

Noun Faithfulness: On the privileged behavior of nouns in phonology

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1. Introduction: Noun faithfulness and domain-specific faithfulness

In a number of languages, nouns are permitted to show more phonological contrasts than words of other categories. The privileged phonological status of nouns fits the pattern of domain-specific faithfulness effects (often called positional-faithfulness effects; e.g., Beckman 1996). This paper therefore proposes that the universal set of constraints

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includes noun-faithfulness constraints -- domain-specific faithfulness constraints for the lexical category noun -- which are distinct from, and separately rankable from, other kinds of faithfulness constraints.

In a canonical case of domain-specific faithfulness, a particular domain or position that is appropriately salient, in some phonological, phonetic, grammatical, or cognitive sense, licenses a greater number of phonological contrasts than other domains or positions can have. Domains that have been proposed to show domain-specific faithfulness effects include the stressed syllable (Alderete 1995, Beckman 1996), the syllable onset (or perhaps all consonants which are [+release]; Lombardi 1996, Padgett 1995), the morphological root (McCarthy & Prince 1995), and the root-initial syllable (Beckman 1995, 1996).

Beckman (1996) and most of the other references mentioned above account for domain-specific faithfulness effects as follows. The grammar of the language under consideration contains a markedness constraint (**M**) that prohibits a certain phonological contrast from appearing in surface forms. This markedness constraint outranks the general, context-free faithfulness constraint (**F**) that would have required the contrast to be maintained in surface forms throughout the language. However, the grammar also contains a high-ranking domain-specific faithfulness constraint (**DF**) that calls for the contrast to be maintained *within the particular domain in question*. Given this ranking, **DF** >> **M** >> **F**, the contrast does not in general appear in the language (because **M** >> **F**), but it does appear within the privileged domain (because **DF** >> **M**).

As noted above, this paper accounts for the privileged phonological behavior of nouns as a case of domain-specific faithfulness. The grammar contains domain-specific faithfulness constraints for the category noun, or *noun-faithfulness constraints* (**NF**). Cases where nouns license phonological contrasts not supported elsewhere in the language can thus be accounted for with the ranking **NF** >> **M** >> **F**, a subcase of the general pattern for domain-specific faithfulness effects.

The proposal that noun-faithfulness constraints are part of the grammar (and faithfulness constraints specific to words of other categories are *not*) has two important implications. First, it predicts that any case of category-specific faithfulness will be a case of noun faithfulness: the phonological contrasts present in nouns may be a superset of those present in verbs, but the reverse should never be true. Second, Beckman (1996) constrains the theory of domain-specific faithfulness by suggesting that only salient domains can have specific faithfulness constraints. Therefore, proposing that noun-faithfulness constraints exist amounts to making the claim that the category noun is, in some linguistically relevant way, a salient domain. This paper addresses both implications.

First, Section 2 provides initial motivation for noun-faithfulness constraints with a discussion of the typology of accent-related phenomena found among the dialects of Japanese. Section 3 then confronts the case of word-stress assignment in Tuyuca, which appears at first to be a counterexample to the claim that nouns are the only category that can show privileged phonological behavior. An alternative analysis of Tuyuca word stress is developed, demonstrating first that Tuyuca is not really a counterexample to the noun-faithfulness hypothesis, and ultimately that Tuyuca itself actually shows noun-faithfulness effects. Finally, Section 4 presents evidence from psycholinguistics and language acquisition indicating that the category noun is indeed salient compared to the other lexical categories.

2. The case for noun faithfulness: The accent typology of Japanese dialects¹

When the phonological patterning of accentedness and accent location is examined across dialects of Japanese, three types of behavior are found. In some cases, no words, of any lexical category, are permitted to have a phonological contrast with respect to a particular accent-related structure. In other cases, words of all lexical categories have the accent-related contrast in question. Finally, there are cases where nouns, and only nouns, are permitted to contrast with respect to accent. A fourth logical possibility is *not* found: a dialect in which words of a certain category are permitted to show an accent-related phonological contrast, but nouns are not. That is, the only category that ever has special

¹Portions of Section 2 have appeared as Smith (1997).

phonological privileges is the noun.

This section argues that the accent-behavior typology in Japanese is best explained by including noun-faithfulness constraints in the grammar. The possible rankings of markedness, context-free faithfulness, and noun-faithfulness constraints with respect to one another produce all and only the three kinds of grammars that are actually attested in the dialects of Japanese.

2.1 Accent in Japanese

In most dialects of Japanese, pitch is distinctive;² many dialects have minimal pairs of words differing in nothing but pitch contour. Nevertheless, in order to determine the tonal contour of a word, it is necessary to know only the location (or absence) of the *accent*, which is the locus of an abrupt change in pitch, and the default tonal pattern assigned to the remaining syllables in the particular dialect in question.³ Japanese dialects are therefore generally considered to be pitch-accent systems. Typically, the surface realization of accent in a given dialect is a high tone followed by a fall in pitch.

Most analyses of Japanese accent fall into one of two groups. Some researchers treat lexical accent as a *diacritic* on a vowel, mora, or syllable in the lexical entry of a word (e.g., Hattori 1951, McCawley 1968, Haraguchi 1977). Other analyses represent lexical accent as a *tone* or a *sequence of tones* that is associated with a vowel, mora, or syllable (e.g., Poser 1984 and references therein, Pierrehumbert & Beckman 1988). This discussion is concerned with the behavior of accent, not with the nature of its lexical representation. For notational convenience, accent is therefore represented here as a diacritic, but this choice is not intended to imply any substantive claims about the nature of accent.⁴

In the remainder of this section, two kinds of accent-related behavior are examined in various dialects of Japanese. The first is *accentedness*, the question of whether there is a phonological contrast between accented and unaccented words. The second is *accent location*, the question of whether the location of the accent in a word (or phrase) is contrastive or predictable.⁵ These two properties are independent, so it is possible for a given dialect to show one type of behavior with respect to accentedness while showing a different type of behavior with respect to accent location.

2.2 No-Contrast behavior

Some dialects of Japanese simply do not permit any word, of any category, to have a particular phonological

²For some dialects, such as Miyakonojō, the pitch contour of a phrase is completely predictable. This phenomenon is shown below to be the result of a high-ranking markedness constraint.

³In dialects with more than one lexical melody or "word tone", such as the Kyōto-type dialects, it is necessary to specify the melodic or tone class to which a word belongs as well as the location of its accent. Pierrehumbert and Beckman (1988) account for the word tone as an initial H or L tone associated lexically with each word; word tone and accent are distinct phenomena.

⁴The distinction between accent as diacritic and accent as tone may be less significant than was once thought. Pierrehumbert and Beckman (1988) present evidence that the tonal contour of a word or phrase in Japanese does not come from spreading the tones of the accent to other syllables, as was assumed in much autosegmental work on Japanese. Instead, the surface pitch contour is produced by phonetic interpolation between tone targets, including not only the nonspreading accent, but also tones associated with higher levels of prosodic structure. Given this analysis, it becomes impossible to distinguish between the diacritic and prelinked-tone theories of accent with respect to how the surface pitch contour is determined, as Pierrehumbert and Beckman note (1988:122).

⁵Frellesvig (1994) refers to these two properties as 'commutative accent' and 'permutative accent' respectively.

contrast, a type of behavior called here No-Contrast behavior. This subsection examines two No-Contrast cases. As usual, the lack of phonological contrast is accounted for by having a markedness constraint ranked higher than any relevant faithfulness constraint.

One example of No-Contrast behavior is accentedness in Miyakonojô, as described by Haraguchi (1977, following Hirayama 1943). In Miyakonojô, all phrases have the same tonal contour: a string of L tones with one final H tone.

- (1) (a) LH LL H
 hana hana-ga
 'flower' or 'nose' 'flower-NOM' or 'nose-NOM'
- (b) L L H L L L H L L H L L L H
 [Kyoto-se] [itta?ku?-dʒi] [genki-de] [o?kuiyai-na] (Careful speech)
 'Kyoto-to will-go as, take care POLITE'
 ('As I will go to Kyoto, take care of yourself well.')

The surface tone pattern is sensitive only to prosodic structure; the lexical content of the phrases does not affect the pitch contour. Therefore, following Haraguchi (and others), I assume that words in Miyakonojô do not have accents (the predictable phrase-final high tone is probably a boundary tone). This state of affairs is the result of a markedness constraint of the *STRUCTURE family (Prince & Smolensky 1993), *ACCENT, which prohibits surface forms from having accents.

- (2) **M:** *ACCENT Output forms do not have accents

In other dialects, there are words with accents, so the grammar also contains a faithfulness constraint requiring preservation of input accents:

- (3) **F:** MAX(ACCENT) An accent in the input must have a correspondent in the output
 (=No deletion of accents)

*ACCENT and MAX(ACCENT) are, of course, in conflict. Which of the two constraints is active in a given dialect is determined by their relative rank in the grammar of that dialect. The ranking *ACCENT >> MAX(ACCENT) gives the pattern observed in Miyakonojô. Under this ranking, whether the input contains an accent or not, high-ranking *ACCENT ensures that the optimal output candidate has no accent. Tableaus (i)-(iii) in (4) demonstrate this instance of the principle of "richness of the base" (Prince & Smolensky 1993).

- (4) *hana* 'flower' (Miyakonojô)

(i) /hana/ *ACCENT >> MAX(ACCENT)

	*ACCENT	MAX(ACCENT)
a. haná	*!	
☞ b. hana		

(ii) /haná/ *ACCENT >> MAX(ACCENT)

	*ACCENT	MAX(ACCENT)
a. haná	*!	
☞ b. hana		*

(iii) /hána/	*ACCENT	>>	MAX(ACCENT)
a. hána	*!		
☞ b. hana			*

That is, it is the constraint hierarchy itself that ensures that no output forms have accents in Miyakonojō. Stipulating that input forms must not have accents serves no purpose; even input forms that do have accents (4ii, iii) give rise to the correct, unaccented forms.⁶

Another example of No-Contrast behavior is the case of accent location in Kagoshima (data from Haraguchi 1977, after Hirayama 1960 and others). Unlike Miyakonojō, words in Kagoshima do contrast for accentedness, so there are words with and without accents.⁷ However, there is no contrast in accent location. The accent always falls on the penultimate syllable of the minor phrase.

- (5) (a) hána 'nose' (a') haná-ga 'nose-NOM'
 (b) sakúra 'cherry' (b') sakurá-ga 'cherry-NOM'
 (c) kagaríbi 'watch-fire' (c') kagaríb-ga 'watch-fire-NOM'

The markedness constraints responsible for penultimate accent are as follows:

- (6) **M**: ALIGN-R(ACCENT) ALIGN(Accent,R, PPh,R): Every accent is at the right edge of a phonological phrase
 NONFINAL(ACCENT) Accent does not fall on the final syllable

Ranking: NONFINAL(ACC) >> ALIGN-R(ACC)

- These two constraints, in this ranking, have the result that accent will fall on the penultimate syllable (the farthest to the right it can be without actually being final). For clarity of exposition, they will be abbreviated in the following discussion as the encapsulated constraint PENULTACCENT.

Again, the markedness constraints are in conflict with a faithfulness constraint:

⁶From the point of view of learnability, one can argue (very plausibly) that a Miyakonojō learner has no reason to think that any of the input forms in the lexicon do have accents, since no accents appear in any output forms. Therefore, the lexicon of an actual Miyakonojō speaker probably contains only unaccented forms. "Richness of the base" does not mean that a speaker has no fixed (and reasonable) input forms in his or her lexicon. What it actually means is that the theory can handle even putative inputs that do contain accents without resorting to any stipulations about the contents of the lexicon.

⁷Kagoshima shows two different surface pitch patterns, (L)⁰HL and (L)⁰H. One characterization of this dialect (e.g., Shibatani 1990) is that these pitch contours belong to accented and unaccented words respectively. An alternative analysis (e.g., Hayata 1977) is that there are no accented words, but words fall into one of two distinct melody classes (perhaps LHL and LH). With the two-melody analysis, one must derive the surface patterns by assuming that word-melodies link and spread. Since Pierrehumbert and Beckman (1988) demonstrate that the linking and spreading of word-level melodies is not the best analysis for surface tone patterns in Tôkyô, I tentatively assume that it is not the appropriate analysis for other dialects either. Therefore, I choose the first option, taking the relevant distinction in Kagoshima to be between accented and unaccented words.

If it is the second option that is in fact correct, then the difference between the two classes of words in Kagoshima is one of lexical word melody, not one of accentedness. Kagoshima would then be another case of No-Contrast behavior with respect to accentedness, exactly like Miyakonojō (recall that lexical melody and accent are distinct phenomena).

(7) **F**: FAITHLOC(ACCENT) Output accent is faithful to its location in the input

In Kagoshima, there is no contrast with respect to accent location. As in the Miyakonojō example above, the lack of contrast is the result of markedness outranking faithfulness: PENULTACCENT dominates FAITHLOC(ACCENT). With this ranking, no matter where the accent is located in the input, the output always has penultimate accent. (Again, the principle of richness of the base can be seen at work. The input accent in (8) is placed arbitrarily on the initial syllable; see footnote 6.)

(8) *sakúra* 'cherry' (Kagoshima)

<i>/sákura/</i>	PENULTACCENT >>	FAITHLOC(ACCENT)
a. <i>sákura</i>	*!	
ㄟ b. <i>sakúra</i>		*

The cases of accent location in Kagoshima and accentedness in Miyakonojō thus illustrate the same generalization, schematized in (9).

(9) Ranking: **M >> F**
 Result: No categories have the relevant phonological contrast

Whenever a markedness constraint banning a certain structure outranks any faithfulness constraints that would require the structure to be maintained, the structure is absent from the language. In such a language, there is of course no phonological contrast with respect to the structure in question.

2.3 All-Contrast behavior

The second pattern of accent behavior found among Japanese dialects is referred to in the following discussion as the All-Contrast type. In All-Contrast behavior, words of any (lexical) category are permitted to have a particular phonological contrast. As usual, the presence of a phonological contrast is analyzed by having a (context-free) faithfulness constraint dominating the conflicting markedness constraint that would otherwise ban the structure from output forms.

Dialects with All-Contrast behavior include Hirosaki (Haraguchi 1977, after Konoshima 1961) and Tōkyō (McCawley 1968, Poser 1984), both with respect to accentedness. In these dialects, a given word of any category may be accented or unaccented.

(10) (a) Hirosaki: *ame* 'candy'
 amé 'rain'

 (b) Tōkyō: *mor-u* 'pile(s)'
 mór-u 'leak(s)'

As seen in section 2.2, there is no contrastive accentedness in Miyakonojō because the markedness constraint *ACCENT dominates the faithfulness constraint MAX(ACCENT). The Tōkyō/Hirosaki pattern, where accentedness is contrastive, comes from the opposite ranking of the same two constraints: in these two dialects, MAX(ACCENT) dominates *ACCENT. Therefore, the optimal candidate is one that preserves an accent found in the input rather than one which deletes it to satisfy the markedness constraint.

(11) *amé* 'rain' (Hirosaki)

/amé/	MAX(ACCENT) >>	*ACCENT
☞ a. amé		*
b. ame	*!	

It is important to note that the Tōkyō/Hirosaki ranking of MAX(ACCENT) over *ACCENT does not force *all* output forms to have an accent. MAX(ACCENT) requires only that an accent *present in the input* have a correspondent in the output. If for a given word the input has no accent, then the optimal output for that word will not have an accent.

(12) *ame* 'candy' (Hirosaki, Tōkyō)

/ame/	MAX(ACCENT) >>	*ACCENT
a. amé		*!
☞ b. ame		

The above discussion demonstrates that in Tōkyō and Hirosaki, MAX(ACCENT) dominates *ACCENT. As a result, any word may have an accent. The case of accentedness in these two dialects is an example of the general pattern in (13).

- (13) Ranking: **F >> M**
 Result: All categories have the relevant phonological contrast

Whenever a faithfulness constraint outranks a conflicting markedness constraint, the optimal output is one that stays faithful to the input form, rather than one that gratuitously eliminates the structure banned by the markedness constraint. Inputs with the relevant structure correspond to outputs that have it as well; inputs without the structure correspond to outputs that do not have it. Thus, there is a phonological contrast in the language for the structure in question.

2.4 Noun-Contrast behavior

The two types of accent behavior just discussed have a common characteristic: words of all lexical categories behave the same way with respect to the phonological contrast under consideration. In No-Contrast phenomena, no categories have the contrast, and in All-Contrast phenomena, all categories have the contrast. The third type of grammar observed among the dialects of Japanese is the Noun-Contrast type, in which nouns are permitted to have a certain phonological contrast but words of other categories (specifically, verbs and adjectives) are not.

As discussed in Section 1, the restriction of a phonological contrast to a particular domain is a canonical domain-specific faithfulness effect. Therefore, this analysis proposes that instances of Noun-Contrast behavior in dialects of Japanese are cases of domain-specific faithfulness involving high-ranking noun-faithfulness constraints.

A well-known example of Noun-Contrast behavior is the case of accent location in Tōkyō (McCawley 1968, Poser 1984). While accent location is distinctive for (accented) nouns in this dialect, it is not distinctive for (accented) verbs or adjectives.

- (14) (a) Nouns: accent location unpredictable (Haraguchi 1977)
- (i) *í*noti 'life'
 - (ii) kokóro 'heart'
 - (iii) atamá 'head'

(b) Verbs: accent location predictable (Most data from Poser 1984)

- | | |
|-------------------------------------|-----------------------|
| (i) ká <u>k</u> -u 'write' | (iv) dé-ru 'emerge' |
| (ii) nayá <u>m</u> -u 'worry' | (v) kaké-ru 'hang' |
| (iii) kumadó <u>r</u> -u 'graduate' | (vi) todomé-ru 'stop' |

(c) Adjectives: accent location predictable

- | | |
|-----------------------|-------------------------------|
| (i) taká-i 'high' | (iii) omosiró-i 'interesting' |
| (ii) surudó-i 'acute' | (iv) urayamasí-i 'enviable' |

For the verbs and adjectives, a lack of phonological contrast implies, as usual, that markedness outranks faithfulness. The markedness constraint in question for Tōkyō is one that fixes the accent in a particular location, abbreviated here as FIXLOC(ACCENT).⁸ The faithfulness constraint that it dominates is FAITHLOC(ACCENT), introduced in the analysis of Kagoshima in section 2.2. As (15) shows, the higher rank of the markedness constraint ensures that no matter which syllable may bear the accent in the input, accent always appears in a fixed location in the output.

(15) *omosiró-i_A* 'interesting' (Tōkyō)

/omósiro-i _A /	FIXLOC(ACCENT) >>	FAITHLOC(ACCENT)
a. omósiroi	*!	
☞ b. omosiró <i>i</i>		*

On the other hand, as observed in (14a), accented nouns in Tōkyō may have their accent on any syllable; accent location is contrastive for nouns. Generally, the presence of a phonological contrast implies that faithfulness outranks markedness. However, we can not simply discard the ranking in (15) and say that the correct ranking for Tōkyō is FAITHLOC(ACCENT) >> FIXLOC(ACCENT). While such a ranking would correctly give us contrastive accent location for nouns, it would also, incorrectly, give us a contrast for verbs and adjectives as well.

This apparent paradox can be resolved by including in the grammar a new family of faithfulness constraints: domain-specific faithfulness constraints that apply only to nouns, or *noun-faithfulness constraints*. For example, adding the following noun-faithfulness constraint to the hierarchy so that it dominates the markedness constraint FIXLOC(ACCENT) produces the correct results for the case of accent location in Tōkyō.

(16) **NF**: FAITHLOC_N(ACC) Output accent is faithful to its input location, *in nouns*

With this hierarchy, for nouns the winning candidate is the one that preserves the input accent location, satisfying the high-ranking noun-faithfulness constraint.

(17) *atamá_N* 'head' (Tōkyō)

/atamá _N /	FAITHLOC _N (ACC) >>	FIXLOC(ACC) >>	FAITHLOC(ACC)
☞ a. atamá <i>i</i>		*	
b. atá <i>ma</i>	*!		*

This revised constraint ranking is still able to choose the correct output form for verbs and adjectives. Since these words

⁸The precise location of the accent often depends on the inflectional form, as in Tōkyō *kakéru* 'hang', *káketa* 'hung'; *taká*i** 'is high', *tákakatta* ~ *takákatta* 'was high'. Therefore, the constraint name FIXLOC(ACCENT) is used here to encapsulate several simpler constraints that interact to determine the accent location for a given verbal or adjectival inflection.

are not nouns, they are not subject to noun-faithfulness constraints such as $\text{FAITHLOC}_N(\text{ACCENT})$, so it is the markedness constraint $\text{FIXLOC}(\text{ACCENT})$ that determines the winning candidate. As a result, verbs and adjectives do not have phonologically contrastive accent location.

(18) *omosiró_i* 'interesting' (Tôkyô)

/omósiro-i _A /	$\text{FAITHLOC}_N(\text{ACC}) \gg$	$\text{FIXLOC}(\text{ACC}) \gg$	$\text{FAITHLOC}(\text{ACC})$
a. omósiroi		*!	
☞ b. omosiró _i			*

A second example of Noun-Contrast type accent behavior is the case of contrastive accentedness in Hakata (Hayata 1985). In this dialect, nouns may be accented or unaccented. However, verbs and adjectives must be accented.

The markedness constraint responsible for enforcing accentedness in verbs and adjectives can be formulated as follows:

(19) **M:** HAVEACCENT An output form has an accent

Note that this markedness constraint (which is reminiscent of requirements that metrical constituents be headed; cf. Liberman & Prince 1977, Hayes 1995) has exactly the opposite effect of the $*\text{ACCENT}$ constraint introduced in section 2.2. In dialects such as Miyakonojô, where the effects of $*\text{ACCENT}$ are seen, HAVEACCENT must be low-ranking. Similarly, in dialects where HAVEACCENT is active, as in Hakata, $*\text{ACCENT}$ must be low-ranking.

The faithfulness constraint that conflicts with HAVEACCENT is the following:

(20) **F:** $\text{DEP}(\text{ACCENT})$ An accent in the output must have a correspondent in the input (=No insertion of accents)

Because accent is obligatory for verbs and adjectives, HAVEACCENT must dominate $\text{DEP}(\text{ACCENT})$, as shown in (21).

(21) *yó_b-u_v* 'call(s)' (Hakata)

/yob-u _v /	$\text{HAVEACCENT} \gg$	$\text{DEP}(\text{ACCENT})$
a. yobu	*!	
☞ b. yó _b u		*

But nouns do not have to obey the markedness constraint HAVEACCENT . This indicates that the following noun-faithfulness constraint dominates HAVEACCENT .

(22) **NF:** $\text{DEP}_N(\text{ACCENT})$ *In nouns*, an accent in the output must have a correspondent in the input (=No insertion of accents, *in nouns*)

This constraint ranking correctly selects the attested output form both for nouns, as in (23), and for verbs and adjectives, as in (24).

(23) *atama*_N 'head' (Hakata)

/atama _N /	DEP _N (ACC) >>	HAVEACC >>	DEP(ACC)
☞ a. atama		*	
b. atáma	*!		*

(24) *yób-u*_V 'call(s)' (Hakata)

/yob-u _V /	DEP _N (ACC) >>	HAVEACC >>	DEP(ACC)
a. yobu		*!	
☞ b. yóbu			*

Accent location in Tôkyô and accentedness in Hakata are examples of Noun-Contrast behavior, where only nouns are permitted to have a phonological contrast. This privileged behavior of nouns comes from a constraint ranking of the following type.

(25) Ranking: **NF >> M >> F**
 Result: Only nouns have the relevant phonological contrast

Here, a markedness constraint dominates a general faithfulness constraint, banning a certain structure from words in general. However, the markedness constraint is in turn dominated by a noun-specific faithfulness constraint, requiring that nouns be faithful to their input forms, and in effect making nouns exempt from the markedness constraint that applies to words of other categories.

2.5 Summary: Factorial typology of accent phenomena

With a constraint set that contains markedness constraints, general faithfulness constraints, and noun-faithfulness constraints, grammars corresponding to all three observed types of accent behavior can be generated, as summarized in (26).

- (26)
- | | |
|----------------------------|---|
| (a) No-Contrast behavior | Ranking: M >> NF, F
Result: No categories have the contrast
Examples: Accentedness in Miyakonojô
Accent location in Kagoshima |
| (b) All-Contrast behavior | Ranking: F >> M (NF: rank irrelevant)
Result: All categories have the contrast
Examples: Accentedness in Tôkyô
Accentedness in Hirosaki |
| (c) Noun-Contrast behavior | Ranking: NF >> M >> F
Result: Only nouns have the contrast
Examples: Accent location in Tôkyô
Accentedness in Hakata |

Given this constraint set, no other result is possible. In particular, no reranking of these constraints produces a grammar in which words of some category can have a certain phonological contrast but nouns can not. Therefore, to best account for the typology of accent behavior in the dialects of Japanese, it is necessary to include noun-faithfulness constraints in the grammar. An analysis that relies on noun-faithfulness constraints is able to generate all and only the

grammars that are actually attested among the dialects of Japanese with respect to accent behavior.

3. Defusing a counterexample: Word stress in Tuyuca

The typology of accent behavior in Japanese provides motivation for the hypothesis that noun-faithfulness constraints are part of the grammar. A number of other languages also show instances of privileged noun behavior. For example, in English and Spanish, nouns are permitted to have more stress patterns than verbs (Hayes 1981, Harris 1983). In Arabic, nouns may or may not fit a CV-template, but verbs are always templatic (J. McCarthy, p.c.). In many Bantu languages, only nouns can take prefixes of the shape N-, which means that only nouns can begin with NC clusters (J. Kingston, p.c.; while this is an observation about permissible morpheme shapes, it may well be the result of a $\mathbf{NF} \gg \mathbf{M} \gg \mathbf{F}$ ranking). All of these examples of phonological contrasts specific to nouns are likely candidates for a noun-faithfulness-based analysis.

This paper assumes the strongest possible version of the noun-faithfulness hypothesis that is consistent with the facts examined thus far: namely, that noun-faithfulness constraints are the *only* kind of category-specific faithfulness constraints in the grammar. Making this claim is equivalent to predicting that whenever a language allows words of one lexical category to have a phonological contrast that does not appear in words of other categories, that privileged category is the noun.

If a language were to come to light in which some other category, such as the verb, licensed more phonological contrasts than nouns could license, this would be evidence against the strong version of the noun-faithfulness hypothesis. The analysis of word-stress placement in Tuyuca developed by Barnes (1996) appears to be one such counterexample. Barnes (1996) argues that verbs have a three-way lexical contrast for accent class, whereas nouns have only a two-way contrast.

However, this section proposes an independently motivated alternative analysis of Tuyuca word stress. Under the new analysis, Tuyuca ceases to be a counterexample to the noun-faithfulness hypothesis. In fact, noun faithfulness plays a crucial role in accounting for the Tuyuca word-stress facts.

3.1 Basic facts about Tuyuca word stress

Tuyuca is a Tucanoan language, spoken in Colombia and Brazil. The data discussed here are mainly from Barnes (1996), supplemented with data from Barnes and Takagi de Silzer (1976).

As described by Barnes (1996), Tuyuca assigns stress within the domain of the prosodic word (abbreviated PWd in the following discussion; Barnes (1996) refers to this domain as the "phonological word"). A PWd consists of one or more stems, followed optionally by one or more suffixes.

(27) The prosodic word in Tuyuca: some examples (Nasalized vowels and sonorants are italicized)

- | | | |
|-----|------------------------------------|--------------------------|
| (a) | keeró | 'lightning bug' |
| (b) | wáa | 'to go' |
| (c) | betó-ri-re-ra → betórirera | 'to precisely the coils' |
| | <i>coil-INAN.PL-SPEC-precisely</i> | |
| (d) | hóa-masí-ri-ga → hóamasiriga | 'I can't write' |
| | <i>write-know-NEG-EV</i> | |

Every PWd bears exactly one word stress, which is realized phonetically as a combination of intensity and high pitch. The placement of the word stress within a PWd is determined by the accents of its component morphemes. In a PWd containing only unaccented morphemes, word stress is assigned by default to the final vowel of the stem. When

one or more of the morphemes in a PwD has an underlying accent, then one of those accents will bear the word stress.⁹ As for the question of which accent bears the word stress in a case where more than one accent would be eligible to do so, this matter is to be the focus of the present discussion.

3.2 The Barnes (1996) analysis of word stress: A three-way accent-class contrast

Barnes (1996) accounts for word-stress placement in Tuyuca by setting up a three-way accent contrast and classifying all stems and suffixes as one of the three types. The placement of word stress in a given PwD is then predictable, given a hierarchy of "preference" among the three types. This section describes the patterns of word-stress placement and outlines Barnes' analysis.

For the reader's reference, (28) is a chart summarizing the upcoming discussion in sections 3.2.1 and 3.2.2.

(28) Word-stress placement: The Barnes (1996) three-accent-class analysis

	Associated-accent (suffix)	Unassociated-accent (suffix)	Unaccented (suffix)	
Associated-accent (stem)	hóo-re	hóo-wi	hóo-a	/hóo/ 'plant.manioc'
Unassociated-accent (stem)	hoo-ré	hoó-wi	hoó-a	/hoo (A) / 'cut.slashes'
Unaccented (stem)	hoo-ré	hoo-wí	hoó-a	/hoo/ 'submerge.oneself'

/ré/ /wi (A)/ /a/
 NOMINALIZER EVIDENTIAL EVIDENTIAL

- Notation: An acute accent indicates that a morpheme has associated accent on that vowel. The notation (A) after a morpheme indicates that the morpheme has unassociated accent.

3.2.1 Stems

There is a class of stems that always bear the word stress, even if they are combined with accented suffixes (that is, suffixes that receive the stress when combined with unaccented stems; see below).

- (29) Stems that always bear word stress: "associated accent"
- (a) /hóo-ré/ plant.manioc-NOM → hóore 'the planting of manioc'
- (b) /sáa-ró/ transport-tool → sáaro 'vehicle used for transporting'

In the Barnes (1996) analysis, these stems have associated accent (first row in table (28)). That is, they have an underlying accent, and moreover, the location of the accent is lexically specified by means of an autosegmental link to a particular vowel in the stem.

⁹According to Barnes (1996:46 ff.), the word stress is restricted to the first two morphemes of a PwD (except for certain highly restricted cases involving nominal classifiers, when the stress may fall on the third morpheme). This two-morpheme window for stress suggests that Tuyuca has a recursive PwD structure for multiply suffixed words, along the lines of $[_{PWd} [_{PWd} stem + suffix] + suffix]$. If stress were to fall on the second suffix in such a structure, the innermost PwD would be left with no stress.

A second class of stems contains those that Barnes calls "unmarked" lexically for accent (third row in table (28)); I will use the term unaccented in this paper in order to avoid confusion with other uses of the term "markedness". These stems never have the word stress, unless there are no accented morphemes in the word (that are eligible for stress). Thus, a PWd containing one of these stems and an accented suffix, as in (30a), will have stress on the suffix. However, a PWd with no accented morphemes, as in (30b), will have default word stress on the stem-final vowel.

- (30) Unaccented stems
- | | | | | | |
|-----|----------|----------------------|---|-------|-----------------------------|
| (a) | /hoo-ré/ | submerge.oneself-NOM | → | hooré | 'the submerging of oneself' |
| (b) | /hoo-a/ | submerge.oneself-EV | → | hoóa | 'I submerge myself' |

Finally, Barnes recognizes a third class of stems, whose behavior is different from that of the other two classes. Specifically, this third class of stems shows that there is a distinction between two classes of accented suffixes. The forms in (31a,b) below demonstrate that the suffixes [-wi] and [-re] are both accented suffixes, because when they combine with the unaccented stem /hoo/ 'submerge.oneself', it is the suffixes that bear the word stress. In (32a,b), however, the same two suffixes are combined with a stem of the third accent class. With a stem from this class, a distinction between the two suffixes becomes apparent. When the stem combines with the suffix [-wi], in (32a), the stem bears the word stress. However, when the same stem combines with [-re], in (32b), it is instead the suffix that bears the word stress.

- (31) Both suffixes [-wi] and [-re] have accents
- | | | | | |
|-----|--------|----------------------|--|-----------------------------|
| (a) | hoo-wí | submerge.oneself-EV | | 'he submerged himself' |
| (b) | hoo-ré | submerge.oneself-NOM | | 'the submerging of oneself' |
- (32) Suffixes [-wi] and [-re] with a stem of the third class
- | | | | | |
|-----|--------|-----------------|--|--------------------------|
| (a) | hoó-wi | cut.slashes-EV | | 'he cut slashes' |
| (b) | hoo-ré | cut.slashes-NOM | | 'the cutting of slashes' |

According to Barnes, the stems in this third class have unassociated accent (middle row in table (28)). A stem of this type has an accent in its lexical entry, but the accent is floating; it is not associated with any vowel. When a stem with unassociated accent is in the right environment to have the word stress (regarding which environment see section 3.2.3), the stress is predictably realized on the final vowel of the stem, so there is no need to specify its location in the lexicon.

3.2.2 Suffixes

In the Barnes (1996) analysis, suffixes fall into the same three accent classes as stems. First, the suffixes that prevail over the unassociated-accent stems, such as [-re] in (32b) above, are said to have associated accent (first column in table (28)); again, this is an accent that is lexically linked to a vowel. Second, suffixes that never have the word stress, even when combined with unaccented stems, are deemed unaccented (third column in table (28)). Finally, the suffixes that bear the word stress when combined with unaccented stems but not when combined with unassociated-accent stems, such as [-wi] in (32a) above, are said to have unassociated accent (middle column in table (28)); as with stems, this is a lexically specified but floating accent.

3.2.3 Accent-class preference and word-stress placement

The Barnes (1996) analysis makes use of the three accent classes for stems and suffixes, plus a notion of "preference" among accent classes, to determine the location of the word stress in a given PWd, as summarized below; again, refer to table (28) for examples.

(33) Determining word-stress location

- (a) The three accent classes form a hierarchy of "preference":
associated accent > *unassociated accent* > *unaccented*
- (b) When morphemes are combined, the morpheme of the preferred accent class bears the word stress
- (c) When stem and suffix belong to the same class, the stem bears the word stress

3.2.4 A problem for the noun-faithfulness hypothesis?

According to Barnes (1996), verb (and adjective) stems can be of any of the three classes: associated accent, unassociated accent, or unaccented. Noun stems, however, can only have associated accent or be unaccented; there are no nouns with unassociated accent.¹⁰ That is, verbs have a three-way contrast for accent class, whereas nouns have only a two-way contrast. This generalization poses a problem for the strong version of the noun-faithfulness hypothesis, which claims that no lexical category other than the noun should ever show privileged phonological behavior.

However, even setting aside concerns about noun faithfulness, there is an independent reason for considering an alternative analysis of word-stress assignment in Tuyuca. The Barnes (1996) analysis has a gap in its typology of possible forms. While associated-accent nouns can have their accent on any mora, associated-accent verbs never have their accent on the final mora. On the other hand, when unassociated-accent verbs show their accent, it is *always* on the final mora. These facts suggest that the division of verbs into three distinct accent classes could be reconsidered.

Section 3.3 outlines an alternative analysis of Tuyuca word stress. Under the new analysis, there is no such thing as a verb with unassociated accent. Verbs like *hoó* 'cut.slashes', whose accent receives the word stress when combined with some accented suffixes but not with others, are simply associated-accent verbs with accent on the final mora. The testing ground for this new analysis is its ability to account for why the final-accent verbs are dominated by the accent of certain suffixes; this question is the topic of section 3.3.2.

3.3 A new analysis of Tuyuca word stress

It is possible to view the relationship between underlying accent and surface word stress in Tuyuca in two different ways. One possibility is to assume, as Barnes (1996) does, that stress is the automatic surface realization of every accent. Since a PWd has only one stress in Tuyuca, this view of the accent-stress relationship must say that all accents, except the one that surfaces as the word stress, are deleted from the output form of a PWd.

The second possibility, which is the one chosen for the new analysis of Tuyuca presented in this section, is to separate accent more completely from stress. Under this view, *accent* is a diacritic (indicated with an underline: ̀) that has no overt phonetic correlate. Its location is contrastive and must therefore be specified in the lexicon. Essentially, accent marks a particular mora as eligible for stress. *Stress* is a property of output forms, realized as a combination of intensity and high pitch (indicated with an acute accent: *ó*). There are constraints in the grammar that require accents to receive surface stress and stress to fall on accented moras, but these constraints, being violable, are not necessarily surface-true. Crucial to the new analysis (see especially the treatment of accent clash in 3.3.2) is the following assumption: Although a PWd in Tuyuca has only one *stress*, multiple *accents* may be present in output forms.

3.3.1 Accounting for the basic facts of word-stress placement

As noted above, every PWd in Tuyuca has one and only one stress. This fact can be accounted for by means of the

¹⁰Barnes (1996:52) states that a few nonverb stems, all of which are demonstratives or numerals, are in the unassociated-accent class. This is not necessarily a problem for the current analysis, because it is quite plausible that demonstratives and numerals are not nouns and are therefore not subject to noun-faithfulness constraints, in the same way that verbs are not (see section 3.3.2).

following constraints, ranked as in (35).

- (34) HEADEDNESS Every PwD has a head (=stress)
 *STRESS Have no stresses in the output
 STRESS-TO-ACCENT Every accent is realized as a stress, and every stress is on an accent

- (35) *Ranking:* HEADEDNESS >> *STRESS >> STR-TO-ACC

Because HEADEDNESS is highest ranked, every PwD will surface with a stress. Should none of the morphemes in a PwD have accents, a stress is inserted; it does not matter that inserting a stress where there is no accent violates both *STRESS and STR-TO-ACC, because these constraints are ranked lower than HEADEDNESS.

(36) /hoo+a/ 'submerge.oneself-EV' HEADEDNESS >> *STRESS >> STR-TO-ACC

a. hooa	*!		
☞ b. hoóa		*	*

It is the ranking *STRESS >> STR-TO-ACC that ensures that no PwD has more than one stress. *STRESS is always violated (once) to satisfy higher-ranking HEADEDNESS, but violation is minimal; *STRESS will never be violated more than once, even at the cost of violating STR-TO-ACC.

(37) /hoo+wí/ 'plant.manioc-EV' HEADEDNESS >> *STRESS >> STR-TO-ACC

a. h́owí		**!	
☞ b. h́owí		*	*

The next observation to account for is the fact that, all else being equal, stems have priority over suffixes for receiving stress. The following constraint will bring about the correct result.

- (38) STEMSTRESS Every stem has a stress

When both the stem and the suffix have accents, STEMSTRESS ensures that it is the stem accent, and not the suffix accent, that receives the stress.

(39) /hoo+wí/ 'plant.manioc-EV' [*STRESS >> STR-TO-ACC] , STEMSTRESS

a. h́owí	**!		
☞ b. h́owí	*	*	
c. h́owí	*	*	*!

Similarly, when neither the stem nor the suffix have accents, STEMSTRESS forces the stress to be inserted into the stem rather than into the suffix.

(40) /hoo+a/ 'submerge.oneself-EV' [HEADEDNESS >> STR-TO-ACC] , STEMSTRESS

a. hoo a	*(!)		*(!)
b. hoo á		*	*!
☞ c. hoó a		*	

The preceding tableau raises a question: given that the stress will be inserted into the stem when there are no accented morphemes, what ensures that the stress falls on the stem-final mora and not some other mora in the stem? The preference of a default accent for the stem-final mora can be analyzed as an Alignment effect.

(41) ALIGN-STRESS-R Every stress is aligned with the right edge of a PWd

However, ALIGN-STRESS-R is crucially dominated by STEMSTRESS; stress stays within the stem rather than going to the rightmost mora of the PWd.

(42) Ranking: STEMSTRESS >> ALIGN-STRESS-R

(43) /hoo+a/ 'submerge.oneself-EV' STEMSTRESS >> ALIGN-STRESS-R

		STEMSTRESS	>>	ALIGN-STRESS-R
a.	[hóo a] _{PWd}			μμ!
☞ b.	[hoó a] _{PWd}			μ
c.	[hoo á] _{PWd}	*!		

Furthermore, ALIGN-STRESS-R is also dominated by STR-TO-ACC; it is always better for the stress to fall on an accented mora than for it to fall at the right edge of a stem.

(44) Ranking: STR-TO-ACC >> ALIGN-STRESS-R

(45) /hoo/ 'plant.manioc' HEADEDNESS >> *STRESS >> STR-TO-ACC >> ALIGN-STRESS-R

		HEADEDNESS	>>	*STRESS	>>	STR-TO-ACC	>>	ALIGN-STRESS-R
☞ a.	hóo			*				μ
b.	hoó			*		*!		

A final basic fact about word-stress assignment in Tuyuca is that stress prefers an accented suffix to an unaccented stem. This fact motivates the ranking given in (46), which is exemplified in tableau (47): it is better to realize the stress on an accent than it is to keep the stress within the stem.

(46) Ranking: STR-TO-ACC >> STEMSTRESS

(47) /hoo+wi/ 'submerge.oneself-NOM' STR-TO-ACC >> STEMSTRESS >> ALIGN-STRESS-R

		STR-TO-ACC	>>	STEMSTRESS	>>	ALIGN-STRESS-R
☞ a.	hoo wí			*		
b.	hoó wí	*!				μ

The constraint ranking motivated so far is as follows.

(48) HEADEDNESS >> *STRESS >> STR-TO-ACC >> STEMSTRESS >> ALIGN-STRESS-R

3.3.2 The case of final-accent verbs

The distinction between associated-accent and unassociated-accent verbs in the Barnes (1996) analysis is intended to account for why only the unassociated-accent verbs lose out to certain suffixes for word stress. The current analysis, which does not make the associated/unassociated-accent distinction, must nevertheless find a way to account for why only final-accent verbs (Barnes' "unassociated-accent verbs") are subordinate to certain suffixes.

As shown in (49a), the final-accent verb /hoo/ behaves as expected when combined with most accented suffixes: the stress falls on the stem accent, not on the suffix accent. But when the same verb is combined with a monosyllabic nominalizer, as in (49b), the stress unexpectedly falls on the suffix accent.

- (49) A final-accent verb: *hoó* ‘cut.slashes’
 (a) With a typical accented suffix: /hoo+wi/ *hoówi* ‘he cut slashes’
 (b) With a monosyllabic nominalizer: /hoo+re/ *hooré* ‘the cutting of slashes’

In order for a verb accent to lose out to a suffix accent, the following conditions must be met. First, the verb accent must be stem-final. Furthermore, the suffix must be one of the monosyllabic nominalizers (which are all accented). That is, suffix accents are dominant only in the following configuration:

- (50) The necessary configuration for suffix dominance
 ho_v+re_N

Two facts about this configuration are immediately apparent. First, the accents of the two morphemes are adjacent: this is a case of accent clash. Second, the accent that loses belongs to the stem, which is a verb, while the accent that wins belongs to the nominalizing suffix, which, according to most current theories of generative morphology, is a noun. Therefore, the subordination of final-accent verbs to monosyllabic nominalizers can be straightforwardly analyzed as clash resolution in favor of a noun rather than a verb. That is, the domination of final-accent verbs is actually a *noun-faithfulness effect*.

The relevant constraints are as follows:

- (51) NOCLASH Accents on two adjacent moras are prohibited
 MAX(ACCENT) An accent in the input must have an output correspondent
 (=No deletion of accents)
 MAX_N(ACCENT) An accent in the input *that belongs to a noun* must have an output correspondent (=No deletion of accents, *in nouns*)

Furthermore, NOCLASH must dominate MAX(ACCENT), because accents are deleted in order to avoid an accent-clash configuration.

- (52) *Ranking:* NOCLASH >> MAX(ACCENT)

When a final-accent verb is combined with an ordinary accented (monosyllabic) suffix, the verb accent receives the stress. In such a case, one accent must delete to resolve the clash; STEMSTRESS ensures that it is the stem accent that remains, so that the stress will fall within the stem.

- (53) /ho_v+w_{EV}/ ‘cut.slashes-EV’ [NOCLASH >> MAX(ACC)] , STEMSTRESS

a.	ho <u>o</u> w <u>i</u>	*!		
b.	ho <u>o</u> w <u>i</u>	*!		*
c.	ho <u>o</u> w <u>i</u>		*	
d.	ho <u>o</u> w <u>i</u>		*	*!

However, when a final-accent verb is combined with a (monosyllabic) nominalizer, the clash is resolved in the other direction: the suffix accent is the one that remains and receives the stress. The necessary ranking is therefore the one in (54).

- (54) *Ranking:* [MAX_N(ACC), NOCLASH] >> STEMSTRESS

Both MAX_N(ACC) and NOCLASH dominate STEMSTRESS. That is, protecting the noun accent from deletion and avoiding clash are both more important than keeping the stress within the stem.

- (55) /hoo_v+rere_N/ ‘cut.slashes-NOM’ Note: MAX_N(ACC), MAX(ACC) unranked
 [MAX_N(ACC) , NOCLASH] >> [STEMSTRESS , MAX(ACC)]

a.	ho <u>o</u> re		*!		
b.	ho <u>o</u> re		*!	*	
c.	ho <u>o</u> re	*!			*
☞	ho <u>o</u> re			*	*

Adding the MAX constraints and NOCLASH to the hierarchy makes no difference in the case of non-final-accent verbs. For these verbs, accent clash never arises, and there is therefore no need to delete any of the accents. As usual, STEMSTRESS ensures that the stem accent will receive the stress, not the suffix accent.

- (56) /hoo_v+rere_N/ ‘plant.manioc-NOM’ [MAX_N(ACC) , NOCLASH] >> [STEMSTRESS , MAX(ACC)]

☞	a.	ho <u>o</u> re				
	b.	ho <u>o</u> re			*!	
	c.	ho <u>o</u> re	*!			*
	d.	ho <u>o</u> re			*(!)	*(!)

The above discussion of final-accent verbs has considered only nominalizers that are monosyllabic. This is because polysyllabic nominalizers do not show “dominant” behavior with final-accent verbs. However, it is not difficult to incorporate the polysyllabic nominalizers into the current analysis, by ranking the following constraint low in the hierarchy.

- (57) NOSHIFT If accent α_1 and mora μ_1 are associated in the input, then their correspondents α_2 and μ_2 are associated in the output (=Accents do not change location)

- (58) *Ranking:* [MAX(ACC) , STEMSTRESS] >> NOSHIFT

With this ranking, it is better to shift the suffix accent than to delete it or have the stress fall outside the stem.¹¹ Note that shifting the accent is not an option for the monosyllabic (or, more properly, monomoraic) nominalizers, since they have no other moras for the accent to shift to. Therefore, clash becomes a problem -- and suffix dominance effects are observed -- only with monosyllabic nominalizers.

¹¹Shifting the accent to avoid clash is never something observed within stems, only within suffixes. This is another example of domain-specific faithfulness. Although the context-free NOSHIFT is low ranking, the root-specific faithfulness constraint NOSHIFT_{Root} is undominated in Tuyuca.

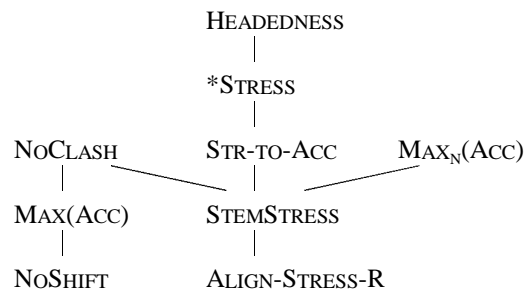
It is interesting to note, though hardly surprising, that the noun-verb distinction and the root-affix distinction partition the lexicon differently in Tuyuca. While the nominalizing suffixes are nouns, and are therefore subject to noun-faithfulness constraints, they are *not* roots, so they are not subject to root-specific faithfulness constraints.

(59) /ho_v+a_Nɗara/ 'cut.slashes-NOM.ANIM.PL.FUT' (constructed example) *Note: MAX_N(ACC), MAX(ACC) unranked*
 [MAX(ACC)_N , NoCLASH] >> [STEMSTRESS , MAX(ACC)] >> NoSHIFT

a.	ho _v áɗara		*!			
b.	hoo _v áɗara		*!	*		
c.	ho _v áɗara	*(!)			*(!)	
d.	hoo _v áɗara			*(!)	*(!)	
e.	ho _v áɗara					*

This concludes the analysis of word-stress assignment in Tuyuca. The final combined constraint ranking is given in (60) below.

(60) The final constraint ranking



3.4 Tuyuca: Concluding remarks

The new analysis of Tuyuca word-stress assignment proposed in this section has two advantages over the Barnes (1996) analysis. First, it eliminates the gap in the Barnes typology of verb accent classes: under this analysis, there *are* final-accent verbs.

Second, the new analysis needs one fewer contrastive accent class than the Barnes analysis. Nouns, verbs, and suffixes all have only two accent classes, *accented* and *unaccented*. The unaccented morphemes in the new analysis correspond to the unaccented morphemes in the Barnes analysis. The accented morphemes in the new analysis correspond to both the "associated-accent" and the "unassociated-accent" morphemes in the Barnes analysis, as outlined in (61) below.

(61) Eliminating the associated/unassociated-accent distinction

- (a) Nouns: Even in the Barnes analysis, all accented nouns had associated accent.
- (b) Verbs: "Unassociated-accent" verbs are simply verbs with final accent. Their domination by monosyllabic nominalizers comes from the satisfaction of NOCLASH and MAX_N(ACCENT) at the expense of MAX(ACCENT) and STEMSTRESS.
 "Associated-accent" verbs are non-finally accented verbs. For these verbs, the faithful candidates never violate NOCLASH, so no suffix dominance effects are seen.
- (c) Suffixes: The "associated-accent" suffixes in the Barnes analysis are the monosyllabic nominalizers. The new analysis does not need to place these suffixes in a different class from other accented suffixes. Their dominant behavior with

respect to final-accent verbs is simply a noun-faithfulness effect.

Under this new, independently motivated analysis of word-stress assignment, Tuyuca is no longer a counterexample to the strong version of the noun-faithfulness hypothesis. In fact, since the dominant-suffix phenomena in Tuyuca are accounted for by means of noun-faithfulness constraints, Tuyuca is now another case study in *support* of the noun-faithfulness hypothesis.

4. Other evidence for the salience of the category noun

This paper has examined several cases in which nouns show more phonological contrasts than words of other categories. The privileged phonological behavior of nouns is treated as a case of domain-specific faithfulness; that is, the universal constraint hierarchy contains faithfulness constraints that are specific to the category noun. In a language where noun-faithfulness constraints are highest ranked, but markedness constraints outrank context-free faithfulness constraints, the typical pattern of domain-specific faithfulness emerges: only nouns show the relevant phonological contrast.

As discussed in Section 1, Beckman (1996) and other researchers have placed a constraint on the theory of domain-specific faithfulness. The only domains for which domain-specific faithfulness constraints exist, it is suggested, are those which are in some way salient. Therefore, proposing that the grammar includes noun-faithfulness constraints means claiming that the category noun is more salient than the other lexical categories.

In fact, there is evidence outside phonology supporting the claim that the category noun is cross-linguistically salient. While it is beyond the scope of this paper to give a comprehensive review of all of the relevant literature, this section summarizes a number of findings from the areas of language processing in aphasic subjects, language processing in normal subjects, and language acquisition. All of these findings suggest at least that nouns are stored, represented, or processed differently from predicates. Furthermore, most of these results support the claim that nouns are more cognitively salient than predicates: nouns appear to be maintained more easily in short-term memory, retrieved more quickly during production tasks, and acquired more quickly and in greater numbers during early stages of acquisition, than predicates.

4.1 Evidence from processing in aphasic subjects

The results of several experiments performed with aphasic subjects, including native speakers of Italian, English, and Chinese, provide evidence at least for the claim that there is some kind of cognitive difference between nouns and predicates.

4.1.1 Italian

Miceli et al. (1984, reported in Zingeser & Berndt 1990) found that Italian-speaking patients in different syndromes of aphasia showed differences in their ability to produce nouns and verbs. Specifically, they found that Broca's aphasics were better able to produce nouns than verbs, and Wernicke's aphasics were better at producing verbs than nouns (this finding was also replicated for English by Zingeser & Berndt (1990)). These results do not bear directly on the question of noun *salience* itself, but since different syndromes of aphasia affect nouns and predicates differently, it appears that some aspect of storage, retrieval, or processing is crucially different for nouns than for verbs.

4.1.2 English

Williams & Canter (1987) tested English-speaking patients with Broca's, Wernicke's, conduction, and anomic aphasia for performance on both confrontation-naming and picture-description tasks for actions (verbs). They compare their results with those of an earlier study on objects (nouns), and find differences between object-naming and action-naming performance.

First, there was a straightforward difference in performance: patients in all four syndromes were better at naming objects than at naming actions. Second, a number of differences between confrontation naming and picture description that were found in the noun study were not found in the verb study. For example, in the object-naming study, Broca's aphasics did better on confrontation naming than on picture description, while for Wernicke's aphasics the pattern was reversed. However, in the action-naming study, no such consistent patterns were found for any of the patient groups. A second such difference between the two experiments was that in the object-naming study, performance on one of the two tasks tended to be correlated with performance on the other task. This correlation was not found in the action-naming study.

As for why the patterns that emerged in the noun study were not seen in the verb study, Williams & Canter (1987:134-5) suggest that the "overall difficulty in verb recall and/or production" is great enough to obscure any slight performance advantage such as that seen for Broca's aphasics during confrontation naming in the noun study. That is, processing nouns appears to be easier for the patients in the studies than processing verbs. This result again indicates that cognitively, nouns and predicates differ. The fact that nouns posed fewer problems for the patients than verbs might even be evidence for the greater salience of nouns.

4.1.3 Chinese

Bates et al. (1991) performed an experiment with Chinese-speaking aphasics (native speakers of either Mandarin or Taiwanese) in an attempt to replicate, for Chinese, Miceli et al.'s (1984) findings. Bates et al. note that since Italian verbs are more morphologically complex than nouns, the difference between nouns and verbs found by Miceli et al. could have been an effect of morphological complexity rather than evidence for a true noun-verb difference per se. Bates et al. carried out the same experiment for Chinese, an isolating language, to see whether nouns and verbs still give different results for patients in different syndromes of aphasia even when they are arguably equal in morphological complexity.

In fact, Bates et al. were able to replicate a main result of Miceli et al.'s study. For confrontation-naming tasks in Chinese, just as in Italian, Broca's patients were better at object naming than at action naming. Conversely, Wernicke's patients were better at action naming than at object naming. These findings indicate that it is not just a difference in degree of morphological complexity, but rather a more fundamental difference between nouns and verbs, that accounts for the noun-verb difference in the performance of aphasia patients.

The results from the experiments performed by Miceli et al. (1984), Williams & Canter (1987), and Bates et al. (1991) thus provide evidence that nouns are somehow stored or processed differently from predicates. Furthermore, some of the results, such as Williams & Canter's finding that English-speaking patients in all four syndromes of aphasia performed better on object-naming tasks than on action-naming tasks, support the claim that nouns are more salient than predicates.

4.2 Evidence from processing in normal subjects

Huttenlocher & Lui (1979) performed a number of processing experiments with preschool children, as well as some with adults. One of the goals of their study was to see whether children of preschool age show any difference between nouns and verbs in processing. From their various results, they conclude that nouns and verbs are organized differently in the lexicon (for adults as well as for children). Several of their findings, summarized in this subsection, indicate that nouns are in fact more salient than verbs.

First, Huttenlocher & Lui review work by various researchers concerning a noun-verb asymmetry in word-association responses. Responses to a word-association task are classified either as syntagmatic, when the response is of the same category as the stimulus, or as paradigmatic, when the response is of a different category from the stimulus. While adults are more likely to give syntagmatic responses than children under age eight for words of all lexical categories, both adults and children show more paradigmatic responses for adjectives or verbs than for nouns. That is,

subjects are more likely to respond to a predicate stimulus with a noun response than they are to respond to a noun stimulus with a predicate response. Perhaps this shows that noun responses are easier or faster to produce than predicate responses, so that the tendency to give a syntagmatic response to a predicate stimulus is sometimes overcome by the greater ease or speed of giving a noun response.

In list-recall experiments, subjects (adults as well as children) were asked to listen to and then recall lists of related or unrelated nouns or verbs. Huttenlocher & Lui report that for the related-items condition, subjects were better at recalling nouns than verbs.¹²

Another set of experiments performed by Huttenlocher & Lui tested "release from proactive inhibition (PI)". If subjects are given a few words from the same semantic category, such as names of fruit, and are then made to perform an interference task for a few seconds, they will probably recall most of the fruit names after the interference task. But when this procedure is repeated with successive sets of fruit names, it becomes progressively more difficult for the subjects to recall the set heard immediately before the most recent interference task; this is the phenomenon of proactive inhibition. However, if the subjects are then given a new set of words from another semantic category, such as names of furniture, recall of the new set after the interference task improves drastically; this effect is known as release from PI.

Huttenlocher & Lui tested preschool children for differences between nouns and verbs in release from PI. For nouns, an adult-like release from PI was found in experiments that used 8-second interference tasks. For verbs, however, several interesting results were obtained. First, in a pilot study with 8-second interference tasks, subjects could not recall any verbs at all after the interference task, even though with nouns an interference task of the same length was not a problem for the subjects. Moreover, in the main experiment (which reduced the interference tasks to 5 seconds in the verb condition), there was no *buildup* of PI for verbs, let alone any release-from-PI effects. Even if the verbs had been treated as random words rather than as belonging to related pairs, they would have been expected to show at least buildup of PI. Huttenlocher & Lui suggest that the children simply forget verbs so quickly that the verbs heard earlier in the experiment are not still present in memory to inhibit recall of the most recently presented verbs. That is, the children tested in the release-from-PI experiment were able to retain nouns in memory longer than they could retain verbs.

The findings reported by Huttenlocher & Lui thus show that in a variety of different experimental tasks, nouns and verbs produce different effects. Moreover, a number of their results suggest that for English-speaking preschoolers, nouns are easier to recall orally, or even to retain in memory at all, than verbs. This difference indicates that nouns are more salient than verbs.

4.3 Evidence from language acquisition

Finally, there is evidence from language acquisition that suggests that nouns are more salient than predicates for very young children first beginning to acquire language.

Goldin-Meadow et al. (1976) carried out a cross-sectional study of twelve children, of approximately two years of age, who were acquiring English, as well as a longitudinal study of three of the twelve children. They found two distinct stages of early acquisition, which they named the Receptive stage and the Productive stage. The children in the Receptive stage demonstrated comprehension of at least three times as many nouns as they actually produced, whereas the children in the Productive stage produced most of the nouns they comprehended, with a noun comprehension-to-production ratio of less than two to one.

¹²When the lists contained instead unrelated nouns or unrelated verbs, no difference was found between the recall of nouns and that of verbs. Huttenlocher & Lui propose that this is because what produces the effect in the *related* lists is a difference in conceptual organization between nouns and verbs. With lists of unrelated items, the organization of the words in the lexicon becomes irrelevant, so there is no noun-verb effect.

Moreover, Goldin-Meadow et al.'s results for verb production in each of the two stages are quite interesting. The study found that the children in the Receptive stage comprehended some verbs but produced none at all. The children in the Productive stage did produce some verbs, but they comprehended more verbs than they produced. Furthermore, the children in this stage still produced well over twice as many nouns as verbs.

To summarize Goldin-Meadow et al.'s findings: First, the children in the study began producing nouns before they produced any verbs. Second, even once they began producing some verbs, the children still produced many more nouns than verbs, and furthermore, they produced a higher proportion of the nouns that they could comprehend than they did of the verbs that they could comprehend. Both of these results suggest that nouns are more salient than verbs during language acquisition, at least for English. That is, nouns are comprehended earlier and produced earlier than verbs; it seems that nouns are easier to acquire than verbs.

While Goldin-Meadow et al.'s study examines only the acquisition of English, there is also cross-linguistic evidence that nouns are acquired earlier than verbs. An acquisition study by Gentner (1982) compares the language production of very young children acquiring German, English, Turkish, Japanese, Kaluli (New Guinea), and Mandarin. Gentner finds that children under age two acquiring each of these languages show the same pattern: at least half the total vocabulary consists of nominals,¹³ while no more than 31% (in the highest case) consists of predicates.

The languages examined by Gentner include languages with verb-final utterances (Japanese, Turkish, Kaluli, and German) as well as those with object-final utterances (English, Mandarin, and German); languages that are highly synthetic (Turkish, Kaluli) as well as Mandarin, which is extremely analytic; and languages from cultures where caretakers emphasize objects in the world (e.g., English, Mandarin) as well as cultures where caretakers emphasize relationships with other people (Kaluli). Therefore, it seems reasonable to claim that the tendency toward a greater proportion of nominals than predicates in early child language observed by Gentner is a true cross-linguistic generalization, not simply the effect of certain language-particular morphological, syntactic, or cultural characteristics.

4.4 Why nouns might be salient

Many of the researchers whose findings are summarized in this section offer the same speculation as to why nouns and predicates show different effects: they invoke the proposal that nouns have a hierarchical organization within the lexicon, whereas the organization of verbs is more matrix-like.

Kintsch (1972) provides a theoretical outline of such a model of lexical organization. In his model, lexical entries consist of sets of propositions. For nouns, the major organizing principle is the *is-a* relation, which provides a partial ordering over the set of all nouns. That is, nouns are organized by means of associations to the nouns that are their superordinate and subordinate categories.

The lexical organization of predicates in Kintsch's model is quite different. Kintsch notes that verbs must be classified in the lexicon together with the arguments that they must take. This information must be represented in lexical entries because the argument structure for a given predicate is idiosyncratic. Furthermore, as Kintsch observes, the precise meaning of a predicate such as *operate* can not be determined without knowing whether the arguments will be, for example, (*surgeon, patient*) or (*operator, machine*). Therefore, predicates are organized in the lexicon not only with associations to other predicates but also with associations to the nouns (noun hierarchies) that can serve as their

¹³The case with the lowest percentage of nominals (50%) is Kaluli. Gentner reports that "According to Schieffelin (1979), the Kaluli have little interest in teaching children the names of objects or beings, other than relatives....[M]others give their children extensive and explicit training in conversational interaction -- e.g., requesting, asserting rights, teasing -- often by modeling appropriate remarks for the child." Despite this cultural pattern of caregiver-child interaction, Gentner points out, "the noun-predominance effect is still there: Kaluli children still show twice as many nominals as predicates" (p 321).

arguments.¹⁴

Huttenlocher & Lui (1979), whose study found differences in the way children process nouns and verbs, explicitly assume a Kintsch-style organization of the lexicon in their discussion. Citing Miller & Johnson-Laird (1976), they further note that while verbs do fall into semantic fields (motion verbs, verbs of vision, etc.), there are various cross-classifying features, such as manner or intent, that cause verbs to be linked to other verbs in different semantic fields; much less cross-classifying, they suggest, occurs within nouns.

Graesser et al. (1987) attempted to find experimental evidence for a Kintsch-type theory of lexical organization. They determined experimentally the “hierarchical-organization” (HO) scores and “matrix-organization” (MO) scores for sets of nouns and verbs. Then, in an unconstrained sort task, they had subjects divide a list of nouns or verbs into groups. While the results were somewhat complex, Graesser et al. did find that HO scores were a greater factor than MO scores in predicting how nouns were sorted in the unconstrained task, and conversely that MO scores were a greater factor than HO scores for verbs. These results, they argue, provide at least some support for the theory that nouns are organized in a hierarchy while verbs are organized in a matrix.

If it is indeed the case that the way nouns are organized in the lexicon is different from the way that predicates are organized, this could be one reason for the greater salience of nouns. Perhaps the complicated organization of predicates, involving both within-class and cross-classifying associations to other predicates, combined with their associations to their arguments, makes them more conceptually complex and therefore less salient than nouns.

It is also possible that noun salience originates in the way that object and action words are acquired by children. Gentner (1982) suggests the following explanation for the earlier acquisition of nouns than of predicates. When a child begins the process of language acquisition, there are two distinct input streams that (s)he must analyze: language input, and general input from the physical world. One aspect of language acquisition involves deciding how to match the language stream with the objects and actions in the world.

While undoubtedly objects and actions are both perceptually salient to the child, Gentner argues, there is one important difference between the two classes. Since objects have clearly defined boundaries, most languages are likely to lexicalize a given object in essentially the same way. That is, it is relatively easy for the child to separate off an object from the rest of the physical world and assume that it will have one particular linguistic form associated with it.

However, the linguistic encoding of a particular action may vary greatly from one language to the next. Actions typically involve considerations of manner, instrument, direction, and so on, and while one language may include all of such attributes within the verb meaning for a given action, another language may express the same action by means of a verb combined with adverbials or adpositions. Gentner (1982:322) gives the following example of such a difference between English and Spanish.

- (62) (a) The bottle *floated into* the cave.
(b) La botella *entró en* la cueva, *flotando*.
the bottle entered in the cave floating

In the English version of the sentence, the verb meaning includes the concepts 'motion' and 'manner of motion', while 'direction of motion' is encoded by the preposition. In the Spanish version, the verb encodes 'motion' and 'direction of motion', while 'manner of motion' is contributed by the participle. The fact that there is much cross-linguistic variation in the way that actions are linguistically encoded suggests that there is no one particular obvious way to lexicalize an action. Therefore, it may be more difficult for the child to pair a concept with a linguistic form for actions than it is for objects.

¹⁴The claim, noted explicitly by Graesser et al. (1982), is that the links between nouns are bidirectional, while the links from verbs to nouns are unidirectional. In this sense, one can say that verbs are linked to nouns without saying that nouns are therefore linked to verbs.

Finally, it should be noted that the experimental evidence for noun salience discussed above has all come from studies that use object categories -- that is, concrete, common, count nouns. In order for the lexical category noun itself to have uniform status as a salient linguistic category, it is necessary to assume that the cognitive, perceptual salience observed for concrete objects is somehow grammaticalized and extended to the noun as a lexical category. Gentner (1982:328-9) suggests that "the noun-verb distinctions, once encoded syntactically, can be extended into abstract conceptual realms as well....Object-reference mappings may provide natural entry points into language -- an initial set of fixed hooks with which children can bootstrap themselves into a position to learn the less transparent aspects of language." Initial experience with concrete, salient objects may perhaps cause children to accord the category noun special status during the course of acquisition.

The explanations for the origin of noun salience considered in this subsection remain speculative at best. However, the fact remains that observationally, nouns are in some sense more cognitively salient than predicates. Since only salient domains have domain-specific faithfulness constraints, the evidence for the cognitive salience of nouns helps justify the proposal that noun-faithfulness constraints are part of the grammar.

5. Conclusions

In a number of languages, including various dialects of Japanese, and also Tuyuca, there is a difference in the number of phonological contrasts that appear in words of different lexical categories. Specifically, nouns have more contrasts than other words. This paper has argued that the privileged phonological behavior of nouns is best analyzed as a subcase of the same phenomenon that gives rise to privileged phonological behavior in, e.g., stressed syllables or morphological roots: domain-specific faithfulness.

Including noun-faithfulness constraints in the grammar, along with markedness constraints and context-free faithfulness constraints, predicts that every language should either allow a given contrast in words of all lexical categories, permit the contrast in no words at all, or allow the contrast in nouns but not in words of other categories. The languages examined thus far bear out this prediction. Even Tuyuca, in which suffix-dominance effects seemed under a previous analysis to require more underlying phonological contrasts for verbs than for nouns, is shown not to be a true counterexample. In fact, the very suffix-dominance patterns that seemed to motivate an extra accent class for verbs in the previous analysis are shown here to be noun-faithfulness effects themselves.

Furthermore, the proposal that noun-faithfulness constraints are part of the grammar implies that the category noun, like other domains for which domain-specific faithfulness constraints have been motivated, is a salient domain. Here, several pieces of evidence have been presented demonstrating that nouns are in some way more cognitively salient than other categories. While the ultimate source of noun salience is as yet unknown, the fact that noun-salience effects are observed outside phonology provides justification for the claim that nouns have their own domain-specific faithfulness constraints.

References

- Alderete, John (1995). "Faithfulness to prosodic heads." Ms., University of Massachusetts, Amherst.
- Barnes, Janet (1996). "Autosegments with three-way lexical contrasts in Tuyuca." *International Journal of American Linguistics* 62, 1:31-58.
- Barnes, Janet and Sheryl Takagi (de Silzer) (1976). "Fonología del tuyuca." *Sistemas fonológicos de idiomas colombianos*, tomo III. (Bogotá): Ministerio de Gobierno.
- Bates, Elizabeth, Sylvia Chen, Ovid Tzeng, Ping Li, and Meiti Opie (1991). "The noun-verb problem in Chinese aphasia." *Brain and Language* 41:302-233.
- Beckman, Jill N. (1995). "Shona height harmony: Markedness and positional identity." In Beckman, Dickey, and Urbanczyk, eds., 53-75.
- Beckman, Jill N. (1996). *Positional Faithfulness*. PhD dissertation, University of Massachusetts, Amherst.
- Beckman, Jill N., Laura Walsh Dickey, and Suzanne Urbanczyk, eds. (1995). *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory*. Amherst: GLSA.
- Berndt, Rita Sloan, and Louise B. Zingeser (1991). "Grammatical class effects in word production: Finding the locus of the deficit." *Brain and Language* 41:597-600.
- Gentner, Dedre (1982). "Why nouns are learned before verbs: Linguistic Relativity versus Natural Partitioning." In Stan Kuczaj, II, ed., *Language Development*. Hillsdale, NJ: Erlbaum.
- Goldin-Meadow, Susan, Martin E. P. Seligman, and Rochel Gelman (1976). "Language in the two-year old." *Cognition* 4:189-202.
- Graesser, Arthur C., Patricia L. Hopkinson, and Cheryl Schmid (1987). "Differences in interconcept organization between nouns and verbs." *Journal of Memory and Language* 26:242-253.
- Haraguchi, Shōsuke (1977). *The Tone Pattern of Japanese: An Autosegmental Theory of Tonology*. Tokyo: Kaitakusha.
- Harris, James (1983). *Syllable Structure and Stress in Spanish: A Nonlinear Analysis*. *Linguistic Inquiry* Monograph 8. Cambridge, MA: MIT Press.
- [Hattori Shirō (1951). *Onseigaku* [Phonetics]. Tōkyō: Iwanami Shoten.]
- Hayata Teruhiro (1977). "Seisei akusento ron [A generative theory of accent]." In Ono and Shibata (1977a), 323-360.
- Hayata Teruhiro (1985). *Hakata-hōgen no akusento/keitairon* [The accent and morphology of the Hakata dialect]. Fukuoka: Kyūshū Daigaku Shuppankai.
- Hayes, Bruce (1981). *A Metrical Theory of Stress Rules*. PhD dissertation, MIT. [New York: Garland Press, 1985.]
- Hayes, Bruce (1995). *Metrical Stress Theory*. Chicago: University of Chicago Press.
- [Hirayama Teruo (1943). "Akusento bunpu to 1-gata akusento [Distribution of accent systems and one-tonal-class dialects]." *Kokugo akusento no hanasi* [Lectures on accent in Japanese].]
- [Hirayama Teruo (1960). *Zenkoku akusento ziten* [All-Japan accent dictionary]. Tōkyō: Tōkyōdō.]
- Huttenlocher, Janellen, and Felicia Lui (1979). "The semantic organization of some simple nouns and verbs." *Journal of Verbal Learning and Verbal Behavior* 18: 141-162.
- Kindaichi Haruhiko (1977). "Akusento no bunpu to henshen [Accent distribution and accent change]." In Ono and Shibata (1977b), 129-180.
- Kintsch, Walter (1972). "Notes on the structure of semantic memory." In Endel Tulving and Wayne Donaldson, eds., *Organization of Memory*. New York: Academic Press, 247-308.
- [Konoshima Masatoshi (1961). "Hōgen no zittai to kyōtūgoka no mondaiten--Aomori [The Aomori dialect: Its reality and the problem of standardization]". In Tōjō, M., ed., *Hōgengaku kōza* [A course on dialectology] 2: 127-48.]
- Liberman, Mark, and Alan Prince (1977). "On stress and linguistic rhythm." *Linguistic Inquiry* 8, 249-336.
- Lombardi, Linda (1996). "Positional faithfulness and the phonology of voicing in Optimality Theory." Ms., University of Maryland, College Park.
- McCarthy, John J., and Alan Prince (1995). "Faithfulness and reduplicative identity." In Beckman, Dickey, and Urbanczyk, eds., 249-384.
- McCawley, James D. (1968). *The Phonological Component of a Grammar of Japanese*. The Hague/Paris: Mouton.
- [Miceli, G., D. Silveri, G. Villa, and A. Caramazza (1984). "On the basis for the agrammatic's difficulty in producing main verbs." *Cortex* 20:207-220.]
- Ono Susumu and Shibata Takeshi (1977a). *Iwanami kōza nihongo 5: On'inron* [Iwanami course on the Japanese

- language 5: Phonology]. Tôkyô: Iwanami Shoten.
- Ono Susumu and Shibata Takeshi (1977b). *Iwanami kôza nihongo 11: Hôgen* [Iwanami course on the Japanese language 11: Dialects]. Tôkyô: Iwanami Shoten.
- Padgett, Jaye (1995). "Partial class behavior and nasal place assimilation." *Proceedings of the Arizona Phonology Conference: Workshop on Features in Optimality Theory*, Coyote Working Papers in Linguistics, University of Arizona.
- Pierrehumbert, Janet, and Mary Beckman (1988). *Japanese Tone Structure*. Cambridge: MIT Press.
- Poser, William J. (1984). *The Phonetics and Phonology of Tone and Intonation in Japanese*. PhD dissertation, MIT.
- Prince, Alan, and Paul Smolensky (1993). *Optimality Theory: Constraint Interaction in Generative Grammar*. Ms., Rutgers University and University of Colorado, Boulder.
- Shibatani, Masayoshi (1979). Review of Haraguchi (1977). *Language* 55:4, 928-936.
- Shibatani, Masayoshi (1990). *The Languages of Japan*. Cambridge: Cambridge University Press.
- Smith, Jennifer L. (1997). "Noun faithfulness: Evidence from accent in Japanese dialects." To appear in *Japanese/Korean Linguistics* 7. Stanford: CSLI.
- Uwano Zendô (1977). "Nihongo no akusento [Japanese accent]." In Ono and Shibata (1977a), 281-322.
- Williams, Sarah E., and Gerald J. Canter (1987). "Action-naming performances in four syndromes of aphasia." *Brain and Language* 32: 124-136.