The dragging to falling tone alternation can thus be explained by stipulating that the accent-mutating suffixes shown above subcategorize for an OO-correspondence relation, and upon this relation, the ranking in (109a) holds. As noted in §5.4.2.1, the dragging tone mutation is only found in the stem-final syllable, showing that the Anti-Faithfulness effect is restricted to the syllable adjacent to the base-mutating affix. In the framework for locality effects developed in §4.3, this restriction is described by locally conjoining the TAF constraint with ANCHOR(Stem, PrWd, R) in the domain of the syllable, i.e., $(\neg$ OO-NO-FLOP-TONE & ANCHOR(Stem, PrWd, R)) $_{\sigma}$, which I will abbreviate as \neg OO-NO-FLOP-T_{Edge- σ} . This result is illustrated in the following tableau.

(110) Tone in Derived Words Part 1: Mutate Dragging to Falling

Base	/C $\acute{\text{V}}\acute{\text{V}}$ C + V/	ALIGN-L	\neg OO-NO-FLOP-T _{Edge-σ}	OO-NO-FLOP-T
a. → C $\acute{\text{V}}\acute{\text{V}}$ C	C $\acute{\text{V}}$ VC-V			*
b. C $\acute{\text{V}}\acute{\text{V}}$ C	C $\acute{\text{V}}\acute{\text{V}}$ C-V		*!	
c. C $\acute{\text{V}}\acute{\text{V}}$ C	CV $\acute{\text{V}}$ C-V	*!		

The faithful mapping shown in (110b) is ruled out because it violates the TAF constraint \neg OO-NO-FLOP-TONE, and this constraint dominates the OO-Tone Faithfulness constraint OO-NO-FLOP-TONE. The remaining candidates mutate the tonal structure of the base in different ways: candidate (110a) loses the link between the H tone and the second mora, while candidate (110c) loses the association with the first mora. The latter option can be

ruled out in a principled fashion because this candidate violates an independently attested constraint in the grammar, namely ALIGN-L(H, σ). In other words, the mutation of the dragging tone to a rising tone is ruled out because this mapping would produce a structure that is generally avoided in the language. Finally, words which have a dragging tone on a non-final syllable do not experience a change because the tonal unit in this case is outside the scope of the complex Anti-Faithfulness constraint.

The next step in the analysis is to account for the lack of mutation in mappings in which the base has a falling tone. The same basic constraints are at work in this case too, except a lower-ranking OO-TONE-FAITH decides the final outcome. Thus, given a base with a falling tone, the derivative cannot shift the H tone one mora to the right, as in (111c), because this mapping gives a rising tonal contour, and such configurations are not allowed. In particular, the absence of such a mutation shows that ALIGN-L(H, σ) dominates the TAF constraint in this system. The remaining two candidates, (111a) and (111b), fail to mutate the derived form in the required way as neither brings about a loss of an association with the base sponsor of the H tone. Lower-ranking Tone Faithfulness therefore decides the competition between these two candidates, favoring the faithful candidate because it avoids a violation of the anti-spreading constraint for tones.

(111) Tone in Derived Words Part 2: Don't Mutate Falling to Dragging

Base	/C [́] VC + V/	ALIGN-L	¬OO-NO-FLOP-T _{Edge-σ}	OO-NO-SPREAD-T
a. → C [́] VC	C [́] VC-V		*	
b. C [́] VC	C [́] VC-V		*	*!
c. C [́] VC	CV [́] C-V	*!		*

In other words, this ranking of TAF constraint relative to the Tone Faithfulness constraints yields a flopping mutation only when the change felt in the base-derivative pair does not violate the high-ranking Alignment constraint. When the mutation would require a violation of this constraint, the system opts not to change the derivative at all. The analysis therefore shows another type of grammar dependent mutation in that high-ranking constraints in the grammar predict both the pattern of Anti-Faithfulness observed in the system, as observed in the tableau in (110), and, whether or not the mutation takes place at all, as shown in (111). Thus, in addition to governing the ultimate outcome of a process, a top-ranked constraint may actually block a process altogether. These results are reflected in the constraint rankings given below in which the Alignment constraint is top-ranked in both subsystems.

(112) Summary Rankings for Accent Shift in Limburg Dutch

Rankings for Derived Words

ALIGN-L(H, σ)
 |
 ¬OO-NO-FLOP(TONE)_{Edge- σ}
 |
 OO-TONE-FAITH

Rankings for Underived Words

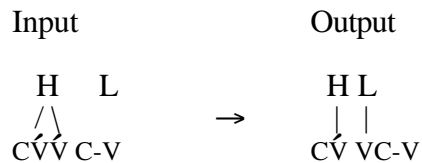
ALIGN-L(H, σ), *L
 | /
 IO-TONE-FAITH
 |
 *H

To summarize the results reached above, I have proposed an analysis of a morphological pattern of tonal mutation with the use of Faithfulness and Anti-Faithfulness constraints for tone structure. The proposed analysis explains all of the basic properties of

this morphological pattern, i.e., that it is lexically idiosyncratic, morphologically triggered, base-mutating, grammar dependent, and subject to locality effects. Furthermore, the same basic mechanisms at work in the analysis of tone flop in Limburg Dutch are also employed in the analysis of accent shifts in Japanese and Aguaruna developed below, and so the proposed analysis explains these properties in a way that extends to other languages.

Before bringing this case study to a close, it is important to contrast the analysis of accent shift given here with a purely phonological analysis of the problem. Hermans 1991 proposes that the suffixes which have the effect of mutating the dragging tone are specified for a L tone, which, when it docks to the second component of an accented syllable, triggers a de-linking of doubly-linked H tone, as sketched below

(113) Phonological Account of Dragging Tone Mutation



It is difficult to compare Hermans' actual analysis with the one made here as they are formulated in very different frameworks, and so I will not enter into the formal details. The chief difference is that Hermans' analysis is phonological, while the TAF analysis treats the dragging tone mutation as a morphological phenomenon. This larger theoretical difference between the two theories leads to a substantive formal difference, however, which is that the phonological account entails lexical specification of a L tone to account for the retraction of the doubly-linked structure. The analysis presented here accounts for accent purely in terms of H tones, and as emphasized above, the analysis is in line with recent approaches to tonal accent systems like the one given in Pulleyblank 1986 for Tonga. The advantages of the pre-linked H tone analyses of accent therefore apply to this case, tipping the scales in favor of the TAF analysis.

A second point in favor of the TAF analysis is that it relates a wide range of morphologically triggered shifts as effects of a specific type of Anti-Faithfulness. Thus, the loss of a link in the dragging tone mutation is treated on a par with the obligatory shifts found in Japanese and Aguaruna. Both of these cases are modelled as responses to a constraint type that requires a severing of the ties between a suprasegmental and its sponsor, namely \neg NO-FLOP. This analysis differs from the phonological account here which is clearly designed for Limburg Dutch alone. For example, purely phonological accounts of Japanese involve the insertion of an autosegmental link with affixation (Poser 1984), which is clearly inappropriate for the dragging tone mutation.

A final argument in favor of the account of the accentual mutation in terms of Anti-Faithfulness is that it explains the relation between the properties of the accent shift with independently needed constraints. The Anti-Faithfulness constraint \neg NO-FLOP says literally nothing about the output of the accentual shift; it simply states that an existing accent must change in some way. As is common in ACA, the rest of the grammar then kicks in and determines the actual shape of the mutation. In LD, we have found that independently needed constraints had a role in both predicting the outcome of the change and blocking another logically possible shift. This aspect of the analysis truly distinguishes the TAF theoretic approach to accent shifts from purely phonological analyses which simply posit the necessary elements to get the facts right. In summary, the TAF approach clarifies the role of the larger grammar in the process, while the phonological analysis masks this fundamental property of accentual shifts.

One interesting question that arises in the comparison of these two analyses is whether or not one finds a morphological construction in which accent is shifted in two different directions. The phonological analysis, with a lexical L tone, predicts that shifts will only flop, or be retracted, in one direction, basically shifting away from the lexically specified tone in the affix. In the morphological analysis, on the other hand, the uni-directional pattern is only due to the language particular ranking of ALIGN-L(H, σ) over the TAF constraint. If \neg NO-FLOP-TONE was undominated, a shift in both directions would be possible because the Anti-Faithfulness constraint does not specify the direction of the shift. The existence of a morphologically triggered bi-directional shift would therefore constitute a further argument in favor of the theory proposed here.

Stress shift in two related consecutive constructions in Tiberian Hebrew appears to be a case in point (see McCarthy 1979a for discussion and analysis of the relation between these shifts and other phonological patterns in Hebrew). In imperfect consecutives, stress shifts from the final to the penultimate syllable, as in *wayyáaqom* ‘and he arose’, from the related jussive *yaaqóom* ‘let him arise’ (the final vowel is underlyingly short); this shift is blocked, however, if the penultimate syllable does not contain a long vowel, as shown by *wayyabdéel* ‘and he divided’. In perfect consecutives, stress shifts from the penult to the ultima if the penultimate syllable has a short vowel, as in *wǝkaat**á**btáa* ‘and you will write’, cf. *wǝqaar**á**taa* ‘and you will read’ (the underlined vowel shows the position of stress in the basic finite verb). While these are not identical morphological constructions, they are related in that they both produce verbs with consecutive meanings. Therefore, the fact that they exhibit similar phonological patterns, yielding a shift in stress and showing sensitivity to vowel length in the penultimate syllable, suggests that they should be treated as the result of the same morpho-accentual process. If both the perfective and imperfective consecutives are subjected to the TAF constraint \neg NO-FLOP-PROM, both shifts can be understood as a forced breach of Faithfulness for morphological reasons. Furthermore, as with the case of Limburg Dutch, the Anti-Faithfulness constraint is dominated, presumably by a constraint akin to Prince’s 1990 Weight-to-Stress Principle, to account for the triggering and blocking of the shift in words with heavy penultimate syllables. Thus, while there are further details of the analysis to be worked out here, this case appears to represent a bi-directional shift of the type predicted by the TAF theory of accent shift.

5.4.3 Case Study: Accent Shift in Tokyo Japanese

As pointed out in the introduction, certain suffixes in Tokyo Japanese trigger a shift of the lexical accent of the base to which they are attached. Furthermore, this shift is to a default position for these affixed structures, showing that the morphologically triggered shift is grammar dependent. In this case study, I develop an analysis of this affix-controlled process as an effect of the Anti-Faithfulness constraint \neg NO-FLOP-PROM, similar to the analysis of the dragging tone mutation in Limburg Dutch and other grammar dependent affix-controlled processes.

The suffixes of interest here pattern in certain respects like compounds as they attach to an uninflected stem. These suffixes are mentioned in passing in McCawley 1968: 166-67 as oddities for his rules of noun-noun compounds. Later, Poser 1984 takes these cases head on, incorporating them into a complete typology of morpho-accentual rules as ‘dependent affixes’, so-called because they only trigger a process when they attach to an accented stem. Some examples of two representative suffixes are given below (from Poser 1984, with some additions).

(114) Accent-shifting Suffix *-mono* ‘thing’

- a. /kákí + mono/ → kakí-mono ‘scroll’
yómi + mono/ → yomí-mono ‘reading matter’
- b. /nori + mono/ → nori-mono ‘vehicle’
/wasure + mono/ → wasure-mono ‘forgotten item’

(115) Accent-shifting Suffix *-ya* ‘keeper, seller of/house of X’

- a. /koná + ya/ → koná-ya ‘flour seller’
/nomí + ya/ → nomí-ya ‘bar, saloon’
/kúzu + ya/ → kuzú-ya ‘junk man’
/sóba + ya/ → sobá-ya ‘noodle house’
- b. /kabu + ya/ → kabu-ya ‘stockbroker’
/toma + ya/ → toma-ya ‘mat seller’
/tindon + ya/ → tindon-ya ‘traditional Japanese band’
/unsoo + ya/ → unsoo-ya ‘forwarding agency’

The salient observation here is that these suffixes cause a shift of the lexical base accent to the stem-final syllable, as in (114a) and (115a). On the other hand, when these suffixes attach to an unaccented stem, the stem is left unaccented, creating unaccented words, as in (114b) and (115b).

A variation on this pattern is exemplified with the agentive suffix *-te*, which, like the two suffixes above, triggers a shift of a lexical accent. However, the shift of this accent is to the suffix itself, as shown in (116a) below.

(116) Agentive Suffix *-te* (Poser 1984: 50)

- a. /kákí + te/ → kaki-té ‘writer’
/yómi + te/ → yomi-té ‘reader’
- b. /katari + te/ → katari-te ‘narrator’
/kiki + te/ → kiki-te ‘hearer’

McCawley’s description of the particle *nagara* ‘though, in spite of’, also fits this pattern, as it induces a shift of the accent of the base to the first syllable of the particle, as in: /inoti + nagara/ → *inoti-nágara* ‘in spite of life’, cf. /miyako + nagara/ → *miyako-nagara* ‘in spite of the city’. I will argue below that this class of suffixes is different in an important way from *-mono* and *-ya* because they involve a banishment of the lexical accent from the stem, which invites an analysis in terms of dominance effects discussed in §5.2.

Exploiting the full power of autosegmental representations, Poser 1984 treats the accent-shifting suffixes above as triggering an insertion of a link over a designated syllable. The fact that the shift in accent depends on the presence of an existing accent therefore

follows from the assumption that no accents are inserted. Accented stems will undergo a shift, docking their accent to the inserted autosegmental link, but unaccented stems will be left unchanged. In what follows, I develop an alternative to this account which is more restrictive. This analysis also accounts for the fact that the shift is only found in words with accented stems, but more interestingly, it predicts that the shift will be towards the language particular default pattern for accent. Thus, in the case of the accent-shifting suffixes above, I will argue that it is no accident that these suffixes trigger a shift to the stem-final syllable or the first vowel of the suffix; these are the default positions for accent in compounds, and since these affixed words are compound-like, these are the predicted patterns of Anti-Faithfulness.

To be more concrete, I posit a structure for the affixed structures which is akin to the structures given in §3.3 for noun-noun compounds. In particular, I propose that the words containing accent-shifting suffixes have a recursive PrWd, as shown below.

(117) Proposed Structures for Words with Affix-Shifting Suffixes

- a. [[kakí]_{PrWd} [mono]_{PrWd}]_{PrWd} b. [[kaki]_{PrWd} [té]_{PrWd}]_{PrWd}

These words are not structurally identical to compounds as they are not dominated by the higher level category used in the analysis of compounds, namely P-Comp. This difference is important, as these structures pattern differently than compounds in one important way: they may be unaccented. The absence of a superordinate P-Comp predicts this difference because the obligatory accent found in noun-noun compounds is due to a requirement that the PrWd head of the P-Comp must have an accent; these structures do not have an analogous head, and so they do not trigger an insertion of accent in words with unaccented morphemes.

But words with affix-shifting suffixes have some important similarities with compounds, and the related structures for these words provides a means of explaining these similarities. To begin first with a morphological fact, many of the suffixes above attach to the uninflected, or conjunctive, form of the verb, which is also observed in compounds. If we assume that these suffixes have the same basic morphological collocation as compounds, presumably attaching to morphological words, then the fact that these affixed words and compounds attach to the same verbal form can be tied to their similar morphological frame. A second important point is that the accentual defaults in words with accent-shifting suffixes are paralleled in compounds (as described in §3.3, following Kubozono 1995). Thus, in compounds with short second members, accent falls on the final syllable of the first member, as observed above in words with *-mono* and *-ya*. When the second member of a compound is long, however, accent is assigned to this member, with default initial accent on N₂. Both of the affixed words above which have accent on the suffix, i.e., words with *-te* and *nagara*, have accent on the initial syllable of these morphemes (though *-te* is sub-minimal for the purposes of accent assignment in compounds, a point which I return to below). It is clear therefore that some of the assumptions made in the analysis of noun-noun compounds will apply in words with accent-shifting suffixes, which will become apparent in the analysis of particular affixes given below.

The phonological operation observed with suffixes like *-mono* is a shift of the base accent. Words with unaccented stems, however, are unaffected by these suffixes, showing that the accent shift is not an insertion of accent itself, but a mutation of an existing accent. Since one of the Prosodic Faithfulness constraints developed in §1.2.2.1, NO-FLOP-PROM, specifically bans this type of phonological activity, it is natural to model this accentual process as a forced violation of this type of Faithfulness. Thus, the negation of

NO-FLOP-PROM, using the formula for Anti-Faithfulness constraints given in chapter 4, yields exactly the right tool for the job, as shown below.

(118) \neg NO-FLOP-PROM

\neg [$\forall x \forall y \forall z$, $x \in$ prominence, $y \in$ sponsor, $z \in$ link, if x and y are associated by z in S_1 , then $\exists x' \exists y' \exists z'$ s.t. $(x, y, z)R(x', y', z')$ and x' and y' are associated by z' in S_2 .]

To paraphrase this constraint, \neg NO-FLOP-PROM entails that it must not be the case that corresponding prominences have corresponding sponsors; or alternatively, that corresponding prominences have corresponding links. The inclusion of autosegmental links is crucial in the definition, as it allows \neg NO-FLOP-PROM to be satisfied by just the deletion and insertion of a link. This assumption will allow the non-overt satisfaction of \neg NO-FLOP-PROM, which is necessary in Japanese, as shown by input-output mappings like /koná + ya/ \rightarrow *koná-ya*. Thus, the analysis of the apparent lack of shift in these cases is handled in a similar way as non-overt Anti-Faithfulness in pre-accentuation.

As with all Anti-Faithfulness effects, they derive from Transderivational Anti-Faithfulness, and hence, the important constraint rankings will involve OO-Anti-Faithfulness, as shown below.

(119) Schematic Rankings

a. Obligatory Accent Shift: \neg OO-NO-FLOP-PROM \gg OO-NO-FLOP-PROM

b. No Accent Shift: OO-NO-FLOP-PROM \gg \neg OO-NO-FLOP-PROM

When the TAF constraint \neg OO-NO-FLOP-PROM is ranked above its corresponding Faithfulness constraint, the result will be an obligatory accent shift. When the reverse ranking holds, no shift is predicted. In the now familiar way, these two rankings can be incorporated in the same constraint system using multiple correspondence relations, as shown below in (120a). The accent-shifting suffixes observed above will subcategorize for OO_{Dom}-correspondence, as shown in (121), which predicts that words with these suffixes will undergo a shift, because \neg OO_{Dom}-NO-FLOP-PROM is top-ranked in the constraint hierarchy. A second important set of rankings, carried over from the analysis of compound accent given in chapter 3, is given in (120b). This ranking gives the PrWd-final default for accent in compounds with accented initial members and initial accent on finally-accented members — an accentual default which is important in determining the landing site for shifted accents, as I will demonstrate below.¹⁸

(120) Accent Shift in Tokyo Japanese

a. \neg OO_{Dom}-NO-FLOP-PM \gg OO-NO-FLOP-PM \gg \neg OO_{Rec}-NO-FLOP-PM

b. NONFINALITY_{Comp} \gg ALIGN-R(PM, PrWd) \gg ALIGN-L(PM, PrWd)

(121) Lexical Entries for Accenting-Shifting Suffixes

<i>-mono</i>	N	[[Noun]OO _{Dom} ____]
<i>-ya</i>	N	[[Verb]OO _{Dom} ____]

¹⁸The NONFINALITY constraint here is somewhat different than the one used in §3.3 as it is relativized to any prosodic compound, not just P-Comps, which will be important in deriving the avoidance of final accent in these words when the suffix is accented.

While non-accent-shifting suffixes are not listed above, most Japanese suffixes do not pattern with *-mono* and *-ya*, showing that this morpho-accentual process is lexically idiosyncratic. Accordingly, the non-accent-shifting suffixes subcategorize for OO_{Rec} -correspondence and therefore do not trigger a shift.

The assumptions developed thus far yield precisely the pattern of accent shift observed above for suffixes like *-mono*, as I will now demonstrate. Starting first with words with accented stems, the attachment of *-mono* in such contexts triggers a shift to the stem-final syllable. This is because words with *-mono* are evaluated by $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$, and this constraint is top-ranked in the constraint hierarchy. Thus, if the accent of the base does not shift, as in (122a) below, such an output incurs a fatal violation of the top-ranked TAF constraint. A second alternative, shown in (122b), is also ruled out by $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$ because this candidate does not mutate the base in the relevant way. Succinctly, the TAF constraint requires a shift of the lexical accent within the base in the output. Given that the base *káku* only stands in correspondence with the stem of the suffixed form (see §4.2), the candidate in (122b) has only undergone deletion of accent, not accent shift, and so it does not mutate the base in the right way (a point which is also crucial in words with *-te* discussed below). The winner then is the form which shifts the base accent to the default PrWd-final position.

(122) Accent Shift with Accented Base

Base	/káki + mono/	$\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$	OO-NO-FLOP-PM
a. káku	[[káki]-[mono]]	*!	
b. káku	[[kaki]-[móno]]	*!	
c. → káku	[[kakí]-[mono]]		*

Words with unaccented stems will not undergo a shift for the simple reason that the TAF constraint $\neg\text{OO-NO-FLOP-PM}$ is not relevant here. In this case, there is no accent in the base to shift, and so the condition specified in the antecedent to the implication of the constraint in (118) is not met. Thus, the two structures shown below are equal on the TAF constraint, and so the decision falls on the shoulders of the Faithfulness constraint IO-DEP-PM . In other words, the insertion of an accent into a default position does not lead to satisfaction of $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$ because this is not a flop; since this insertion gives a gratuitous violation of Faithfulness, it is ruled out in favor of the unaccented word, as shown below.

(123) No Accent Shift with Unaccented Base

Base	/nori + mono/	$\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$	IO-DEP-PM
a. nori	[[nori]-[mono]]		*!
b. → nori	[[nori]-[mono]]		

This peculiar behavior of accent-shifting suffixes therefore receives a direct and natural account in TAF theory. The constraint $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$ requires a mutation of an existing accent, but in unaccented words, there is no accent to be mutated, and so the TAF constraint is vacuously satisfied.

Finally, the tableau below shows the role of the Alignment constraint in deriving default PrWd-final accent (with a hypothetical example).¹⁹ The first two options (124a-b) are ruled out in the same way they are above in (122); these structures lead to a fatal violation of the TAF constraint $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PROM}$. Thus, the accent of the base must shift within the stem, but the TAF constraint says nothing about the landing site of the shifted accent (other than it must stay within the base). The decision in this case therefore goes to lower-ranking constraints in the grammar which are responsible for the accentual default pattern for these structures. As argued in detail in chapter 3, PrWd-final accent is the default position for compounds with accent on the first member. Since these structures are also compound-like in that they have two components wrapped by independent PrWds, this is the accentual default here too, as determined by the Alignment constraint ALIGN-R. So, contrasting the PrWd-penultimate and PrWd-final accents in (124c) and (124d) respectively, the latter is the winner because it fully satisfies ALIGN-R.

(124) Accent Shift with Long Accented Base

Base	/títiti + mono/	$\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM}$	OO-NO-FLOP-PM	ALIGN-R
a. títiti	[[títiti]-[mono]]	*!		*
b. títiti	[[títiti]-[móno]]	*!		
c. títiti	[[títiti]-[mono]]		*	*!
d.→ títiti	[[títiti]-[mono]]		*	

This result shows that the morphologically triggered accent shifts are grammar dependent because the independently attested constraints on the distribution of accent predict the ultimate resting spot of a perturbed accent. As I show directly below, the shifted accent which lands on the first vowel of the suffix is also grammar dependent, but in a different way.

Suffixes like *-te* trigger a shift, but not to the final syllable of the stem which sponsors the accent. Instead, these suffixes trigger a shift to the first syllable of the suffix itself, as shown by the behavior of *nagara* above. Given the paucity of suffixes showing this pattern, it is not clear whether this is a linguistically significant pattern or just a quirk of these two suffixes. However, it is striking that these suffixes have the second accentual default pattern found in compounds, namely initial accent in the second member. To develop the parallel with the suffixes *-mono* and *-ya* above, I therefore treat this pattern as significant.

Accented, accent-shifting suffixes like *-te* are different than the unaccented ones, however, because they trigger a shift that is non-base-mutating by $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PROM}$: the shift goes outside the stem itself (this is crucial in the analysis of *-mono*). Clearly, this TAF constraint is not at work in words with *-te*. However, its cousin, $\neg\text{OO-MAX-PROM}$, can be at play here, explaining the shift as a shunning of the base accent from the stem, i.e., a dominance effect in the framework developed in §5.2 for such processes. Furthermore, the preservation of a lexical accent can be attributed to other factors,

¹⁹Ikuyo Kaneko (personal communication) points out that stems which would show a long distance shift of the type predicted here may in fact not be attested. For example, in words with trisyllabic stems and initial accent, the result is an unaccented word, as shown by /kísetu + mono/ → *kisetu-mono* ‘seasonal thing’. If further investigation shows that this pattern is indeed a systematic gap, then a locality restriction on the position of the lexical accent, presumably foot-based, may need to be posited (see §5.4.4 for a similar locality restriction on shifts in Aguaruna). This finding would not refute the claim that these shifts are grammar dependent, however, as shifts in disyllabic stems are rightward, to a stem-final syllable.

presumably the IO-Faithfulness constraint MAX-PROM_{Root}. In other words, the behavior of *-te* involves a peculiar set of factors, involving both Anti-Faithfulness and Root-Faithfulness, as depicted below.

(125) Accent Shift as Dominance Effect with Root-Faithfulness

Base	/káki + te/	¬OO-MAX-PM	IO-MAX-PM _{Root}	NONFINALITY
a. káku	[[káki]-[te]]	*!		
b. káku	[[kakí]-[te]]	*!		
c. káku	[[kaki]-[te]]		*!	
d. → káku	[[kaki]-[té]]			*

The fully faithful form is ruled out because it violates the constraint requiring a deletion of base prosody, namely ¬OO-MAX-PROM. The base accent is not simply shifted to the preferred base-final position because this does not satisfy the TAF constraint either (125b). Furthermore, the accent of the base cannot be deleted because this would violate an operative constraint here, namely IO-MAX-PROM_{Root}, as shown in (125c). The end result then is accent on the suffix itself (125d). This result is certainly marked in compounds because of the role of NONFINALITY in these cases, but as shown explicitly above, there are no other options here. A final important point here is that this effect is only possible under Stem-to-Stem correspondence (argued for in chapter 4, section 2), because the accent shift observed in (125d) can only be viewed as a deletion under this conception of OO-correspondence.

In the case of the accented, accent-shifting particle *nagara*, the analysis is similar to that of *-te*, but the size of the morpheme permits satisfaction of NONFINALITY and, accordingly, gives leftmost accent in the second member. This pattern is of course the same pattern observed in compounds where the second member receives an accent, as in /minami + amerika/ → minami-amerika ‘South America’. Since these affixed structures are, by hypothesis, also compound-like, the predicted default here is initial accent on the second PrWd, as shown below.

(126) Default Initial Accent in Second Member

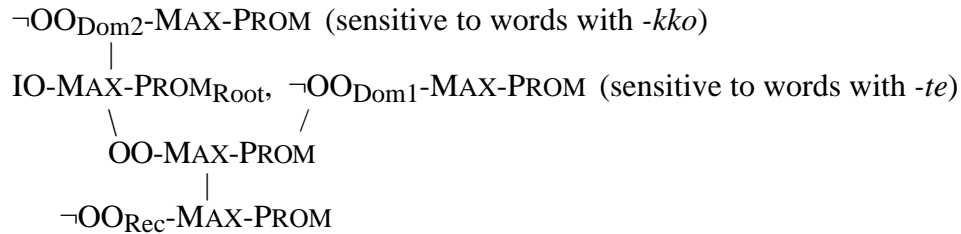
Base	/ínoti + nagara/	¬OO-MAX-PM	NONFINAL	ALIGN-R	ALIGN-L
a. ínoti	[[ínoti]-[nagara]]	*!			
b. ínoti	[[inoti]-[nagará]]		*!	*	*!
c. → ínoti	[[inoti]-[nágara]]			*	

The appeal to NONFINALITY to get the PrWd-initial default here involves a minor inconsistency with the analysis of compounds, as this constraint was relativized to the P-Comp in §3.3, and these suffixed structures have no P-Comp (necessarily, because they may be unaccented). I assume therefore that the relevant prosodic category referred to by NONFINALITY is the highest prosodic category above the innermost PrWd, which generalizes to both compounds and these pseudo-compounds.

The treatment of this peculiar pattern of accent shift as a dominance effect is different from the usual type of dominance discussed in section §5.2, e.g., in words with the dominant unaccented suffix *-kko*, as this type crucially preserves the accent of the root.

I take this fact to be evidence for two co-existing TAF constraints: one is ranked above IO-MAX-PROM_{Root}, while the other is not, as shown below.

(127) Dominance Effects in Japanese



Thus, the top-ranked TAF constraint yields unaccented words because it dominates the Root Faithfulness constraint. On the other hand, this ranking does not hold with $\neg\text{OO}_{\text{Dom1}}\text{-MAX-PROM}$, and so this TAF constraint only involves a deletion of the base accent from the base itself, an expected consequence given the theory of Stem-to-Stem correspondence employed here. In sum, the range of affixed structures in Japanese represent different kinds of dominance effects which are negotiated via a fundamental tenet of the theory, constraint ranking.

To summarize the larger set of results, I have given an analysis of accent-shifting suffixes in Japanese which is consistent with all other types of affix-controlled accent. Suffixes like *-mono*, which induce a flop of the accent, and suffixes like *-te*, which cause a deletion, are both modelled in TAF theory as effects of an appropriate Anti-Faithfulness constraint. Thus, suffixes like *-mono* involved the Anti-Faithfulness constraint, $\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PROM}$, which specifically requires a shift of accent in the derived forms. Suffixes like *-te*, on the other hand, trigger a dominance effect, which is due to high-ranking $\neg\text{OO}_{\text{Dom1}}\text{-MAX-PROM}$. As with all other types of ACA, these effects are lexically idiosyncratic and morphologically triggered: they correlate with the attachment of special suffixes. Furthermore, both of these effects are base-mutating, which as I have shown above, is an absolutely crucial factor in the analysis of these affixed words. Finally, both types of effects are found to be grammar dependent in the sense that independently necessary constraints dictate the outcome of the affix-controlled process. This property stems from the treatment of these affixed structures as compound-like, an assumption which appears to be unavoidable given the observed parallel with compounding morphology. With this assumed structure, the two accentual default patterns observed in these words followed from the assumptions made in the analysis of compounds. When the first member of the compound is accented, as in words with *-mono*, the shifted accent is to the PrWd-final syllable. However, when the accent is on the second member, i.e., on the suffix itself in words with *te*, the default pattern is for PrWd-initial accent, which again is consistent with the observed data. The conclusion is thus that the properties of accent-shifting suffixes are explained in the same way as other affix-controlled phenomena.

5.4.4 Extended Case Study: Accent in Aguaruna

As illustrated in the introduction, the Jivaroan language Aguaruna exhibits a pattern of accent shift that is triggered by special suffixes. This morpho-phonological pattern was shown to display all of the properties of affix-controlled accentual processes, including grammar dependence. In this section, I construct an analysis of accent shift in Aguaruna that explains these properties as an effect of the TAF constraint $\neg\text{NO-FLOP-PROM}$. This case study therefore provides further support for the claim that morphologically triggered

accent shifts are grammar dependent, and offers further empirical support for the overall approach taken here.

This section is organized as follows. I start with a description of the distribution of accent in underived words in §5.4.4.1 and give an analysis of the inventory of these accentual patterns in terms of constraint interaction between Prosodic Faithfulness and various prosodic well-formedness constraints. The interaction between accent placement and a rhythmic pattern of vowel deletion is then studied in §5.4.4.2, as this pattern bears directly on the analysis of derived words. Finally, §5.4.4.3 examines morphologically triggered accent shifts and proposes an analysis within TAF theory.

5.4.4.1. Distribution of Accent in Underived Words

Aguaruna is a ‘pitch accent’ language in the sense that accent correlates with a rise in both f_0 and intensity²⁰ and that the distribution of accent is lexically governed. As illustrated in the following list, the accented vowel may be the first, second, or third vowel from the beginning of the word. It is also clear from these examples that accent can appear on either the first or second component of a syllable, e.g., *waš ímau*, cf. *apuúpuu*, which shows that Aguaruna is a mora-accenting language. Furthermore, the constraints on the distribution of accent (discussed below) typically only make reference to vowel slots. I assume therefore that the mora is the accent-bearing unit in Aguaruna, and that consonants are not dominated by moras. Accented moras are represented here with a ‘M’ in the left-hand column.

(128) Frequencies for Accent Patterns (Payne 1990, from vocabulary in Larson 1963)

Mm	núka	‘leaf’	224
mMm	kawáu	‘parrot’	297
Mmm	káś ai	‘paca’	157
mmMm	wampukái	‘tadpole’	82
mMmm	maákai	‘mud’	123
Mmmm	ámuntai	‘buzzard’	45
mmMmm	apuúpuu	‘dolphin’	34
mMmmm	waš ímau	‘ocelot’	24
Mmmmm	áaNkí as(a)	‘palm spear’	14
mMmmm	agáIkiam(pa)	‘catfish’	5

The assertion made above that accent is phonemic in the language, and therefore marked in the lexicon, is in fact a contentious issue. While Pike & Larson 1964 assume that accent is phonemic, Payne 1990 argues that accent is assigned on the peninitial mora by rule, and that a set of minor rules account for first and third mora accent. For concreteness, I follow Pike & Larson in assuming that accent is marked lexically, but the analysis of accent shift presented below is fully compatible with the hypothesis that accent is assigned ‘by rule’ (in input-output mappings). If it turns out that Payne is correct, therefore, this assumption does not affect the overall argument.

²⁰While pitch and intensity peaks do not coincide perfectly, the distribution of intensity peaks is predictable from pitch peaks (see Payne 1990: 166).

The distribution of accent in bare substantives is subject to two over-arching constraints. First, as alluded to above, the accented mora is always within the first three moras of an underived word. Thus, while one finds words like *apuúpuu*, forms with accent beyond the third mora, e.g., **apuupiúu*, are systematically ruled out. A second important restriction is that the accented mora is never the (underlyingly) final mora of the word. There are no words such as *nuká* or *kawaií* which have accent of the last mora of a word. This last restriction is not always apparent from the surface form, however, as vowel deletion may create words with final mora accent, as in /š uúta/ → š uút ‘large cockroach’.

Consistent with the assumptions for Tokyo Japanese, I assume that pitch accent languages such as Aguaruna have a lexical prominence as the representation of accent, which at the surface is aligned with a high tonal target. This assumption is not critical in the analysis in any way, however, because the principles of Faithfulness and Faithfulness reversals can be applied with equal force to other types of prosodic structure. The constraints governing the realization of lexical accent in Aguaruna are therefore the same constraints employed in the analysis of stress-accent languages like Cupeño and Russian, namely the Prosodic Faithfulness constraints. The distributional gaps discussed above may be accounted for by ranking the Prosodic Faithfulness constraints in relation to other prosodic well-formedness constraints, which are given below.

(129) Constraints Governing the Inventory of Underived Words

- a. Constraint Encapsulation: PROS-FAITH ≡ DEP-PROM, MAX-PROM, NO-FLOP-PROM
- b. ACCENTWINDOW: An accentual prominence must occur on one of the first three moras of a surface form.
- c. NONFINALITY(μ): An accentual prominence must not appear on the final mora of a word. (cf. Prince & Smolensky 1993)

I assume for concreteness that the limitation of accent to the first third moras is due to the constraint ACCENTWINDOW (though this constraint is obviously not a serious proposal; see Green & Kenstowicz 1995 for more substantive ideas). Specifically, when ACCENTWINDOW is ranked above the IO-Prosodic Faithfulness constraints, lexical prominences which are outside of the accentual window will lead to an unfaithful mapping, as shown in (130b). Another important constraint ranking involves the domination of IO-PROS-FAITH by the constraint NONFINALITY(μ), which is defined above. With NONFINALITY(μ) ranked above the Prosodic Faithfulness constraints, if a lexical prominence occurs in the final mora of a word in the input, the IO-mapping will also not be a faithful one (130a). The presence of a positional contrast in accent, however, shows that the Alignment constraints are dominated by IO-PROS-FAITH. Thus, as depicted in (130c), a medial prominence in the word has a corresponding medial prominence in the output, as shifting the prominence to an edge position violates Prosodic Faithfulness.

(130) Illustration of Results for Inventory of Underived Words (v = lexical accent position)

Input	Output	NONFINAL	WINDOW	P-FAITH	ALIGN-R
a. /CVCVCV́ /	→ CVCV́ CV̄			*	*
	*CVCVCV́	*!			
b. /CVVCV́ CV/	→ CVVCV́ CV̄			*	*
	*CVVCV́		*!		*
	CV				
c. /CVCV́ CV/	→ CVCV́ CV̄				*
	*CVCV́			*!	

A final point concerns the effects of NONFINALITY(μ) on forms like *š uít(a)*, which have a deleted final vowel. I argue in the next subsection that these forms actually have covert structure word-finally, essentially a mora which does not dominate a vowel, i.e., [*š uít*Δ]; thus, these forms do in fact conform to the generalization that accented moras are never word-final.

To summarize the above results, the following partial ordering of constraints accounts for the inventory of accentual patterns observed in underived words.

(131) Ranking for Underived Words

NONFINALITY(μ), ACCENTWINDOW >> IO-PROSFAITH >> Alignment

This set of rankings accounts for the fact that the position of accent is generally unpredictable, as the IO-Prosodic Faithfulness constraints outrank the Alignment constraints which require accent to appear at a designated edge (the ordering of the two Alignment constraints with respect to each other is taken up directly below). This contrast in the position of accent is restricted, however, by two high-ranking constraints. Thus, because NONFINALITY(μ) dominates IO-PROSFAITH, accent may not appear on the final mora of a word. Furthermore, the ranking ACCENTWINDOW >> IO-PROSFAITH limits the range of the accentual contrast to the first three moras of a word.

5.4.4.2. Vowel Deletion and Accent Shift

Aguaruna has a phonological pattern of accent shift triggered by the application of vowel deletion. Since the edge orientation of the shift bears directly on the treatment of the morphological shifts, I examine and analyze this pattern first. The data and description of vowel deletion in Aguaruna is presented directly below, followed by the proposed analysis.

Let us start with Payne's description of vowel deletion.²¹

(132) Description of Syncope (Payne 1990)

- a. Syncope has a rhythmic basis: "Basically the elision rule looks at the third vowel from the beginning (or left) of the word, and elides that and every alternate vowel bounded [=surrounded] by consonants. At the end (or right) boundary of the word, Syncope stops short of eliding a penultimate vowel. Instead the final vowel is elided, if that vowel is immediately preceded by a consonant." (p. 164)
- b. Synchronically, syncope makes no reference to accent placement. Historically, however, it may have developed from a vowel reduction process. Indeed, some vowels to be syncope are retained as devoiced vowels in related dialects. (see p. 179, 163)
- c. When the accented vowel is deleted, accent is shifted one mora to the right if there are three or more following vowels (underlyingly); otherwise accent is shifted one mora to the left. (see p. 179-80)

Like many other languages, for example Southeastern Tepehuan (Willett 1991, 1982), syncope in Aguaruna has a rhythmic basis, as it deletes vowels in alternating syllables. This pattern is illustrated by the following examples (vowels to be deleted are underlined in the underlying representation). Forms like *ič inkaNminak* show the preference for dropping a final vowel over the penultimate vowel, even when the latter is predicted by the binary pairing of vowels. The two shifts in accent observed when the accented syllable is deleted are exemplified in (133b). Thus, while the pattern of leftward shift, as in *uNúš num*, is very common, it is clear that the 'default' pattern is to shift the accent to the right because the environment for leftward shift is more specific, as I demonstrate below. This move is somewhat different from Payne's statement above, but this account is largely based on frequency (and not on the phonological composition of the string), as words with third mora accent and more than two following moras are rather rare.

²¹David Payne points out (personal communication) that the vowels in much previous work have been inconsistently transcribed, sometimes resulting in the treatment of a word-final long vowel as short (presumably to predict it from syncope). The reader interested in probing further into the details of the system is thus referred to Payne 1990 for the authoritative statement of this process, where this inconsistency is ironed out.

(133) Exemplification of Syncope in Aguaruna

a. Deletion of an Unaccented Vowel

/ič inak <u>a</u> /	ič inak	‘clay pot’
/ič in <u>a</u> ka + n <u>a</u> /	ič inka-n	‘clay pot (Acc)’
/ič in <u>a</u> ka + N <u>u</u> + mi + n <u>a</u> /	ič inka-N-mi-n	‘your clay pot (Acc)’
/ič in <u>a</u> ka + N <u>u</u> + mi + na + k <u>i</u>	ič inka-N-mi-na-k	‘only your clay pot (Acc)’
/		

b. Deletion of an Accented Vowel

/uhaN <u>í</u> + kit <u>i</u> /	uháN-kit	‘palm species (Compound)’
/uhaN <u>í</u> + kiti + n <u>a</u> /	uhaN-kíti-n	‘palm species (Comp, Acc)’
/uNuš <u>í</u> + num <u>i</u> /	uNúš -num	‘tree species (Compound)’
/uNuš <u>í</u> + numi + n <u>a</u> /	uNuš -númi-n	‘tree species (Comp, Acc)’
/uNuš <u>í</u> + num <u>i</u> + š akam/	uNuš -núm-š akam	‘tree species (Also)’

To summarize, syncope in Aguaruna follows an alternating pattern, with a preference for deleting final vowels. Further, when the accented vowel is deleted, accent shifts to the left if there are less than three following vowels underlyingly; otherwise accent shifts to the right.

The rhythmic pattern of vowel deletion suggests a role for metrical structure in the analysis, as argued in detail in McCarthy 1998 for a similar body of facts in Bedouin dialects of Arabic.²² Thus, if we assume that Aguaruna words are parsed left-to-right into iambs, it is possible to motivate vowel deletion as an effect of principles of rhythmic organization, i.e., the Iambic/ Trochaic Law of Hayes 1995 and Grouping Harmony of Prince 1990. Sketching the analysis informally below, in a sequence of CV syllables, the third vowel in the underlying representation in (134b) ends up in the weak position of the final iamb. The loss of this vowel can hence be explained as a need for a durational contrast in right-headed feet: the outright deletion of the vowel in the weak position satisfies this constraint, rather than the more usual strategy of lengthening the strong member of the iamb.

(134) Metrical Analysis of Syncope

a. /ič inak <u>a</u> /	→	(. x) (x .) (i.č i)(na.kΔ)
b. /ič in <u>a</u> ka + n <u>a</u> /	→	(. x) (. x) (i.č i)(nΔ.ka)-nΔ
c. /uNuš <u>í</u> + num <u>i</u> + š akam/	→	(. x)(. x) (x .) (uNu)(š Δ.-num)-(š akam)

²²See also Kager 1997 for a different approach to rhythmic vowel deletion in terms of the minimal violation of the constraints governing the prosodic organization of syllables.

The fact that syncope only affects vowels which are surrounded by consonants also has a cogent explanation on this account. VV sequences will always either support their own foot or occupy the right member of a branching foot in standard foot typologies, and so they will be systematically ignored by the process. Furthermore, the fact that, in some final feet, the weak member is not deleted may be captured as a foot-type reversal to satisfy NONFINALITY(μ), as argued in Prince & Smolensky 1993 for Latin. Thus, in just those contexts where the head of the iambic foot would appear in the final position of the word, the canonical iamb switches to a left-headed trochee, as shown in (134c), which obviates the need for a durational contrast because the foot is a trochee, not an iamb. The metrical account is of course not the full story, since the complex patterns described above show some language particular intricacies which demand an explicit treatment. For example, the initial vowel is never lost, despite its position in the initial iamb, and so something else needs to be said here. Furthermore, the final vowel in the input-output mapping in (134a-b) is not predicted to drop out in the metrical analysis just described — a problem that will also receive our attention below.

In addition to the theory-internal motivation for this analysis, the assumed structures help in describing two facts. First, as noted in §5.4.4.1, accent is not allowed in the final mora of a word, but words which have lost the word-final vowel yield apparent exceptions to this generalization, e.g. /š uíta/ → š uút. However, if forms such as these have a final CA syllable, then these forms are consistent with final mora extrametricality. If final syllables have a mora, but are vowelless, then the accented mora in [š uú.tΔ] is not final. Second, syncopated forms aside, only nasal consonants are allowed in the coda position (Payne 1990: 166). If the consonants which appear before the deleted vowels are re-syllabified with the preceding syllable, as in /ič inaká/ → [i.č i.nak], then syncope creates exceptions to an otherwise exceptionless constraint on coda consonants. Of course, if these underlyingly pre-vocalic consonants are syllabified as onsets at the surface, as assumed in (134), then this problem does not arise. McCarthy makes this same argument with different facts from Arabic.

Moving now to state these assumptions more formally, the constraint which is responsible for the durational contrast in iambs is given below.

(135) RHYM-SYNC

Avoid full vowels in the weak position of an iambic foot.

With this constraint top-ranked in the hierarchy, specifically outranking the anti-deletion constraint, MAX-V, and the constraint banning vowelless syllables, *EMPTY-NUC, rhythmic vowel deletion is the predicted outcome, as shown below.

(136) Rhythmic Vowel Deletion

/CVCVCVCV ... /	RHYM-SYNC	MAX-V	*EMPTY-NUC
(. x)(. x) (CVCV)(CVCV) ...	*!		
→ (. x)(. x) (CVCV)(CACV) ...		*	*

The loser here has a full vowel in the weak syllable, in violation of RHYM-SYNC, leaving the candidate with an elided vowel in the third syllable as the winner.

The first vowel of the word is never deleted, however, showing that initial syllables are special in some way. Following Beckman 1997 [1998], I treat this fact as evidence for a high-ranking Positional Faithfulness constraint which gives preferential treatment to initial syllables. Thus, with a position-sensitive MAX-V constraint ranked above RHYM-SYNC, deletion of the first vowel is not predicted, as shown below.

(137) No Vowel Deletion in the Initial Syllable

/CVCVCVCV ... /	σ_1 -MAX-V	RHYM-SYNC
(. x)(. x) (CΔCV)(CΔCV) ...	*!	
→ (. x)(. x) (CVCV)(CΔCV) ...		*

The metrical analysis employed thus far does not account for the preference for dropping the final vowel of the word when it can, e.g., /ič inak_a/ → [(ič i)(nakΔ)], since the fourth vowel here does not fall into a strong position. Furthermore, one cannot appeal to a foot-type reversal word-finally to account for the deletion of the final vowel in the weak member of a trochee because the final vowel in cases like /ič inak_a + n_a/ → [(ič i)(nΔka)-nΔ] is not footed (or alternatively, it is not in the weak position if it supports a degenerate foot). It appears, however, that a different constraint is at work which handles these facts by favoring words that end in consonants. This constraint, called FINAL-C in McCarthy & Prince 1993b, receives independent motivation from some additional distributional facts in the language. David Payne notes (personal communication) that the only vowel-final words in the language are those with just two vowels in the word or words which end in a VV sequence. Thus, if FINAL-C is ranked above MAX-V, the generalization that words tend to end in consonants can be treated with the same machinery used for describing the preference for apocope in the vowel deletion. This tack of course requires an analysis of the two classes of V-final words, but these cases also lend themselves to a cogent analysis. First, the avoidance of apocope in CV(C)V words is straightforwardly handled as a two-vowel minimal word requirement, which is generally obeyed in the language. Furthermore, the lack of deletion of a VV in words that end with this sequence can be treated as an effect of stress: word-final VV will invariably be parsed as the head of an iamb, and because this is the preferred head of a light-heavy iamb and a possible monosyllabic iamb, these vowels will be protected from deletion as well.

Putting all of the pieces together, both RHYM-SYNC and the phonotactic constraint FINAL-C are necessary in Aguaruna vowel deletion, as illustrated in the following tableau. The winner here satisfies both constraints by deleting the third and fifth vowel, which contrasts with the two other candidates, which violate one or the other of the two high-ranking constraints.

(138) Rhythmic and Non-Rhythmic Vowel Deletion

/ič inaka + na/	FINAL-C	RHYM-SYNC	MAX-V	*EMPTY-NUC
a. (. x) (. x) (i.č i) (na.ka)-nΔ		*!	*	*
b. (. x) (. x) (i.č i) (nΔ.ka)-na	*!		*	*
c. (. x) (. x) → (i.č i) (nΔ.ka)-nΔ			**	**

The ranking arguments made thus far are summarized in the partial ordering given below.

(139) Ranking for Rhythmic Vowel Deletion

FINAL-C, σ_1 -MAX-V >> RHYM-SYNC >> MAX-V, *EMPTY-NUC

Relating this grammar to Payne's description given in (132), the third vowel from the beginning of the word deletes when it is the weak member of an iamb, which by RHYM-SYNC, must drop out. Only vowels which are surrounded by consonants undergo syncope because a VV sequence is always parsed as the strong syllable of an iamb, and hence, it is not be targeted by RHYM-SYNC. Furthermore, syncope only affects post-pen-initial vowels because when a single vowel appears in the first syllable, it is protected from RHYM-SYNC by the Positional Faithfulness constraint σ_1 -MAX-V. Lastly, the independently motivated constraint FINAL-C accounts for the observed preference for deleting final vowels.

Moving now to the question of what happens when an accented vowel is deleted, let us review the following facts.

(140) Vowel Deletion with Accent Shift

- a. /uNuš í + numi + na/ uNuš -númi-n Shift to Right
- b. /uNuš í + numi/ uNúš -num Shift to Left

When the accented vowel is lost, the accent typically shifts to the right, unless there are less than three underlying moras to the right of the accented vowel, in which case accent shifts to the left.

This type of observation (i.e., accent shifts triggered by deletion of the sponsoring element), is commonly attributed to HV's Faithfulness Condition, which, roughly speaking, entails that heads of feet be preserved throughout a derivation within the metrical constituent structure enclosing them. An initial problem with this approach to accent shift in Aguaruna is that lexical accents do not reliably fall in the head positions of the independently motivated syncope feet, and so a second metrical plane is required to account for the observed facts. Furthermore, the derivational implementation of this idea entails a unitary direction for the shift, but the facts of Aguaruna show that the accent of a deleted vowel shifts in two different directions. A final problem is that an analysis in terms of the Faithfulness Condition requires intermediate stages in the mapping from lexical to surface forms that are otherwise unmotivated, which I take to be fatal for this approach.

The alternative I propose is that the edge orientation is described directly via the Alignment constraints, with an additional requirement that the prominence may not appear in the final foot. This result is achieved through the following constraint ranking, which builds on the constraint system given above for the basic accentual patterns by ranking the Alignment constraints with respect to each other, and by adding another NONFINALITY constraint relativized to the stress foot.

(141) Constraint Ranking for Accent Shift with Vowel Deletion

NONFINALITY(Ft) >> ALIGN (PM, R, PrWd, R) >> ALIGN (PM, L, PrWd, L)

While prominence typically does not shift because of high-ranking Prosodic Faithfulness, when the deletion of the sponsor of a prominence precludes a faithful mapping, a shift must take place. Because ALIGN-R dominates ALIGN-L, a shift to the right is preferred over a shift to the left, as illustrated below.

(142) Default Rightward Shift

/uhaNí + kiti + na/	ALIGN-R	ALIGN-L
(uhá)(NΔ-ki)(ti-nΔ)	****!	*
→ (uha)(NΔ-kí)(ti-nΔ)	**	***

However, when a shift to the right would entail positing a prominence in the final foot of the word (i.e., when the deleted vowel is followed by just two underlying moras), the accent instead shifts to the left because NONFINALITY(Ft) is ranked above ALIGN-R.

(143) Accent Shift with Final Foot Extrametricality

/uhaNí + kití/	NONFINALITY(Ft)	ALIGN-R
(uha)(NΔ-kí)tΔ	*!	*
→ (uhá)(NΔ-ki)tΔ		***

The foot-based analysis here extends to all of the cases of leftward shift described by Payne. The only accented vowels eligible for deletion are the vowels dominated by the third mora because syncope starts with the third vowel from the beginning of the word, and lexical accent never goes beyond this third mora (this is the accentual window effect). Focusing on the vowels following the accented vowel (i.e., those following the third vowel), words with two subsequent underlying vowels or less may drop these vowels, as observed in the form [(uhá)(NΔki)tΔ] above. If any vowels remain, however, they will be in the final foot and therefore ineligible for receiving the accent by NONFINALITY(Ft). If, on the other hand, the following vowels are protected from syncope because they appear in a VV cluster, then the final two vowels are likewise ineligible for accent because they are parsed as the strong member of the iamb, as in: /CVCVCV̄-CVV/ → [(CVCV̄)(CΔ-CVV)].

The proposed analysis thus accounts for the ‘default rightward shift, otherwise leftward shift under duress’ through the constraint interaction shown in (144). However, the analysis does not yet account for the observed boundedness of accent shift, i.e., the fact that the widowed accent only shifts one mora to the right or the left. Since the morphological shifts examined below are also bounded in this sense, it is necessary to have

an analysis of this fact as well.²³ As currently stated, NO-FLOP-PROM does not require bounded accent shift, since any shift is a violation of this constraint, whether the accent shifts are bounded to the moraic sponsor or not. We therefore require a constraint which ensures that the shift will be local, i.e., to an adjacent mora rather than a non-adjacent one. I express this intuition with the following constraint, though other analyses are possible (see Myers 1997a and Bickmore 1996 for some leading ideas).

(144) LOC-FLOP-PROM

$\forall x \forall y \forall z, x \in \text{prominence}, y \in \text{sponsor}, z \in \text{link}$, if x and y are associated by z in S_1 , and $\exists x' \exists y' \exists z'$ s.t. $(x, y, z)R(x', y', z')$ and x' and y' are not associated by z' in S_2 , then $\exists y'' \exists z''$ s.t. x' and y'' are associated by z'' and y' and y'' are adjacent in S_2 .

Satisfaction of LOC-FLOP-PROM is only relevant in structures where the link between a prominence and its sponsor is severed in the IO-map, as stated in the second clause of the antecedent of the implication. The logic of this constraint entails that if there is a shift of a lexical prominence, then the result must be to a sponsor which is adjacent to the correspondent of the sponsor in the input. Applying this reasoning, if a lexical accent could be shifted more than one mora to the right (because the subsequent moras do not appear in the final foot), the ranking of LOC-FLOP-PROM above ALIGN-R predicts a shift exactly one mora to the right. Thus, when a candidate attempting to improve on edge alignment shifts the accent more than one mora, it incurs a violation LOC-FLOP-PROM, and is thus ruled out in favor of the candidate with a bounded shift, as depicted below.

(145) Bounded Accent Shift

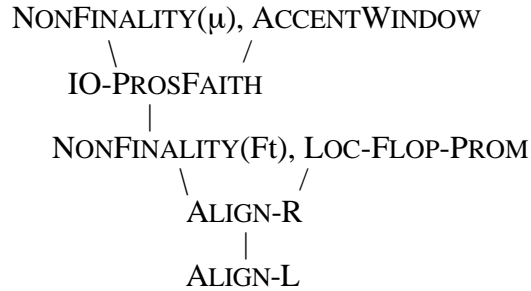
/CVCVCV <u>CV</u> + CVVCVCV/	LOC-FLOP-PROM	ALIGN-R
(CVCV)(C <u>Δ</u> -CV <u>CV</u>)(CVC <u>Δ</u>)	*!	**
→ (CVCV)(C <u>Δ</u> -C <u>CV</u> V)(CVC <u>Δ</u>)		***

The same result holds with the leftward shifts because LOC-FLOP-PROM also dominates ALIGN-L. In the mapping from /uhaNí-kiti/ to [(uhá)(NΔki)tΔ], the competing candidate which defaults to initial accent is ruled out because it also incurs a violation of this top-ranked constraint.

To summarize, the rankings needed for bounded accent shifts are given below. I have also carried over the rankings from the previous subsection to present the complete constraint system.

²³Furthermore, we require a phonological analysis of this fact as it cannot simply be assumed that the accent shifts observed here are immobile phonological accents whose H targets are somehow delayed in the phonetic implementation (as cogently argued for Chichewa in Myers & Kim 1998). The phonological shifts interact with other phonological constraints, i.e., the Alignment constraints and the constraint responsible for leftward shift when the accent would appear in the final foot, which shows that the shifts are phonological in nature.

(146) Summary of Rankings



With LOC-FLOP-PROM ranked above the Alignment constraints, accent shifts will always be bounded to the mora which is the counterpart of the lexical sponsor for accent. Also, ALIGN-R dominates ALIGN-L, describing the fact that a shifted accent typically goes the right. If, however, the shifted accent would end up in the final foot of the word, then it shifts the left because of high-ranking NONFINALITY(Ft). This constraint hierarchy will be directly relevant to the analysis of bounded rightward shift in the morphological environments examined in the next subsection.

5.4.4.3. Accent Shift in Derived Words

We may now proceed to the central facts of interest in this case study, namely the morphological pattern of accent shift. As illustrated in the introduction to this section, certain suffixes trigger a shift in the accent of the base. Since this affix-controlled accentual process has all of the properties of ACA, it may be explained in a general theory of Transderivational Anti-Faithfulness. I start first with the analysis of the basic distinction between accent-shifting and accent-neutral suffixes, and then move to extend the analysis to the behavior of a more complicated set of accent-shifting suffixes and the treatment of the locality conditions on accent shift.

Larson 1956 and Payne 1990 distinguish a wide range of suffixes, each with a distinct morpho-accentual behavior. For the present purposes, however, we only need to contrast the behavior of two classes, the accent-neutral and accent-shifting suffixes. The accent-neutral suffixes are like the stress-neutral suffixes in English in that they leave the accentuation of the base as it is in the underived form. This type of accentual behavior is exemplified below for the predicate-forming suffix *-i*, which Payne glosses as ‘is an X (object not present)’. The derived form is compared with the simplex nominative base, which forms the base for many suffixes.

(147) Accent-neutral *-i*

núka	núka-i	‘leaf’
č aNkín	č aNkína-i	‘basket’
š uNkař m	š uNkař ma-i	‘bird (arrendajo)’
kampaának	kampaánka-i	‘kind of palm’
áaNki as	áaNki asa-i	‘palm spear’
taátaanč	taátaanč i-i	‘water spider’

Other suffixes exhibiting accent-neutral behavior include: *-a* ‘is an X (object present)’, the negation suffix *-č uu*, and *-é u* ‘maybe X’.

Accent-shifting suffixes, on the other hand, cause the accent of the base to shift one mora to the right. This class of suffixes is actually a heterogeneous class, involving distinctions depending on the lexical prosody and syllable make-up of the base. However, since all accent-shifting suffixes have the basic properties of the suffixes discussed directly below, it is clear that our point of departure should be with these. In the closing remarks, I will discuss one of the variations on the basic pattern as it relates to the analysis and sketch an account which is consistent with the analysis given here.

(148) Accent-shifting Suffixes

-na	Accusative
-hai~	Comitative (/i~/ is a nasalized vowel)
-nuu	Possessive

The behavior of these suffixes is exemplified below, again opposing the simplex nominative with the derived forms showing the shift.

(149) Derived Words with Accent Shift

	Nominative	Accusative	Comitative	Possessive	
a.	núka	nuká-n	nuká-hai~	nuká-nuu	‘leaf’
	kawáú	kawaú-n	kawaú-hai~	kawaú-nuu	‘parrot’
	káš ai	kaš ái-n	kaš ái-hai~	kaš ái-nuu	‘paca’
b.	wampukái	wampukái-n	wampukái-hai~	wampukái-nuu	‘tadpole’
	maákai	maákai-n	maákai-hai~	maákai-nuu	‘mud’
	ámuntai	ámuntai-n	ámuntai-hai~	ámuntai-nuu	‘buzzard’
	apuúpuu	apuúpuu-n	apuúpuu-hai~	apuúpuu-nuu	‘dolphin’

As shown by the contrast between the forms in (149a) and (149b), the accent of the base only shifts in the derived form if the base is three moras or less. This fact is significant, as it is observed in one form or another in all the accent-shifting suffixes. Payne suggests that this is a locality effect on the distance of the accent from the accent-shifting suffix, which would further diagnose this pattern as an affix-controlled process. But because locality effects of this kind are linked in an important way to the constraint requiring the shift, I need to set it aside for the moment while I develop the analysis of the basic distinction between accent-neutral and accent-shifting suffixes.

Before presenting the analysis in TAF theory, it is necessary to consider an alternative in which the shift is due to an inherent phonological property of the affix itself. After all, English has similar patterns of stress shift induced by suffixation, e.g., *elétric/electricity*. Since the rightward shift here also correlates with suffixation, perhaps the shift is simply a matter of the phonological composition of the suffixed structures. This parallel is clearly inappropriate, however, because the shifted accent does not conform to any generalizations counting from the left or right edge of the word. Suffixation triggers a shift of the lexically determined accent, which may occur on any of the first three moras; since the accent shift is bounded to the lexical accent, the position of the shifted accent in derived forms is not predictable in terms of mora count.

A different idea is to say that the accent-shifting suffixes contribute an accent, or alternatively, that they simply add a link which is somehow merged with the base accent if it is close enough (as in the approach to accent-shifting suffixes in Poser 1984). Such an analysis is certainly possible here, and indeed, this is essentially the idea mentioned in passing in Payne 1990: 181. As with the case of Japanese, however, I develop an alternative here which is consistent with the more restrictive TAF theory of accent shifts. Thus, accent shift must be rightward and bounded because this is the independently motivated pattern of accent shift in the language. I do not see how the purely phonological account of these shifts would explain this fact, and as grammar dependence is a natural consequence of the theoretical model developed here, the TAF account has a clear advantage over the phonological analysis. Furthermore, a purely phonological analysis of the retraction of tonal accent in Limburg Dutch is highly undesirable (see argumentation in §5.4.2), and I propose to develop an analysis of accent shifts in Aguaruna which is in line with this clear case of morphological shift.

In the now familiar way, the idiosyncratic distinction between whether or not an affix conditions an accentual process is derived through subcategorization of OO-correspondence relations in the lexicon. Thus, assuming the lexical entries in (151) below, the accent-neutral suffixes are sensitive to the TAF constraint $\neg\text{OO}_{\text{Rec}}\text{-NOFLOP-PROM}$, which, because of its low rank in the hierarchy in (150), does not condition a shift in the base-derivative mappings. The suffixes in (151b), in contrast, trigger OO_{Dom} -correspondence, and since the Anti-Faithfulness constraint defined upon this relation is high-ranking, these suffixes are accent-shifting.

(150) Rankings for Accent-neutral/Accent-shifting Distinction

$\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PM} \gg \text{OO-NO-FLOP-PM} \gg \neg\text{OO}_{\text{Rec}}\text{-NO-FLOP-PM}$

(151) Lexical Entries for Accent-neutral and Accent-shifting Suffixes

a.	<i>-i</i>	Pred _X (pres.)	[[Stem]OO _{Rec} ___]	[Accent-Neutral]
	<i>-a</i>	Pred _X (not pres.)	[[Stem]OO _{Rec} ___]	
	<i>-č uu</i>	N _{Neg}	[[Stem]OO _{Rec} ___]	
	<i>-é u</i>	N _{Putative}	[[Stem]OO _{Rec} ___]	
b.	<i>-na</i>	N _{Acc}	[StemOO _{Dom} ___]	[Accent-Shifting]
	<i>-hai~</i>	N _{Com}	[StemOO _{Dom} ___]	
	<i>-nuu</i>	N _{Poss}	[StemOO _{Dom} ___]	

Applying these assumptions to a particular example, the accent-shifting suffix *-na* (which loses the final vowel in syncope) conditions a shift of the base accent because forms with this suffix are evaluated by the TAF constraint, $\neg\text{OO}_{\text{Dom}}\text{-NOFLOP-PROM}$, which is ranked above the OO-Prosodic Faithfulness constraint banning the shift.

(152) Morphological Accent Shift

Base	/núka + na/	$\neg\text{OO}_{\text{Dom}}\text{-NO-FLOP-PROM}$	OO-NO-FLOP-PROM
a. núka	núka-n	*!	
b. → núka	nuká-n		*

The predicate-forming suffix *-i*, on the other hand, does not trigger the shift, as shown below. This suffix subcategorizes for OO_{Rec} -correspondence; since the TAF constraint operating on this type of correspondence is so low-ranking, it cannot have an effect.

(153) No Morphological Accent Shift

Base	/núka + i /	$\neg OO_{Rec}$ -NO-FLOP	OO-NO-FLOP	$\neg OO$ -NO-FLOP
a. \rightarrow núka	núka-i			*
b. núka	nuká-i		*!	

Therefore, as with dominant and pre- and post-accenting affixes, the presence or absence of a shift is due to the rank of the TAF constraint associated with a given suffix.

Returning to the behavior of the accusative suffix *-na*, which is accent-shifting, this suffix triggers a flop of the base accent, which is bounded and rightward, i.e., the same basic pattern for phonologically triggered accent shifts. This fact shows that the morphological accent shifts exhibit grammar dependence and the analysis of this fact stems from the same basic principles applied in the analysis of grammar dependent ACA generally. Thus, an independently needed Alignment constraint, specifically ALIGN (PROM, R, PrWd, R), determines the edge orientation of the mutated accent. This result is illustrated in the tableau below, in which the competition between the two patterns of Anti-Faithfulness is determined by the Alignment constraint.

(154) Grammar Dependence Part 1: Rightward Accent Shift

Base	/kawáu + na/	$\neg OO_{Dom}$ -NO-FLOP	OO-NO-FLOP	ALIGN-R
a. kawáu	kawáu-n	*!		
b. kawáu	káwau-n		*	**!
c. \rightarrow kawáu	kawaú-n		*	

Another type of grammar dependence observed in the morphological shifts is that the mutated accent always shifts one mora to the right, but not all the way to the end of the word. This fact is also explained with the already existing constraint hierarchy, because the LOC-FLOP-PROM dominates ALIGN-R, and so the shifted accent will not migrate too far from its lexical sponsor. As illustrated below, the TAF constraint $\neg OO_{Dom}$ -NO-FLOP-PROM requires a phonologically overt difference between the base and its derivative, but the rest of the grammar, specifically the ranking of IO-Prosodic Faithfulness relative to Alignment, ensures that the shift is bounded to the lexically accented mora.

(155) Grammar Dependence Part 2: Bounded Accent Shift

Base	/káš ai + na/	$\neg OO_{Dom}$ -NO-FLOP	LOC-FLOP-PROM	ALIGN-R
a. káš ai	káš ai-n	*!		
b. káš ai	kaš aí-n		**!	
c. \rightarrow káš ai	kaš ái-n		*	*

The boundedness of the morphological shift is thus explained with the same constraint interaction used for the boundedness of phonological shifts, namely as the domination of ALIGN-R by LOC-FLOP-PROM.

There is an apparent problem with the analysis concerning the grammar dependent nature of the shifts. Shifts due to syncope are to the right by default, but to the left if such a shift would yield an accent in the final foot of the word (see discussion above). Morphological shifts appear to be exclusively to the right, however, which is in conflict with the default-to-opposite nature of the phonological accent shifts. It turns out that this apparent inconsistency is really due to a combination of independently needed constraints which account for the absence of leftward shift. Recall that the morphological shift is only triggered in words with three moras or less (the crucial data is in (149)). This restriction, combined with the general avoidance of final mora accent, has the effect of precluding shifts from the third mora of a word; in order to have third mora accent, it is necessary to have a fourth mora, but bases with four moras or more generally do not shift. Returning to the main point, the only phonological context which would yield a leftward shift under the conditions stated in the analysis of syncope is a word with third mora accent and two moras beyond the third mora; only such a context would produce a shift from the first foot to the final foot, which is ruled out by NONFINALITY(Ft). Furthermore, in words with a morphological shift, the shift of the base accent is always in a non-final foot, necessarily because of the size requirement on the shift, as shown below with some nominative-possessive pairs repeated from above.

(156) Foot Structures for Words with Accent Shift

(núka)	(nuká)-(nuu)
(kawáú)	(kawaú)-(nuu)
(káš ai)	(kaš ái)-(nuu)

These shifts therefore do not incur a violation of NONFINALITY(Ft), and so the shift is toward the default edge in the language, namely the right edge. Note also that words with a monosyllabic suffix, e.g., the accusative suffix *-na*, will also not trigger a leftward shift because all the words with the requisite size to undergo the shift, such as the three mora base, /kawáú + na/ → [(kawaú)-nΔ], will always be parsed by a single prosodic foot. Therefore, a shift into the final foot is unavoidable because there is only one; since any shift will violate NONFINALITY(Ft), the default edge orientation kicks in again to give the observed shift to the right.

As for the size requirement on accent shift, I am only prepared to put forth a speculative analysis which makes use of the prosodic foot. To start, Payne makes the interesting suggestion that this restriction is a kind of locality effect. The idea here is that smaller nouns will bring the accent of the base ‘close enough’ to the suffix in order to trigger the shift; but in longer forms, the base accent and the suffix are too far apart, so there is no shift. If this is the correct way to analyze this pattern, then Aguaruna is indeed a strong case for the theory of accent shifts proposed here, as affix-controlled processes are generally subject to locality requirements. But as far as I can tell, the implementation of this idea will have some difficulties with contrasts like the following.

(157)	a.	kawáú	kawaú-nuu	Base is ≤ μμμ: Accent shifts
		káš ai	kaš ái-nuu	
	b.	wampukái	wampukái-nuu	Base is ≥ μμμ: No shifts
		maákai	maákai-nuu	

The lexical accent in the base forms here are identical in terms of their proximity to the suffix, and yet only the smaller nouns have a shift.

A different idea, in the spirit of Payne's original insight, is that the suffixes specifically mutate the accent in the main stress foot of the word, and that the suffix must be close enough to this primary accent. Thus, employing the foot structures argued for above in the analysis of syncope, we can characterize the initial foot as the main stress foot (realized as a pitch accent in this language), and if the suffix is close enough to the accent of the main stress foot, it can trigger a shift. To be more concrete, if the TAF constraint is conjoined with the Stem: PrWd Anchoring constraint in the domain of the prosodic foot (see §4.3 for the details of constraint formulation), then the accent of the base will only shift if it is in the stem-final foot. Thus, this approach accounts for the cases in (157b) because the accent of the base is either not in the initial foot, as in the case of [(wampu)(káí)-nuu], or the accent of the first foot is not close enough, as in [(maá)(kai)-nuu], the latter effect being crucial to the analysis of locality here.

Furthermore, the foot-based approach leads to an attractive approach to a different class of accent-shifting suffix, which is identical in all respects to the suffixes discussed here, except that in four mora words with third mora accent, the lexical accent is actually shifted. For example, the first person possessive suffix *-N(u)*, behaves this way; it shifts an accent in all of the three mora nouns shown above for other accent-shifting suffixes, but in addition, it shifts an accent in cases like: /wampukáí + Nu/ → *wampukaí-N* 'my tadpole', with stems with four moras and third mora lexical accent. A loosening of the requirement that the shifted accent be in the first foot yields a shift in precisely this context, as shown by: [(wampu)(kaí)-N]. The important point though is that a shift of initial or peninitial accents are still banned because the foot containing these accents would not be adjacent. As the details involved in implementing this idea in the current framework are too cumbersome to present in detail here, I leave the job of working out this problem formally for future research. To sum up, a first pass at an analysis of the size restriction is encouraging, as it fits in nicely with the model of affix-controlled accentual processes laid out in §4.3 to account for locality conditions on the application of the process.

To summarize the results established above, the proposed analysis achieves one of the central goals of this chapter, namely to account for the properties of accent shifts with the same basic toolbox used in the treatment of other affix-controlled accentual processes. Thus, the use of subcategorized correspondence relations sensitive to different TAF constraints is fundamental in distinguishing affixes by their morpho-accentual behavior. Furthermore, the explanation of this behavior via the TAF constraint \neg OO-NOFLOP-PROM accounts for three additional properties of accent shift in Aguaruna, namely that it distinguishes a derivative from its base (i.e., it is morphological) and that the shift is base-mutating and subject to locality conditions. Finally, the independently necessary constraints LOC-FLOP-PROM and ALIGN (PROM, R, PrWd, R) are crucial in the analysis of the boundedness and edge orientation of the shift, effectively characterizing the process as grammar dependent on par with the other types of ACA analyzed in this chapter.

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