PROCEEDINGS OF THE THIRTIETH ANNUAL MEETING OF THE

BERKELEY LINGUISTICS SOCIETY

February 13-16, 2004

GENERAL SESSION

and

PARASESSION on CONCEPTUAL STRUCTURE AND COGNITION IN GRAMMATICAL THEORY

Edited by

Marc Ettlinger, Nicholas Fleisher, and Mischa Park-Doob

Berkeley Linguistics Society
Berkeley, CA, USA

Berkeley Linguistics Society
University of California, Berkeley
Department of Linguistics
1203 Dwinelle Hall
Berkeley, CA 94720-2650
USA

ISSN 0363-2946

LCCN 76-640143

Printed by Sheridan Books
100 N. Staebler Road
Ann Arbor, MI 48103

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A note regarding the contents of this volume

The following authors also presented papers at the conference, though their work does not appear in this volume: Michael Barlow, Cedric Boeckx and Norbert Hornstein, Melissa Bowerman, Claire Bowern, Nancy Chang, Gail Coelho, Carrie Gillon, Bruce Hayes, Dan Jurafsky, Alec Marantz, Joyce McDonough, and Laura Siegel.

Foreword

We are pleased to present the proceedings of BLS 30, held at UC Berkeley in February 2004. We would like to thank the contributors to this volume and all those who attended and participated in the conference.

Marc Ettlinger, Nicholas Fleisher, and Mischa Park-Doob

Volume editors

GENERAL SESSION

Tone-to-Stress and Stress-to-Tone: Ancient Greek Accent Revisited*

LEV BLUMENFELD
Stanford University

0. Introduction

De Lacy (2002) proposed a theory of the interaction of tone and stress, highly restrictive both with respect to the types of influence between the two systems, and with respect to the set of tones available to enter into such interactions. Assuming a tone markedness hierarchy shown in (1)a, de Lacy proposed the constraints in (1)b driving the attraction of more marked tones to more prominent metrical positions and the repulsion of less marked tones from less prominent positions.

(1) a. H 〉 M 〉 L b. *HD/L 〉〉 *HD/M
*NON-HD/H 〉〉 *NON-HD/M

The constraints in b predict two types of interactions: tonal systems that cater to the metrical phonology, via attraction of Hs to prominent positions and repulsion of Ls from non-prominent ones (TONE-TO-STRESS), and stress systems that cater to the tonal phonology, via attraction or repulsion of stress to or from syllables depending on their tonal properties (STRESS-TO-TONE). Ancient Greek, as I will argue below, shows both types of interactions at different strata in the phonology: the lexical phonology behaves like a tone-to-stress system, while the post-lexical component is a stress-to-tone system.

At the same time, the Greek data cannot be handled with de Lacy's theory, because, *ceteris paribus*, it is the L tone rather than the H tone that is attracted to the prominent positions. In this paper I will offer a solution, modifying de Lacy's proposal. My analysis of the stress-tone interactions will depend on a new conception of Greek accent, abandoning long-standing assumptions about the lexical representation of accents and partitioning the data among strata in a novel way. I

* I am grateful to Edward Flemming, Paul Kiparsky, and the BLS audience for comments. This material is based upon work supported under a National Science Foundation Graduate Research Fellowship.

will argue that this proposal offers a better empirical coverage of Greek and makes it possible to conceive of the system in terms of de Lacy's modified theory.

The paper is organized as follows. In Section 1 I lay out the data and briefly discuss previous analyses of Greek accent, followed by my reanalysis in Section 2. In Sections 3 and 4 I will propose a Delacean analysis of the lexical and phrasal components of the phonology, respectively.

1. The Data

Finite verbs, neuter nouns, exocentric compounds, and some other categories are accented according a generalization termed RECESSIVE ACCENT. Final consonants are extrametrical; CV̆ syllables are light, and all other syllables are heavy. This generalization, stated in (2)a, is exemplified in (2)b with words ending in a light syllable and in (2)c with words ending in a heavy syllable, modulo final consonant extrametricality.

(2) a. RECESSIVE ACCENT
Accent the penult if the final syllable is heavy, antepenult otherwise.

b.	e.lám.ba.ne	'take.3SG.IPF'	σ́ σ	CV
	elám.ba.no⟨n⟩	'take.1SG.IPF'	σ́ σ	CV⟨C⟩
c.	lam.bá.nei	'take.3SG.PRES'	σ́	CVV
	lam.bá.nei⟨s⟩	'take.2SG.PRES'	σ́	CVV⟨s⟩
	poi.ki.ló.t^{h}rĭk⟨s⟩	'dappled'	σ́	CVC⟨C⟩

In addition to defining the location of accent in words like those in (2), the recessive generalization delimits the accentable window in ANY Greek word: the accent cannot stand to the left of the syllable defined by (2)a.

Three metrical analyses of the recessive generalizations have been proposed. Steriade (1988) argued for a syllabic trochee analysis, constructing a quantity-insensitive foot at the right edge with final consonant and final light syllable extrametricality. Sauzet (1989) and Golston (1990) have pointed out some problems with such an approach: first, Greek has a bimoraic, not a bisyllabic word minimum; second, quantity-insensitive systems with quantity-sensitive extrametricality are not attested. In light of these difficulties, I will assume Sauzet and Golston's quantity-sensitive analysis, summarized below in (3).

(3) a. Final consonants are extrametrical.
b. A moraic trochee is constructed at the right edge of the word.
c. HL* is associated to the head of the word.

If the final syllable of the word is light, the head of the word will be on the penultimate syllable, and associating the HL* melody will result in the H tone on the antepenult. Final heavy syllables, on the other hand, are heads, and hence the H tone in words like *lambánei* ends up on the penult.

(4) a. elám(bane) b. elám(bano)⟨n⟩ c. lambá(nei)

H	L*	H	L*	H	L*		

Either of the vocalic morae of a long vowel may bear H tone, yielding a contrast between falling tone, called circumflex (spelled *ᾶ*) and rising tone, called acute (spelled *ᾱ́*). The interesting restrictions on the distribution of contours at the word level fall outside of the scope of this paper.

2. Lexical Tones and Phrasal Accents

As mentioned in the previous section, not all words are recessively accented: nouns, adjectives, and non-finite verbs may have unpredictable accent, as long as it is within the accentuation window. The majority of such forms have an orthographic acute accent on the final syllable (5)a—such words are called OXYTONE—and a smaller number of forms have unpredictable penultimate accent (5)b. I will refer to such words as PAROXYTONE.

(5)	a.	adelp^{h}ós	'brother'	t^{h}eós	'god'
		psyk^{h}ḗ	'soul'	t^{h}ȳmós	'spirit'
	b.	megálos	'big'	olígos	'small'
		poikílos	'variegated'		

All previous analyses have assumed that oxytone words bear a lexical tone on the final mora, an assumption I will reject in this paper. I will argue in this section that oxytone words are lexically unaccented, but receive their H tone by phrasal default.

On the standard analysis, the final acutes are subject to a rule of lowering (deletion) unless a clitic or a phrase boundary follows. The orthographic grave accent in place of the lowered acute indicates a toneless vowel (Allen 1973).

(6) a. FINAL LOWERING $\acute{\mu} \rightarrow \mu$ / __ $]_{\omega}$ $[_{\omega}$ b. [ê̄lt^{h}en][ho adelp^{h}ós] 'the brother came' c. [ho adelp^{h}òs] [ê̄lt^{h}en] 'the brother came'

Given the hypothesis that final acutes are not present in the lexical representation, the rule (6)a must be reversed. I propose that rather than deleting a lexical H, the alternations in (6)b are accounted for by a rule that inserts a H phrase-finally unless one of the last three syllables already bears a tone. A more formal version of the informal statement (7) will be given in Section 4.

(7) PHRASAL DEFAULT
Insert phrase-final H tone unless there is a tone on one of the last three σs.

In the remainder of the section I will give five arguments favoring (7) over (6)a. First, preaccenting enclitics require the generalization (7) independently of the analysis of the oxytones. Such enclitics impose a H tone on the final mora of the

word, unless that mora is already linked to a tone (H or L*), or unless the immediately preceding mora in the same syllable is linked to a tone. If, as a result of this preaccentuation, none of the last three syllables of the clitic group bears an accent, the final mora of the clitic is accented. Details are given in Section 4.

Second, the reanalysis (7) simplifies the account of adposition accent. Synchronically, all prepositions are oxytone and postpositions are recessive, with a small set alternating between the two classes, e.g. *perí* 'about' is a preposition, and *péri* is a postposition. On the traditional analysis it is an accident that all prepositions should have lexically unpredictable final accent, while on my analysis, prepositions, being proclitics, are unaccented, while postpositions are independent phonological words and receive default accent.

Third, my hypothesis resolves what I would like to call 'the intonable consonant paradox.' Some morphemes like the NOM.PL MASC *-oi* and FEM *-ai* count as light syllables for the purposes of recessive accent, indicating they have the phonological representations /oj/ and /aj/, with a consonantal offglide which is extrametrical: *ánthrōpo⟨j⟩* 'humans'. However, this same segment in oxytone words can bear orthographic acute accent: *adelphoí* 'brothers'. If oxytone accent is not present in the lexicon and supplied only as a phrasal default, and if the contrast between *j* and *i* is neutralized only postlexically, there is no paradox.

Fourth, my hypothesis provides an account of the accentual paradigms of third declension nouns, which otherwise cannot be derived except by stipulation. According to the traditional generalization, polysyllabic nouns such as *agṓn* 'contest' are accented invariantly on the same syllable throughout the paradigm, while monosyllables such as *thḗs* 'theif' are oxytone in the genitive and dative.

(8)

	SG	PL	SG	PL
NOM	agṓn	agôn̂es	tʰḗs	tʰêtes
GEN	agôn̂os	agṓnōn	tʰētós	tʰētôn̂
DAT	agôn̂i	agôsi	tʰētí	tʰēsí
ACC	agôn̂a	agôn̂as	tʰêta	tʰêtas

Nouns of the type *thḗs* are better characterized as MONOMORPHEMIC rather than monosyllabic: *gynḗ* 'woman', *anḗr* 'man', and *goný* 'knee' follow the same pattern, while some synchronic (but not historical) monosyllables like *êr* 'spring' do not. On the other hand, stems with invariant accent contain accented derivational morphology, e.g. stem formatives: *elp-íd-* 'hope', *asp-id-* 'shield', *alēth-és-* 'true', *graph-eú-* 'scribe'. Traditional analyses are forced to stipulate accent mobility in monosyllables; my hypothesis allows us to treat them as simply unaccented, the mobile acute simply being an orthographic reflex of their lack of a phonological tone.[1]

[1] The ACC.SG and NOM.PL affixes are preaccenting—a category of affixes independently needed for Greek—while the GEN.PL is itself accented. For reasons of space, I am not able to discuss the complex and interesting interactions of accent with morphology in this paper.

The fifth and final argument for my reanalysis of oxytones is conceptual. The assumption that words like *agathós* are lexically associated with a tone raises the question of where that tone is located: -*o* is a thematic vowel, not part of the stem, so stems like *agathós* must be postaccenting. Given that there are no post-accenting stems in the third declension, treating *agathós* as atonic would maintain the same generalization for the first and second declensions as well. The only true lexical final accent on this account is on nouns like *elpís*, where the accent falls on the stem formative -*íd* followed by a non-syllabic desinence.

Having established that oxytones are phonologically toneless, it remains to spell out my assumptions about lexical representation of recessive and paroxytone words before moving on to the analysis. I will treat words with an unpredictable penultimate accent as bearing a lexically linked H tone on the relevant syllable. Recessive words, on the other hand, have an unlinked H in the lexicon, whose placement is driven by tone-to-stress constraints in a fashion to be detailed in the following section. These assumptions are illustrated below.

(9) a. /anthrōpos/ b. /poikílos/ c. /agathós/

H H

Now we are up to the task of analyzing the lexical component of Greek accent.

3. Tone-to-Stress: The Lexical Phonology

De Lacy's universal tone markedness scale H > M > L faces obvious difficulties in the face of languages where metrical prominence is marked with a tone other than H, as in Greek. Such cases suggest that it suffices to associate a salient pitch event rather than a particular tone with metrical prominence. The pitch event that gravitates toward stressed syllables in Greek is a fall, as Sauzet's HL* melody makes clear: in the default case, the syllable selected as prominent by the stress system must bear a L immediately preceded by H.

Let me begin the analysis by spelling out the stress system of the language. Following the Sauzet-Golston account, I assume a moraic trochee at the right edge of the word, with final consonant extrametricality. This translates into the standard OT constraints below, and the ranking given in (10). No tableau should be necessary here; I refer the reader to (4) for illustration of the outputs.

(10) a. NON-FIN(C)
b. AL-FT-R
c. FT-BIN

d. FT-BIN
NON-FIN(C) AL-FT-R

I propose the following constraints in lieu of de Lacy's tone-to-stress scales. Their application is illustrated below the constraints, with σ̲ indicating the metrically prominent syllable.

(11) a. FALL-ONTO-HEAD 'Any tonal fall ends on the prominent syllable'

Satisfied by:	Violated by:
σ σ σ́ (σ̲ σ)	σ σ (σ̲́ σ)
σ σ σ (σ̲ σ)	σ́ σ (σ̲ σ)
σ σ σ (σ̲̂ σ)	

b. FALL-OFF-HEAD 'Any tonal fall begins on the prominent syllable'

Satisfied by:	Violated by:
σ σ (σ̲́ σ)	σ σ (σ̲́ σ́)
σ σ (σ̲̂ σ)	σ σ́ (σ̲ σ)
σ σ (σ̲ σ)	

These constraints force a pitch event—in this case, a fall—to gravitate toward the metrically prominent position.

I will now develop an analysis of the tone-to-stress component of Greek accent. First, the F-ONTO-H constraint must outrank the F-OFF-H constraint, as illustrated by the following tableau.[2]

(12)

	F-ONTO-HD	F-OFF-HD
/pelekys, H/ ☞ $pe_H(le_Lky)s$		*
$pe(le_Hky_L)s$	*!	

Next, the tone-to-stress constraints interact with constraints on contour tones in a way that allows contours to surface on long but not short vowels. The constraint *V̆-CONTOUR is undominated in Greek phonology, while the constraint against contours in general is dominated by the high-ranking tone-to-stress constraint.

(13) a. *V̆-CONTOUR 'No contour tones on short vowels'
b. *CONTOUR 'No contour tones'

	*V̆-CONTOUR	F-ONTO-HD	*CONTOUR
/logos, H/ ☞ $(lo_Hgo_L)s$		*	
$(lo_{HL}go)s$	*!		*
/dōron, H/ ☞ $(d\bar{o}_{HL})ron$			*
$(d\bar{o}_H)ro_Ln$		*!	

Next, the three faithfulness constraints shown below regulate the behavior of underlying linked and unlinked tones.

(14) a. MAX-T 'Input tones have output correspondents'
b. DEP-T 'Output tones have input correspondents'
c. FAITHLINK 'Input association lines are preserved in the output'

[2] A language where F-OFF-HD is ranked above F-ONTO-HD is Japanese.

The anti-delinking constraint must dominate the tone-to-stress constraint in order to prevent the accent of underlying paroxytones from regularizing to the recessive pattern.

(15)

		FAITHLINK	F-ONTO-HD
poiki$_H$los	☞ poi(ki$_H$lo$_L$)s		*
	poi$_H$(ki$_L$lo)s	*!	

In a similar fashion, the anti-insertion constraint must be ranked high enough to allow toneless words like *agathós* to emerge from the lexical component without an accent.

Due to the high-ranking FAITHLINK, the system so far does not guarantee that the accentuation window is observed: prelinked lexical tone will surface faithfully on any syllable, including syllables outside of the accentable domain. To account for the absence of [σ́ σ σ σ] words, I will deploy the conjunction of the two tone-to-stress constraints at the top of the hierarchy, called F-ONTO & OFF-HD for short. This ensures that no form will surface where the prominent syllable neither ends nor begins with a tonal fall.

(16) F-ONTO & OFF-HD Violated iff both constraints in (11)a are violated.

		FOOT PLACEMENT	F-ONTO & OFF-HD	FAITHLINK
/σ́ σ σ σ/	☞ σ σ́ (σ̲ σ)			*
	σ́ σ (σ̲ σ)		*!	
	σ́ (σ̲ σ) σ	*!		

To complete the analysis, we have to account for words with a truly lexical final accent, namely, third declension nominatives like *elpís*, where the accented derivational affix occurs in the last syllable. The desired output of these words is toneless, but the system so far predicts that these words should surface with the final H. In order to prevent this, I use the constraint *FIN, which, ranked above MAX-T, forces tone deletion.

(17) a.

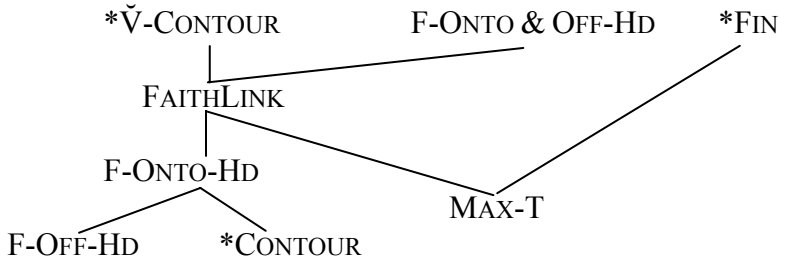
NOM	GEN	Gloss
elp-id-s	elp-íd-os	'hope'
asp-id-s	asp-íd-os	'shield'
ag-ōn	ag-ôn-os	'contest'

b. *FIN 'No final tone'

	*V̆-CONTOUR	FAITHLINK	*FIN	MAX-T
elpi$_H$ds ☞ el(pid)s				*
el(pi$_{HL}$d)s	*!			
el(pi$_H$d)s			*!	
e$_H$l(pi$_L$d)s		*!		

The ranking arguments given in this section are summarized below.

(18)



As in all OT analyses that crucially rely on specifying properties of the input, the issue of Richness of the Base (ROB) must be addressed: does the system predict unattested patterns derived from inputs other than those posited above? The account of the accentuation window above forced a potential underlying tone linked outside of the window to shift to the recessive position: that was a ROB argument.

Since the system in general allows prelinking of tones in the lexicon, as was necessary in the analysis of paroxytones, and since recessive words were lexically represented with unlinked tones, we might ask what the output of a form with a tone prelinked in the recessive position might be. Because the faithful realization of a H tone prelinked to, say, the first syllable of *ánthrōpos*, would satisfy the tone-to-stress constraints, the output would be identical to that of an unlinked H. In the oblique forms like *anthrōpou* ending in a heavy syllable, the linked H would be outside of the accentable domain and would be shifted to the recessive position by the constraint in (16). Prelinking gives the same result as underlying unlinked tone.

By ROB, the situation where two different inputs converge on the same output ought to give rise to a covert contrast between two types of recessive forms: ones with an unlinked tone and ones with a linked H. It turns out that precisely such a contrast provides an account for a rather subtle difference in the accentuation of, on the one hand, first declension nouns like *polítēs* 'citizen', and, on the other, second declension nouns, as well as adjectives of both declensions. It so happens that all of the desinences of the first declension contain a long vowel, except the

NOM.PL *-ai*, underlyingly /-aj/. The recessive accent is thus expected to surface on the penultimate syllable in all case forms except the NOM.PL, where it should fall on the antepenult. However, the actual form is *polî̄tai*, not **pólītai*. This shows that the H tone in *polítēs* is prelinked in the recessive position. However, adjectives in the same morphological category behave differently: the nominative plural of *dikaíā* 'just.FEM' is *díkaiai*, not **dikaîai*. Thus, in these forms, the H tone must be unlinked in the lexicon.[3] The formal difference between linked and unlinked tones corresponds to the difference in behavior between *polî̄tēs* and *dikaíā*.

This concludes the discussion of the lexical component of Greek accent. To summarize: I have argued for treating oxytone words as lexically toneless, while other words were supplied either with a linked or an unlinked H. Greek lexical phonology is a clear case of a tone-to-stress system, in that, to the extent that tonal faithfulness constraints allow it, the metrical constraints determine the placement of tone. I have argued for a modification of de Lacy's constraint set by allowing metrical prominence to be associated with a salient pitch event like a fall rather than with particular tones. In the next section I move on to the stress-to-tone component of Greek: the phrasal phonology.

4. Stress-to-Tone: Phrasal Phonology and Preaccenting Enclitics

As argued above, Greek has a phrasal default inserting a H tone on the domain-final mora, unless none of the last three syllables contains a H tone.[4] This generalization accounts for the accent of oxytones; I will begin this section by showing that the same generalization is independently required to account for the accent of enclitics.

Enclitics of the preaccenting class, such as indefinite pronouns, oblique case forms of personal pronouns, and several particles, impose a H tone on the mora immediately preceding them under certain conditions, summarized below. The host word to which the enclitic attaches bears the tones assigned to it by the lexical component.

(19) The mora preceding the enclitic receives H tone, unless:
  a. That mora is already linked to a tone (H or L), or
  b. The mora immediately preceding within the same syllable is linked to a tone.[5]

---

[3] The contrast between nouns like *polítēs* and adjectives like *dikaíā* arises because adjectives have corresponding masculine forms of the second declension, *díkaios*, which behave just like second declension nouns and have unlinked Hs. Naturally, the stem with an unlinked H used to form the masculine is the same stem that is used to form the feminine, hence forms like *díkaiai*.

[4] More strictly, the last three syllables of the last word must be toneless, to ensure the insertion of H in words like *hodós* 'road' when a circumflex accent immediately precedes. For reasons of space I cannot address this complication.

[5] This fact suggests that the actual melody is not HL* but something like HL*L. This hypothesis would also explain all of the generalizations regarding the distribution of contours, and the enclitic

Thus, enclitic accent is assigned to recessive words, oxytone words, and proclitics, but is blocked in all other cases.

(20)	a.	$pe_{H}le_{L}kys$ + tis	→ pélekýs tis		'some axe'
	b.	$sō_{HL}ma$ + ti	→ sômá ti		'some body'
	c.	kalos + tis	→ kalós tis		'someone beautiful'
	d.	ei + tis	→ eí tis		'if someone'
	e.	$p^{h}ilō_{HL}n$ + tis	→ p^{h}ilôn tis	*p^{h}ilõ̂n tis	'one of the friends'
	f.	$p^{h}i_{H}lo_{L}s$ + tis	→ p^{h}ílos tis	*p^{h}ílós tis	'some friend'
	g.	$lo_{H}go_{L}u$ + ge	→ lógou ge	*lógoú ge	'of word, at least'

Following the assignment of tone to the host by the preaccenting enclitic, the last mora of the entire phrase receives a H tone unless one of the last three syllables of the phrase bears a H tone, in accordance with the generalization (7). This situation can only arise in disyllabic enclitics, as shown below. The final H appears just in case the host word has a penultimate accent. I take enclitic accent as proof of the final phrasal H generalization in (7).

(21)	a.	kalón estin	'it is beautiful'
	b.	tīmõ̂n tina	'honoring someone'
	c.	sõ̂són tina	'save someone!'
	d.	k^{h}órā tis	'some land'
	e.	k^{h}órā tinós	'someone's land'
	f.	p^{h}ílos tinós	'someone's friend'
	g.	kẽ̂ryks tinós	'someone's messenger'

While the lexically assigned tone clearly survives faithfully at the postlexical level, I propose that the stress phonology of phrases differs from that of words: metrical heads simply gravitate to lexical Hs, and the stress constraints only emerge when there is no H tone in the relevant domain. In other words, Greek phrasal phonology is stress-to-tone, in contrast to the tone-to-stress lexical component. There is a quantity-insensitive stress system that marks the final syllable as prominent by default. Its quantity insensitivity is clear from forms such as *kalõ̂n tinōn* 'of some beautiful ones', where the final syllable is heavy and does not attract the postlexical default. In the quantity-sensitive lexical system, the circumflex of *kalõ̂n tinōn* would fall outside of the accentuation window, while in the quantity-insensitive postlexical system it does not.

I assume a default degenerate syllabic trochee at the right edge of the word. Underlying tones can force the final syllabic trochee to be constructed in a way that makes the H tone fall on the head of the foot, but only in case the tone occurs on one of the last three syllables of the word. One formal account of such a

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accent with CVCC-final hosts, such as *kẽ̂ryks tis*. For lack of space I will not pursue these issues here.

window stress system is Weak Local Parsing (Hayes 1995) or, more exactly, its OT equivalent (Elenbaas and Kager 1999), which prohibits foot edges from being adjacent. This analysis is sketched below.

(22) a. H-TO-HD 'Any H tone must be on the head of a foot'
b. AL-HD-R 'Metrical head is on the right edge of the word'
c. WLP Weak Local Parsing (cover constraint)

		MAX	H-TO-HD	WLP	AL-HD-R	DEP
/σ σ σ/	☞ σ σ (σ́)					*
	σ (σ́ σ)				*!	*
/σ́ σ σ/	☞ (σ́ σ) σ				**	
	(σ́ σ) (σ́)			*!		*
	σ́ σ (σ́)		*!			*
/σ σ́ σ/	☞ σ (σ́ σ)				*	
	σ σ (σ́)	*!				*
/σ́ σ σ σ/	☞ (σ́ σ) σ (σ́)					*
	(σ́ σ) σ σ				*!**	

5. Conclusions

I have argued for a reanalysis of Greek accent that separates the lexical component from the phrasal component in a novel way: I argued that orthographically oxytone words are lexically toneless. In addition to a number of empirical advantages, this move permits Greek accent to be analyzed within the framework of de Lacy's theory of tone-stress interactions. Both directions of interaction are attested in Greek, the lexical phonology being a tone-to-stress system, and the postlexical phonology a stress-to-tone system.

There are a number of outstanding issues. First, the notion that a 'salient pitch event' rather than a H tone is what gravitates toward metrically prominent position is in need of a more precise formal characterization. This can be resolved only by looking at a broader typology of languages with tone and stress. Second, the analysis of Greek must be extended to aspects of Greek grammar left outside of the scope of the present paper: the interaction of accent with morphology, the restrictions on contour tones, and an analysis of enclitics other than those of the preaccenting class.

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Linguistics Dept., Bldg. 460
Stanford University
Stanford, CA 94305

lblum@stanford.edu

The Evolution of Hierarchical Structure in Language*

J. C. BROWN and CHRIS GOLSTON
University of British Columbia and *California State University, Fresno*

0. Introduction

Pattee (1973) has argued that all problems of biology are ultimately problems of hierarchical organization. Much the same claim can be made for problems of language, where hierarchical organization is central to grammar. We propose that the scaffolding for hierarchical structure in human language is physiologically based and exapted from an internal mapping of the vocal tract. Following Cruse (2003), we assume that the reorganization of a strictly reactive system into a cognitive system (which can characterize language evolution) often requires an internal mapping of the system body. Thus, an internal map of the vocal tract was created to fine-tune motor control of articulators like the lips, tongue and larynx; the hierarchical structures in that map were then exapted elsewhere in grammar.

It has been argued that much of syntax and higher-order grammatical structure was exapted from the structure of the syllable (Carstairs-McCarthy 1999). This is a desirable approach since it relates various parts of human language through a shared structure, but it leaves unanswered *where the syllable itself evolved from*. We propose that there are two crucial parts to the syllable, the embedding and the headedness, and that each had a different evolutionary source.

1. Embedding

In this section we will try to show that embedded structures (treelets) arise naturally from internal maps of the vocal tract and what one can profitably do with it. Not all parts of the vocal tract are well modeled with a treelet, but enough of them are to make treelets a good way of representing much of the speech apparatus and its output.

Embedded trees are ubiquitous in grammar and give it its hierarchical structure. We suggest that such treelets were exapted from articulation into more purely grammatical spheres to lend coherence to the messages the sound system was being used to communicate. We're interested here in showing just how

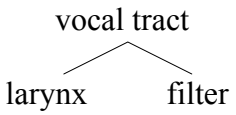
* The authors wish to thank Brian Agbayani, Bruce Hayes, Will Lewis, and the audience at BLS for helpful comments and discussion. All errors remain with the authors.

similar many of these trees are, specifically with how distinctions tend to embed in a similar way, with two binary branchings defining a three-way split. We begin here with a map of the vocal tract and how it is used in speech and note that it often involves bifurcations into two categories (e.g., [lip tongue]) with a secondary distinction involving only one of the first two categories (e.g., tongue = [crown dorsum]). Such dichotomies in phonetic and phonological distinctions are much more common than ternary distinctions with no sub-grouping, or quaternary distinctions with elaborations on both sides of the initial split.

Most of the distinctions we'll encounter here are paradigmatic, different optionals (like labial—coronal—dorsal) that one can take for a given parameter (like place of articulation). The little trees we'll now look at do not generally define syntagmatic, linear relations in language. These will first be countenanced when we look at how sounds are arranged into syllables. Thus we will propose that both the paradigmatic and the syntagmatic aspects of language (Saussure 1916) have phonetic and phonological precursors, specifically consonants and vowels (paradigms) and syllables and feet (syntagms). For now, let us see how more basic phonetic and phonological distinctions break down.

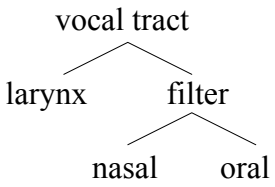
We propose that embedding emerged from an internal mapping of the vocal tract as follows. Long before humans split from other mammals, we would have produced sound with a laryngeal source and a supralaryngeal filter (Fant 1960), just as birds produce sound with their syrinx and a suprasyringeal filter:

(1)



As the larynx descended during human evolution, the supralaryngeal filter bifurcated into the nasal and oral cavities. As humans gained control over the nasopharyngeal port, the filter could produce both nasal *and* oral sounds, the latter being much more readily perceived because of their clearer acoustic signatures (Lieberman 1984):

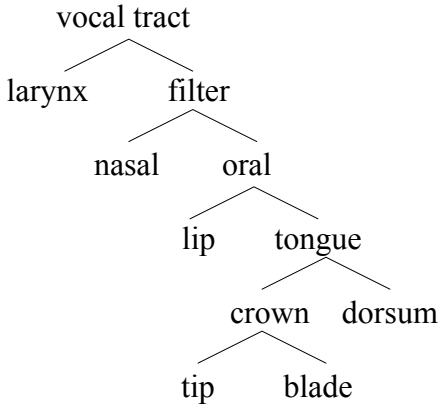
(2)



Not a lot could be done with the nasal cavity, but the oral cavity could be molded by means of two fairly mobile articulators, the bottom lip and the tongue. The tongue's crown and dorsum may be moved independently of one another, so that the tongue is itself treated as two relatively independent articulators, the crown (as much as you can grab comfortably) and the dorsum (the rest). The crown is further divided into the tip and blade, which can be used to close off the vocal

tract with a relatively narrow (tip) or relatively broad (blade) constriction against the teeth or palate. If the internal map of the vocal tract was ramified further to reflect these developments, the map would consist of a large number of embedded treelets, as follows:

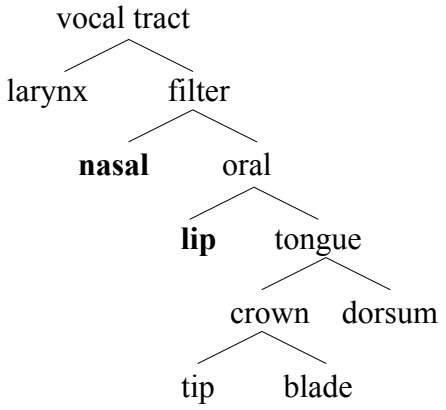
(3)



This internal map of the vocal tract strikes us as the most likely source for the notion of embedding in natural language.

Much of our vocal tract is similar to that of other primates, but the ability to produce and perceive the place distinctions above is limited to humans. Without the two resonating cavities a lowered larynx provides, there is no way of identifying the changes in the first and second formants that signal place of articulation acoustically. At some point in the evolution of our species, this basic physiological configuration was co-opted into the service of meaningful place distinctions in words like (labial) *pea*, (coronal) *tea*, (dorsal) *key*. Such distinctions are purely paradigmatic and map directly onto the articulators used to produce them, creating a close link between meaning and the vocal tract. Thus we can characterize a sound like [m] as follows, with **nasal** and **lip** bolded

(4)



because it is made with nasal airflow and constriction involving the bottom lip.

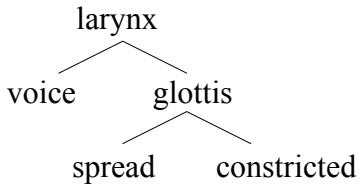
The tree in (4) is both a map of the vocal tract and a simple model of the

articulators involved in producing speech. The tree actually defines a paradigmatic space in which a number of distinct sounds (m, n, ŋ, p, t, k) are differentiated, and that paradigmatic space has a one-to-one relation to the actual vocal tract. This, we think, is how embedding crept into language. The vocal tract must be changed simultaneously along several dimensions to effectively produce a sound like [m] or [k]. And the dimensions along which the sound varies (nasal, labial, etc.) are actually linked to meaningful distinctions in the message that is conveyed, so that *mat*, *bat*, *kat* mean different things. The internal map of the vocal tract becomes a model of articulation and a source of meaningful distinctions.

Once embedded structures were used to model which articulators are involved in a speech sound, the road should have been opened to using such structures for different purposes. We look at two such areas here, involving the larynx and degrees of vocal tract constriction.

Over the course of time control over the larynx grew to allow for six-way stop contrasts: plain, voiced, aspirated, glottalized, implosive, and voiced aspirate. Feature-geometric views of laryngeals (Lombardi 1991; Iverson and Salmons 1995; Kehrein 2001) represent what it can do as follows:

(5)

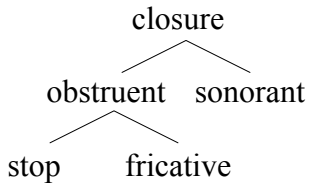


This treelet is *not* a map of the larynx and is purely paradigmatic; indeed, it shows types of laryngeal features that cannot all be distinctively ordered within the same speech sound. We propose that it is a *functional* map of the larynx that shares the same double-branching structure found in the *physiological* map of the vocal tract. Whereas (3) is both a map of the vocal tract and a model of what you can do with it, (5) is *just* a model. Its structure, we suggest, came from exapting the structure of (3) into a new domain, structuring laryngeal contrasts in terms of nested distinctions.

Similarly for the degree of closure in a given sound. Articulatorily there are three useful degrees of closure, which we'll call stop, fricative and resonant articulation, following Laver (1994). These notions cannot be mapped onto the vocal tract in the same way as nasal and labial can because they encode an entirely different dimension.[1] But they can still be usefully mapped with a branching tree, where the major division is between obstruents and sonorants:

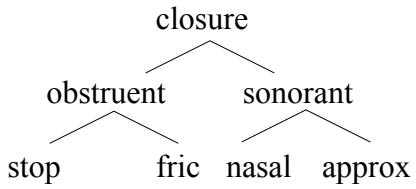
[1] We thank Bruce Hayes for pointing out that this was a major problem with the feature-geometry of the 1980s, e.g., Clements (1985), Sagey (1986), McCarthy (1988): it was never able to satisfactorily deal with stricture issues.

(6)



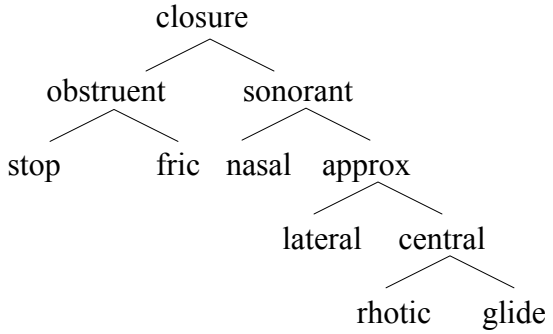
This articulatory difference also maps onto an acoustic difference, since stops and fricatives have less amplitude than sonorants. The latter group breaks down acoustically into nasals and approximants:

(7)



Approximants come in three types, the major distinction involving lateral articulation (along one side of the mouth) vs. central articulation (along the midline). Central approximants can be divided into r-sounds (rhotics) and semi-vowels (glides):

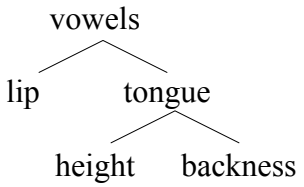
(8)



This tree does not map the vocal tract, but does provide a paradigmatic representation of stricture and sonority. Our proposal is that the classes of sound that this tree maps out (sonorants, approximants, etc.) have the same hierarchical structure as the internal map of the vocal tract we began with. In this way, we think, humans exapted hierarchical structure from a physical to a cognitive domain, from articulation to abstract acoustics.

Vowels provide another case of an acoustic mapping based on hierarchical structure. Articulatorily vowels are shaped by the lips and tongue:

(9)



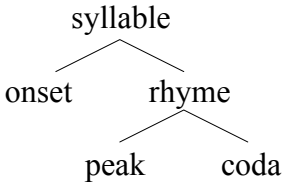
Height and backness are themselves broken down three ways into hi/mid/low (mapping onto the first formant) and front/central/back (mapping onto the second).

So much for embedding. We've seen that a number of important linguistic distinctions seem to be organized in terms of a little tree. All that is required is a basic distinction, one part of which is elaborated. This we take to have been the first stage in the development of the structural part of modern grammar. It involves nothing more than building mental maps of the physiology and acoustic output of the vocal tract. From these phonetic and phonological relationships, the general treelet is exapted out into higher-order modules of language such as syntax and semantics.

2. Headedness

We propose here that headedness emerged from the acoustic effects of mandibular oscillation (MacNeilage 1998), which makes for periodic fluctuation in amplitude. The peak of this loudness (maximal mandibular aperture) and its less salient edges (minimal mandibular aperture) are distinct types of entity such that the identification of the edges is dependent on the perception of the peak, but not vice versa ('consonants are just ways of beginning and ending vowels'). In any case, the most important part of a syllable is the loudest part, the sonority peak:

(10)



This central place for the notion peak, we propose, gave rise to the notion of head. The head of a syllable is the sonority peak it contains. This gave rise to the first *headed* embedded structures, exapted later to morphology and syntax.

Not all linguistic structures are as simple as the ones we've looked at so far. Specifically, none of the little trees we've examined treats any of its daughters differently: lip, crown, and dorsum are equally parts of the mouth and none is the head part of the mouth in any sense. Similarly, stops, fricatives, and sonorants are all manners of articulation, none of which is the head manner of articulation. But this is not the case with higher-order grammatical constituents like syllables and sentences, which do have special (usually endocentric) units called 'heads.'

There must have been a stage in the evolution of language at which headed structures arose, and this will be the topic of the present section. We want to probe what was involved in treating one of the daughters as the *head* of a given category. The most basic structure we can find in language that has a head is the syllable (cf. Carstairs-McCarthy 1999). In developing an evolutionary scenario for language we are left with four possibilities: (i) syntactic heads predate syllabic heads, (ii) syllabic heads predate syntactic heads, (iii) headedness came from elsewhere, or (iv) headedness evolved more than once. Since sentences necessarily imply syllables (in spoken language) but syllables do not necessarily imply sentences, we take it that (i) is unlikely. (iii) is a possibility, but we cannot think of any plausible analogue to grammatical headedness outside of language. (iv) is unparsimonious and unlikely, leaving us with (ii): syllables came before sentences and gave them their headedness.

So let us start with the syllable and see how it may have arisen and how the notion of head would have arisen with it. Our discussion owes much to the work of Carstairs-McCarthy, but we will try and move beyond where he has taken us.

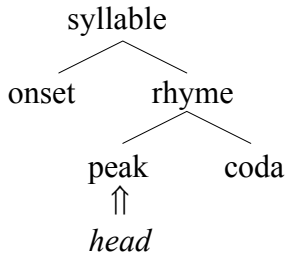
All mammals are obligate nose-breathers except for (adult) humans, who are preferential nose-breathers. You are right now most probably breathing through your nose. This is crucial in understanding syllables for the following reason: if you now have your mouth closed (as you most likely do), you will need to open it in order to produce a noise loud enough to be heard clearly by others. The sequence is then almost always CLOSED → OPEN if you start by breathing through your nose with your mouth closed. A closed-mouth speech sound is a stop (once it gets released) and a fully open-mouth sound is a vowel. Hence we can go directly from preferential nose-breathing to CV syllables. We could only get VC syllables as basic if humans preferentially breathed through their mouths or preferentially breathed through their noses with their mouths wide open. But we don't.

We might also link the rise of CV syllables to mandibular oscillation, following MacNeilage (1998), though we don't see how oscillation in itself can account for the CV nature of syllables. In any case, it makes good evolutionary sense to try and derive syllables from something non-linguistic (chewing, preferential nose-breathing) and then to graft other grammatical structures onto syllables (Carstairs-McCarthy 1998, 1999, 2000). An exaptationist model like this tries to derive grammatical constructs from physiology and acoustics.

All languages have CV syllables and all children begin babbling with CV syllables; it is most reasonable to think that the earliest speaking hominids had CV syllables as well (especially as they breathed through their noses most of the time). So what about headedness? There is no articulatory head to a syllable, but there is an *acoustic* head: the acoustically most salient (loudest) sound in a syllable, or *sonority peak* (Fudge 1969; Selkirk 1982; Clements 1990). The sonority peak is thus the head of the syllable because it is more prominent than the beginning. Bringing in closed syllables (CVC) does not change the picture: C articulations always involve constriction of the vocal tract relative to the V, so

CVC syllables will be headed by the V just as CV syllables will be. Most languages don't allow more than CVC syllables, words like *plant* and *tramp* being quite rare cross-linguistically. So we have a basic division of C and what follows (the onset and the rhyme); and in some languages what follows the onset can be complex, either VV or VC. Syllables thus have the following endocentric structure:

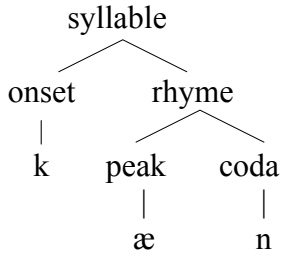
(11)



This structure is straightforwardly syntagmatic, defining the linear order of the pieces of a syllable, not (merely) a typology of positions: onsets always precede nuclei which always precede codas within a syllable. In the terms of Gazdar et al. (1985), the tree specifies *linear precedence* relations (left to right) and *immediate dominance* relations (top to bottom). This seems to be the best phonological precursor for things like word and phrase structure, both of which are inherently syntagmatic. The edges of syllables contain consonants, while the head is usually a vowel (though other sonority peaks will often do as well).

The beauty of syllables is of course that they hierarchically organize sounds, which themselves involve hierarchical organization, as we have seen:

(12)



As Carstairs-McCarthy and others have demonstrated, the head (usually a vowel) is flanked by elements that are more like one another than they are like the head: the nucleus is typically a vowel, but the onset and coda are consonants. In short, we attribute the notion of *headedness* to syllables, which have acoustically motivated heads and which most likely predate complex words. But headedness is all that syllables need to add: the little tree predates it, at least on the assumption that sounds predate syllables. (For the idea that syllables came first, see Studdert-Kennedy 1998.)

We hypothesize that the *headed* treelet, although it originates within the phonology, was exapted from there into higher linguistic structures in much the

same way that embedded trees were exapted into semantics (Brown and Golston 2002). Morphology would have been the first area to be affected, assuming that words predate sentences in phylogeny as they do in ontogeny. Roots are the heads and form stems with derivational affixes; stems form words with inflectional affixes. In the syntactic realm we have heads and complements forming X′ constituents and their specifiers finishing off the phrases as XPs.

3. Conclusion

The evolutionary scenario we propose is thus: embedding comes from an internal map of the vocal tract and is later exapted to less physiological areas like sonority; headedness is added from acoustics and is later exapted to less physiological areas like morphology and syntax. Our proposal is essentially an internal reconstruction of grammar starting at morphology and syntax and working back to syllables and the sounds they organize, and ultimately to the vocal tract that produces these sounds.

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Department of Linguistics
1866 Main Mall, Buchanan E270
University of British Columbia
Vancouver, British Columbia V6T 1Z1
Canada

jcb@interchange.ubc.ca

Department of Linguistics
California State University, Fresno
Peters Business Building, Room 383
5245 North Backer Avenue
Fresno, CA 93740-8001

chrisg@csufresno.edu

Serialization of Simultaneity in Mandarin

LIANCHENG CHIEF
University at Buffalo, The State University of New York

0. Introduction

To express that two events occur concurrently, the "Agent VP_1-*zhe* VP_2" construction is often used in Mandarin, as shown in (1).

(1) ta zuo zhe du shu
he sit DUR read book
'He read a book while sitting.'

(2) *ta du zhe shu zuo
he read DUR book sit

In (1) and (2) the two events, sitting and reading, overlap temporally, but only one sequential arrangement is allowed. This paper shows that this asymmetry can be determined solely by the semantic properties of the verbs involved in terms of Figure and Ground event assignment (Talmy 2000).

This paper focuses on the following questions. First, given two verbs that can be used to describe two concurrent events, can we predict which one is realized as the subordinate VP_1 and which one is realized as the main VP_2 in the "Agent VP_1-*zhe* VP_2" construction? Second, if we can make such predictions, what is the motivation behind this pattern? This paper claims that the correlation between Figure and Ground events and main and subordinate VPs is the answer.

This paper is organized as follows. Section 1 gives some background information about the "Agent VP_1-*zhe* VP_2"construction. Section 2 demonstrates that some verbs are likely to be expressed as VP_1 or VP_2 on the basis of corpus data.[1] Section 3 shows that the distinction between Figure and Ground events correlates well with the distinction between main and subordinate verb phrases in this construction and that this correlation accounts for the data discussed in section 2. The final section concludes the paper.

[1] Most of the data used in this study are taken from the Sinica Corpus. Information on the Sinica Corpus 3.0 can be found at http://www.sinica.edu.tw/ftms-bin/kiwi.sh.

1. The "Agent VP_1-*zhe* VP_2" Construction

The "Agent VP_1-*zhe* VP_2" construction in Mandarin can be used to describe two concurrent events. In this construction, the durative marker -*zhe* is attached to the first verb. Traditionally, the first VP is analyzed as the subordinate VP while the second VP is the main VP (Chu 1987). An intriguing fact about this construction is that the sequential arrangement of the two VPs is not random but governed by certain principles. Take sentences (1) and (2), for example: the two events, sitting and reading, occur simultaneously, but only one sequential arrangement of the two events is allowed, namely, the sitting event is expressed as subordinated to the main event reading. If the encoding of events is reversed, then the sentence is ungrammatical as (2) shows.

One might suggest that there is a lexical or syntactic constraint that certain verbs can only occur in the first verb or second verb position. The following three sentences prove it is not the case.

(3) ta pao zhe hui.jia
he run DUR return.home
'He went home running.'

(4) ta chuan zhe xie pao
he wear DUR shoes run
'He ran with shoes on.'

(5) ta zhan zhe chuan yifu
he stand DUR wear clothes
'He wore clothes while standing.'

The verb *pao* 'run' can appear either in VP_1 position as in (3) or VP_2 position as in (4). Similarly, the verb *chuan* 'wear' can occur either in VP_1 as in (4) or VP_2 as in (5). Obviously, there is no particular constraint against certain verbs occurring in VP_1 or VP_2. However, if the order of the two verbs in each sentence is reversed, all sentences in (3) through (5) are unacceptable. This suggests that the order of VPs is relative; it depends on the pair of verbs involved. I will argue that the order follows from how Figure and Ground events (Talmy 2000) are expressed in this construction. This approach provides a semantic motivation that previous analyses neglect to offer. For example, Chen (1986) asserts that the interrelationship between the two VPs in this construction has to be conventional, logical, and physical. Furthermore, VP_2 has to have predominant weight. These semantic notions are not fully explained and remain vague. I will show that the concept of Figure and Ground events can provide a simple and unified account of the order of VP_1 and VP_2.

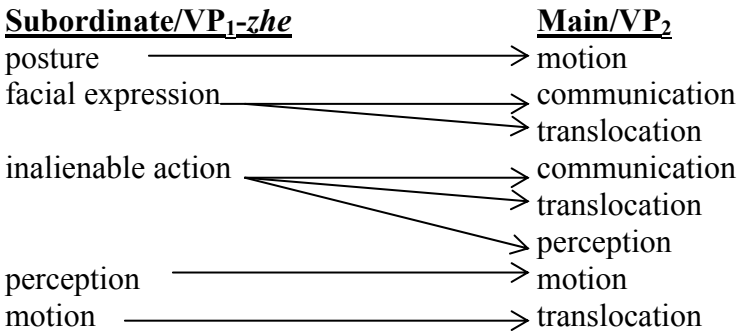
2. Verbs That Tend to Occur in VP_1 and VP_2

The first question this paper focuses on is whether, given two verbs that can be

used to describe two concurrent events, we can predict which one is realized as the subordinate VP_1 and which one is realized as the main VP_2. To answer this question, I looked at corpus data.

Based on my preliminary study of the Sinica Corpus,[2] some verb classes tend to occur in the VP_1 position or VP_2 position. The figure in (6) is the result of my study of the Sinica Corpus. In (6), verb classes are shown in pairs. In each pair, the one to the left appears as VP_1 when it co-occurs with verb classes on the right side. For example, when a posture verb occurs with a motion verb, the posture verb is always realized as VP_1 and the motion verb as VP_2. Similarly, when facial expression verbs co-occur with either communication verbs or translocation verbs, it is the facial expression verb that is realized as the subordinate VP_1.

(6) The Relative Occurrence of VP_1 and VP_2 in Pairs of Verbs



Members of each verb class in (6) are listed in (7).

(7) a. Posture verbs
  i: Manner of posture: *quanqu* 'curl'
  ii: Posture: *zuo* 'sit', *zhan* 'stand', *tang* 'lie', *dun* 'squat'
b. Verbs involving the body
  i: Facial expression: *ku* 'cry', *xiao* 'smile'
  ii: Inalienable action: *rou yanjing* 'rub eyes', *yao tou* 'shake one's head', *hui shou* 'wave one's hand', *chui koushao* 'whistle'
c. Composite
  There is a static spatial relation between the subject and the object of the verb: *kang* 'carry something on one's shoulder', *bao* 'hold', *chuan* 'wear'
d. Perception
  i. Inactive: *ting* 'listen'
  ii. Active: *du* 'read', *kan* 'watch'

[2] The data are extracted from the Sinica Corpus website, which randomly gives 2,000 results at most. My observation is based on sentences which contain the "Agent VP_1-*zhe* VP_2" constructions among these 2,000 sentences.

e. Motion
kai che 'drive a car', *pao* 'run', *zou* 'walk'
f. Communication
shuo 'speak, talk', *wen* 'ask'
g. Translocation
likai 'leave', *jin* 'enter', *dao* 'arrive'

In the rest of this section, I provide some examples that illustrate (6). In (8) through (10), all posture verbs are realized as VP_1. If the order of the verb phrases is reversed, the sentences become ungrammatical.

(8) ta tang zhe ting yinyue
he lie DUR listen music
'He listened to the music while lying.'

(9) ta zuo zhe zhaogu yang.qun
she sit DUR look.after herd.of.sheep
'She looked after a herd of sheep while sitting.'

(10) ta zhan zhe chang ge
he stand DUR sing song
'He sang while standing.'

(6) shows that facial expression verbs tend to be VP_1 when they co-occur with verbs of communication or translocation. This is illustrated by sentences (11) and (12).

(11) ta ku zhe pao.hui jia
he cry DUR run.return home
'He ran home crying.'

(12) ta weixiao zhe wen xuesheng wenti
he smile DUR ask student question
'He asked students questions smiling.'

The following set of sentences contains verbs describing how an agent acts on himself, e.g., rubbing his eyes or shaking his head.

(13) ta yao zhe tou zou.kai
he shake DUR head walk.away
'He walked away shaking his head.'

(14) ta rou zhe yanjing shuohua
he rub DUR eyes talk
'He talked rubbing his eyes.'

In (13) and (14), verbs involving bodily actions are realized as VP_1 when they co-occur with communication, translocation, or perception verbs. If the order of each verb phrase is reversed, the resulting sentences are ungrammatical.

Example (15) illustrates a situation in which a perception verb and an activity verb occur at the same time. In this situation, the perception verb occurs in VP_1.

(15) ta ting zhe yinyue xie gongke
he listen DUR music write homework
'He wrote homework listening to music.'

The general tendency is clear: some verbs have to occur within VP_1 relative to other verbs. As the next section shows, the data presented in this section can be accounted for by a general principle, i.e., the assignment of Figure and Ground events to main and subordinate clauses.

3. Figure and Ground Event Correlation

Talmy (2000) indicates that Figure and Ground are central to the conceptual organization of languages. The Ground functions as a reference point for locating the Figure in space. Because of a spatiotemporal homology in language, these two concepts can also be applied to explain the patterns of relative location of events in time. Talmy demonstrates that the Figure event is realized in the main clause and the Ground event is realized in the subordinate clause. He uses *while* clauses to illustrate this claim. Hayase (1997) also mentions that in Japanese the Figure and Ground events are aligned to main clauses and subordinate clauses, respectively. Both the English and the Japanese examples in their studies are complex sentences with two clauses, in the sense that the subordinate clause is marked explicitly by *while* or *nagara*, respectively. In the Mandarin construction at issue in this paper, the relation between two VPs is tighter, in the sense that they are not composed of two clauses and there is no overt subordinate clause marker. In structural terms, the first VP is subordinated to the second VP, which is treated as the main VP. If we extend Talmy's proposal that in a complex sentence the Figure event is expressed by the main clause and the Ground event is expressed by the subordinate clause, then we can set up the following correlation for the Mandarin "Agent VP_1-*zhe* VP_2" construction.

(16) Agent (VP_1-*zhe*) VP_2
|
Subordinate Main
|
Ground Figure

(16) indicates that VP_1 is the subordinate VP and VP_2 the main VP. Moreover, VP_1 is the Ground event and VP_2 the Figure event. It is generally agreed that the first VP is subordinate to the second VP in the "Agent VP_1-*zhe* VP_2" construction (Li and Thompson 1981). Therefore, what remains to be examined is which VPs encode the Figure and Ground events.

There are some basic characteristics associated with the concept of Figure and Ground events. Generally, the Figure denotes an event which describes a more salient occurrence with respect to the Ground, which denotes a reference event that has a stationary setting. The following example illustrates this tendency.

(17) ta cheng zhe yusan zou
he hold DUR umbrella walk
'He walked holding an umbrella.'

(18) *ta zou zhe cheng yusan
he walk DUR hold umbrella

The walking event expresses the notion of translocation. On the other hand, the event of holding an umbrella depicts a static relationship between the person who holds the umbrella and the umbrella. Since translocation denotes a situation which is more salient than static, the walking event should be categorized as the Figure event and the event of holding an umbrella should be categorized as the Ground event. This is why sentence (17) is good and sentence (18) is odd. In (18), the walking event is assigned Ground event status as it is encoded as a subordinate VP, despite its higher dynamicity; hence the ungrammaticality of the sentence. This set of examples shows that generally Figure status should be assigned to the main VP_2 and Ground status to the subordinate VP_1. More generally, we can summarize that if certain verbs tend to occur within VP_1 relative to their collocating verbs, these verbs tend to be assigned Ground status and vice versa if they tend to occur within VP_2.

In the following, I discuss several constraints that distinguish Figure events from Ground events. Section 3.1 examines the contrast between point events and extent events. Section 3.2 shows events that depict situations in which the location of entities changes or is more permanent. Section 3.3 examines the contrast between more salient and more backgrounded events. Based on these associated characteristics of Figure and Ground, I show that, given two events that are used to describe temporally overlapping events, one is more likely to be the Figure than the other, and that this distinction, in turn, can account for the examples mentioned in section 2.

3.1. Extent vs. Point Events

One of the associated characteristics of Figure and Ground is that one is geometrically simpler (often point-like), and the other is geometrically more complex. In terms of temporality, the Figure event is more a point-like event and

the Ground event is an extent event. In other words, Figure events tend to be telic, whereas Ground events tend to be atelic. In the following examples, all the main VPs which express Figure events are telic.

(19) ta pao zhe hua.jia
he run DUR return.home
'He went home running.'

(20) ta yao zhe tou zou.kai
he shake DUR head walk.away
'He walked away shaking his head.'

(21) ta kang zhe futou zou.jin linjian
he carry DUR axe walk.enter woods
'He walked into the woods carrying an axe.'

(22) tamen hua zhe chuan dao hehuacong li
they row DUR boat arrive lotus.cluster in
'They entered into the lotus clusters rowing the boat.'

For each sentence, the order of the two VPs cannot be reversed. Otherwise, the sentence is ungrammatical. For each pair of verbs, one is an atelic verb and the other is a telic verb. For example, *pao* 'run' is atelic whereas *hui.jia* 'return home' is telic. The sequential arrangement in these examples supports the claim that the Figure event is realized as the main VP, and the Ground event is realized as the subordinate VP. When a telic verb and an atelic verb are used to describe concurrent events, the telic verb is assigned the Figure event status and the atelic verb the Ground one. In the "Agent VP_1-*zhe* VP_2" construction, the telic verb is expressed as the main VP_2 and the atelic verb as the subordinate VP_1. This correlation supports the mapping between Figure/Ground Event and Main/Subordinate VP in (7).

3.2. More Permanently Located vs. More Movable

There are cases where one event describes a more permanently located relation between two entities and the other event describes a more movable relation between two entities. In this case, the former one is categorized as the Ground and the latter one as the Figure. One manifestation of this relation is when the subject of the whole sentence and the object of the VP form a Composite Figure. The following example taken from Talmy (2000) illustrates this situation.

(23) The lion chased the gazelle through the forest.

In this sentence, there are multiple levels of Figure and Ground relationships. Specifically, the gazelle in (23) has two statuses. With respect to the lion, the

Figure, it is the Ground. However, if they move at the same speed, then their Figure and Ground relation is static. In this sense, both of them form a Composite Figure with respect to the forest, which is the Ground in this relation.

It seems that if the object of a verb can form a Composite Figure with the subject, then this verb has to be expressed as the first verb in the "Agent VP_1-*zhe* VP_2" construction, when it co-occurs with translocational verbs. The following examples all illustrate this tendency. In these sentences, the subject and the object of the first verb form a Composite Figure because their Figure and Ground relation is static. In other words, VP_1 in (24) through (27) describes a static event; hence the first VP is the Ground event.

(24) ta bao zhe baobao pao
he hold DUR baby run
'He ran holding a baby.'

(25) ta kang zhe futou zou.jin linjian
he carry DUR axe walk.enter woods
'He walked into the woods carrying an axe.'

(26) tamen hua zhe chuan dao hehua.cong li
they row DUR boat arrive lotus.cluster into
'They entered into the lotus clusters rowing the boat.'

(27) ta chuan zhe xie pao
he wear DUR shoes run
'He ran with shoes on.'

In (24), the relation between the baby-holder and the baby is static. This is also true for the axe-carrier and the axe in (25), the boat-rower and the boat in (26), and the runner and her shoes in (27). Their relation is static because the two entities in question move together. Other verbs that co-occur with them describe events that involve more motion such as translocation, i.e., the Composite Figure moves from one place to the other in space with respect to the Ground. For instance, in (25), the axe-carrier and the axe form a Composite Figure with respect to the woods which now functions as the Ground. Similarly, in (26), the boat-rower and the boat form a Composite Figure and the lotus cluster is the Ground. To sum up, given two verbs in this construction, if the object of these verbs can form a Composite Figure with the subject, then this verb has to be realized as the subordinate VP_1. This is semantically motivated because this verb describes a static relation and this relation is more likely to receive Ground event status. Here again, the assignment of Figure and Ground event status is determined by the semantic properties of each verb.

3.3. More Backgrounded vs. More Salient Events

It has already been noted in the literature that in the "Agent VP_1-*zhe* VP_2" construction, the first VP functions as the background for the meaning of the second VP. For example, Tai (1993) says that the first VP provides backgrounded information and the second VP provides foregrounded information. In addition, Chu (1987) points out that *-zhe* is "a durative aspect marker in semantics, a subordinating suffix in syntax and a backgrounding device in pragmatics." However, why one meaning must be backgrounded relative to the other has not been discussed. The distinction between Figure and Ground events motivates this constraint.

(28) ta xiao zhe shuo.hua
he smile DUR talk
'He talked with a smile.'

For example, in sentence (28), the smiling event is treated as the background event. However, given that *-zhe* can attach to both verbs, *xiao* and *shuo*, why is the following sentence ungrammatical?

(29) *ta shuo zhe hua xiao
he talk DUR word smile

(29) shows that the talking event cannot be backgrounded when it occurs concurrently with the smiling event. Note that *shuo* can occur in the first VP or be backgrounded too when it co-occurs with other verbs, as shown in (30).

(30) ta shu zhe huazoulu
he talk DUR talkwalk
'He walked talking.'

These examples demonstrate that we need to predict what factors determine which event is backgrounded. In that respect, it is important to note that what is the Figure event and what is the Ground event is relative. Specifically, the talking event is interpreted as the Figure event relative to the smiling event, and is interpreted as the Ground event relative to the walking event. By comparing smiling and talking, we can see that talking has more Figure-associated features. For example, talking is more salient and of greater concern than smiling. In other words, when a person is smiling and talking at the same time, people pay more attention to what she is talking about. Therefore, in (28) the talking event has to be categorized as the Figure. In (30) the walking involves more motion than the talking event and therefore receives the Figure event status. Thus, while I agree with previous analyses that the first VP is backgrounded relative to the second VP, I claim that the motivation behind this difference lies in the relative categorization of the two events as Figure and Ground. In brief, Ground events are more likely to

be backgrounded.

In this section, I discussed how the assignment of Figure and Ground events is determined, and its application to the data presented in section 2. The assignment can be determined by the telicity of verbs or by the lexical semantics of verbs in the sense that whether two arguments of a verb can form a Composite Figure or not is determined lexically. To sum up, for a pair of verbs, if one of them is associated with more Figure or Ground event characteristics, then they are categorized as the Figure or Ground event. Furthermore, based on Talmy's claim that in complex sentences Figure events are expressed by main clauses and Ground events by subordinate clauses, we can predict the arrangement of VP_1 and VP_2 in the "Agent VP_1-*zhe* VP_2" construction.

4. Conclusion

This paper discusses the Mandarin "Agent VP_1-*zhe* VP_2" construction in terms of Talmy's distinction between Figure and Ground events. It shows that given two verbs which describe temporally overlapping events, it is possible to predict which verb is realized as part of VP_1 or part of VP_2. Based on corpus data I have shown that some verbs tend to occur in either VP_1 or VP_2 position. In addition, in this construction, VP_1 is categorized as the Ground event and VP_2 as the Figure event. By comparing two co-occurring verbs, relative Figure and Ground assignment is determined on the basis of the semantic properties of each verb in the pair. Once the Figure and Ground event assignment is determined, the asymmetry between the two VPs in this construction can be predicted and accounted for.

Acknowledgement

I would like to thank Jean-Pierre Koenig, Leonard Talmy, and Hui-Chen Sabrina Hsiao for their comments. All remaining errors are mine.

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Linguistics Department
609 Baldy
University at Buffalo, The State University of New York
Buffalo, NY 14260

lchief@buffalo.edu

Sequentiality and Non-Tensed Verbal Coordination in Korean*

SAE-YOUN CHO
Honam University

0. Introduction

Lakoff (1986) argues that the Across-The-Board (ATB) constraint on extraction from coordinate structures of Ross (1967) is not a syntactic constraint but a semantic or pragmatic one, since ATB violations occur when conjuncts are interpreted sequentially, as shown by the contrast between (1a) and (1b).

(1) a. **Which whisky**$_i$ did Johnny [[go to the store] [and buy ___$_i$]]?
b. ***What** $_i$ does Johnny [[like apples] [and hate ___$_i$]]?

However, Lakoff's (1986) claim that the sequential reading alone suffices to sanction ATB violations cannot be supported in Korean verbal coordination of Tensed Phrases (TPs), where all conjuncts contain tense inflection. As shown in (2), extraction out of the conjunction of TPs in Korean is not possible regardless of whether the conjuncts are interpreted sequentially or non-sequentially.

(2) a. Marcia-ka [imsin-ul ha-ess-ko] [kyelhoyn-ul hay-ess-ta.]
M-Nom pregnant do-Past-Conj marriage-Acc do-Past-Decl
'Marica was pregnant and got married.'
(sequential (SEQ) or non-sequential (NS))
b. ***kyelhoyn-ul** $_i$, [Marcia-ka [imsin-ul ha-ess-ko] [___$_i$ hay-ess-ta.]]
marriage-Acc M-Nom pregnant do-Past-Conj do-Past-Decl

Unlike the conjunction of TPs in Korean, ATB violations are allowed in the coordination of Non-Tensed Phrases (NTPs), where the non-final conjuncts lack tense inflection, so that the suffix *-ko* is directly attached to the verbal root only when the conjuncts are interpreted sequentially, as in (3).

* I am grateful to the 30th BLS participants at UC Berkeley, including Alec Marantz, Chung-Hye Han, and Seung-Ho Nam for their discussions and valuable comments, and also to James Yoon, Jong-Bok Kim, and Peter Sells for their critical comments. All misinterpretations and misunderstandings are of course mine. This work was supported by the Korea Research Foundation (Grant Number 2003-041-A00224).

(3) a. Marcia-ka [imsin-ul ha-ko] [kyelhoyn-ul hay-ess-ta.]
M-Nom pregnant do-Conj marriage-Acc do-Past-Decl
'Marica was pregnant and got married.' (SEQ or NS)

b. **kyelhoyn-ul** $_i$, [Marcia-ka [imsin-ul ha-ko] [___ $_i$ hay-ess-ta.]]
marriage-Acc M-Nom pregnant do-Conj do-Past-Decl
'Marica was pregnant and got married.' (SEQ only)

Thus, the facts of Korean coordination falsify Lakoff's claim that extraction out of coordinate structures can violate the ATB constraint as long as the coordinate structure is interpreted sequentially.

In this paper, I will argue that the NTPs in (3) may be either conjuncts or adjuncts. That is, *V-ko* marks either a conjunct phrase in a coordinate structure or an adjunct phrase meaning 'and-then (after)', 'and as a result (cause & effect)', or 'and nonetheless'. I claim here that the ATB violation is allowed only when an NTP instantiates a *head-adjunct structure*, but not when it is a coordinate structure. This will enable us to account for the contrast between sentences in (3), where ATB violation is allowed, and sentences in (2), where it is not. I also claim here that the sequential reading of (3) is obtained when the first conjunct is an adjunct, while the non-sequential reading is obtained when the NTPs in (3) are coordinate structures. I will represent *-ko* used as an adjunct complementizer as *-ko1* and the conjunctive *-ko* as *-ko2* in the rest of this paper. Again, the adjunct complementizer *-ko1* may have at least three subtypes as follows:

(4) The Classification of *-ko*

	Notion	Function	Subtype (variants)	Meaning
(a)	*-ko1*	Adjunct compl-ementizer	i. *-ko(nase)*	'after' or 'and then'
			ii. *-ko(se)*	'cause and effect'
			iii. *-ko(seto)*	'and nonetheless'
(b)	*-ko2*	Conjunctive	*-ko*	'and'

Though it is true that ATB violations are allowed only when the NTP coordination at issue receives a sequential reading, a claim made in this paper is that the distinction between sequential and non-sequential readings in the coordination of NTPs in (3) is a distinction made by syntax, while the sequential vs. non-sequential reading of (2) is derived from semantics or pragmatics. This enables us to maintain the claim that the ATB and the Coordinate Structure Constraint (CSC) hold as syntactic constraints in Korean, since ATB violation is attested only when the NTPs in (3) instantiate a *head-adjunct* structure.

This paper is organized as follows. In section 1, I provide various linguistic properties of NTPs in coordination to support the claim that the NTPs at issue can be ambiguous between a conjunct and an adjunct analysis, emphasizing that *-ko1* and other adjunct suffixes exhibit parallel linguistic behavior. Section 2 shows how to implement the generalizations from the properties of NTPs in coordination

into HPSG (Sag et al. 2003). On this basis, I will demonstrate how my analysis works for NTPs in coordination. In conclusion, I attempt to show the similarities and differences between Korean NTPs in coordination and English verbal coordination, with respect to extraction.

1. Properties of Verbal Coordination in Korean

1.1. Phonological Properties of NTPs

In Korean, the adjunct suffix *-ko1* used in NTPs in coordination, like the adjunct suffix *-kose* in an *after*-adjunct, may bear a falling tone or be followed by a pause. In such circumstances, the sentences are read as sequential. In contrast, the conjunct suffix *-ko2* 'and' does not exhibit such behavior, whether coordination is tensed or non-tensed. This shows that the NTPs interpreted sequentially are similar to adjuncts, which exhibit similar properties.

The sequence *-ko1* in (5a) can have a falling tone in the Kyung Sang dialect or may be followed by a pause when the reading is sequential. Likewise, there is a falling tone or a pause between the sequence *-kose* 'after' and the main clause VP as shown in (5b). However, even though the conjunct *-ko2* in a coordinate structure with two TPs, as in (6b), may bear a falling tone or be followed by a pause, both the sequential and non-sequential readings are available. (# stands for a pause or a falling tone.)

(5) a. Kim-i pap-ul mek-ko1 # kulus-ul chiu-ess-ta.
K-Nom rice-Acc eat-adj.suf dish-Acc clean-Past-Decl
'Kim cleaned the dishes after eating the rice.' (SEQ)

b. Kim-i pap-ul mek-kose # kulus-ul chiu-ess-ta.
K-Nom rice-Acc eat-adj.suf dish-Acc clean-Past-Decl
'Kim ate the rice and then cleaned the dishes.' (SEQ)

(6) a. Kim-i pap-ul mek-ko2 kulus-ul chiu-ess-ta.
K-Nom rice-Acc eat-Conj dish-Acc clean-Past-Decl
'Kim ate the rice and cleaned the dishes.' (NS)

b. Kim-i pap-ul mek-ess-ko2 kulus-ul chiu-ess-ta.
K-Nom rice-Acc eat-Past-Conj dish-Acc clean-Past-Decl
'Kim ate the rice and cleaned the dishes.' (SEQ or NS)

A coordinate structure with two TPs, as in (7), can have a sequential reading, since the two events, the event of buying the rice and the event of loading it in the car, can be a natural course of events in the world. In this case, we can obtain a sequential reading, regardless of the existence of tone or pause. On the other hand, a sentence with a TP, as shown in (8), can be interpreted either sequentially or non-sequentially, depending on tone or pause. In (8), if a falling tone falls on *-ko*, the sentence must be interpreted sequentially, whereas if there is no tone the sentence need not be.

(7) Kim-i ssal-ul sa-ess-ko2 cha-ey sil-ess-ta.
K-Nom rice-Acc buy-Past-Conj car-PostP load-Past-Decl
'Kim bought the rice and loaded it in the car.' (SEQ or NS)

(8) Kim-i pap-ul mek-ko(1/2) ppang-ul mek-ess-ta.
K-Nom rice-Acc eat-Conj bread-Acc eat-Past-Decl
'Kim ate the bread after eating the rice.' (SEQ)
or 'Kim ate the rice and the bread.' (NS)

If a sequential reading is a matter of semantics or pragmatics alone, it is hard to account for why the reading of (8) varies in terms of the existence of tone or pause, but the reading of (6b) and (7) does not. But if NTPs in apparent coordination can also be adjuncts, the phonological property follows.

1.2. Morphological Properties of NTPs

Morphologically, the suffix *-ko1* and other adjunct suffixes such as *-kose* exhibit similar distributional behaviors in that they both require a non-tensed verbal form in order to be an independent word, as shown in (9).

(9) a. mek-ko1 vs. *mek-ess-ko1 'and (then)'
eat-adj.suf eat-Past-adj.suf
b. mek-kose vs. *mek-ess-kose
eat-adj.suf eat-Past-adj.suf 'cause and effect'
c. mek-koseto vs. *mek-ess-koseto 'nonetheless'
d. mek-konase vs. *mek-ess-konase 'and then/after'

In addition to that, the verbal form attached to suffix *-ko1* and adjunct suffixes should be non-stative, as in (10).

(10) a. *alumtap-ko1 vs. *alumtawue-ess-ko1 'and (then)'
beautiful(stative)-adj.suf beautiful(stative)-adj.suf
b. *alumtap-kose vs. *alumtawue-ess-kose 'cause and effect'
c. *alumtap-koseto vs. *alumtawue-ess-koseto 'nonetheless'
d. *alumtap-konase vs. *alumtawue-ess-konase 'and then/after'

This similarity in behavior shows us that *-ko1* can be an adjunct suffix such as 'after'.

1.3. Syntactic and Semantic Properties of NTPs

1.3.1. Rightward Extraction

The fact that an element contained in the final verbal phrase of a sentence with a sequentially interpreted NTP can be relativized while an element contained in the final conjunct in TP coordination cannot, regardless of its reading, shows that NTPs are more similar to adjuncts than conjuncts. This is due to the fact that

extraction is possible from the head daughter in a *head-adjunct* structure.

The sentence (11) shows that an NP contained in the final VP in a sentence interpreted sequentially can be relativized. Similarly, the NP contained in the final VP in a sentence with an adjunct phrase can also be relativized, as shown in (12). However, the NP contained in the final TP in a TP coordinate structure, as in (13), cannot be moved out.

(11) [Kim-i [pap-ul mek-ko1] [___$_i$ mek-un]] **ppang**$_i$ …
K-Nom rice-Acc eat-Comp eat-Past-Rel bread
'the bread which Kim ate t after eating the rice…' (SEQ)

(12) [Kim-i [pap-ul mek-kose] [____$_i$ mek-un]] **ppang**$_i$ …
K-Nom rice-Acc eat-Comp(after) eat-Past-Rel bread
'the bread which Kim ate t after eating the rice…'

(13) *[Kim-i [pap-ul mek-ess-ko2] [____$_i$ mek-un]] **ppang**$_i$ …
K-Nom rice-Acc eat-Past-Conj eat-Past-Rel bread
'the bread which Kim ate the rice and ate t…' (NS or SEQ)

If the first NTP in (11) is an adjunct like (12), the difference in grammaticality between (11) and (13) follows from the CSC, proposed by Ross (1967).

(14) <u>The Coordinate Structure Constraint</u> (CSC)
In a coordinate structure, no conjunct may be moved, nor may any element contained in a conjunct be moved out of that conjunct. (Ross 1967:98-99)

The sentences in (11) and (12) are not subject to the CSC, since we are assuming that the NTP is an adjunct. On the other hand, if sentence (11) is a coordinate structure, we need to explain why (11) is acceptable and (13) is not.

1.3.2. Leftward Extraction

An NP contained in the final VP of a sentence containing *-ko1* or a temporal adjunct marker like *-kose* can be scrambled out of the VP, while an NP contained in the final TP in a TP coordination cannot. Similar to relatives, this also shows that the NTP with *-ko1* is more like an adjunct phrase than a conjunct. The sentences (15) and (16) licensed by *head-adjunct* structures are acceptable because they do not violate the CSC, even if the NP is moved out of the main VP, whereas the sentence (17) is unacceptable because the NP is moved from a single conjunct and thus violates the CSC.

(15) ppang-ul$_i$, Kim-i [pap-ul mek-ko1] [___$_i$ mek-ess-ta.]
bread-Acc K-Nom rice-Acc eat-adj.suf eat-Past-Decl
'Kim ate the bread after eating the rice.' (SEQ, not NS)

(16) ppang-ul$_i$, Kim-i [pap-ul mek-kose] [___$_i$ mek-ess-ta.]
bread-Acc K-Nom rice-Acc eat-adj.suf eat-Past-Decl
'Kim ate the rice and then ate the bread.' (SEQ)

(17) *ppang-ul$_i$, Kim-i [pap-ul mek-ess-ko2] [___$_i$ mek-ess-ta.]
bread-Acc K-Nom rice-Acc eat-Past-Conj eat-Past-Decl
'Kim ate the rice and ate the bread.' (NS or SEQ)

Semantically, *-ko1* occurs when the NTP containing it delivers sequential meanings such as 'after', 'cause and effect', and 'nonetheless', as illustrated in (18) through (20). The sentences with adjunct suffixes including *-ko1* can undergo preposing, delivering various sequential meanings as shown in the (a) and (b) examples below. In contrast, sentences with *-ko2* cannot undergo preposing regardless of the existence of tense inflection or sequential vs. non-sequential reading, as illustrated in the (c) examples below.

(18) a. kulus-ul$_i$, Kim-i [pap-ul mek-ko1] [____$_i$ chiu-ess-ta.]
dish-Acc K-Nom rice-Acc eat-adj.suf clean-Past-Decl
b. kulus-ul$_i$, Kim-i [pap-ul mek-konase] [____$_i$ chiu-ess-ta.]
dish-Acc K-Nom rice-Acc eat-adj.suf clean-Past-Decl
'Kim ate the rice and then cleaned the dishes.' (SEQ 'and then')
c. *kulus-ul$_i$, Kim-i [pap-ul mek-ess-ko2] [____$_i$ chiu-ess-ta.]
dish-Acc K-Nom rice-Acc eat-Past-Conj clean-Past-Decl
'Kim ate the rice and cleaned the dishes.' (SEQ or NS)

(19) a. pay-ka$_i$, Kim-i [pap-ul mek-ko1] [____$_i$ apha-ess-ta.]
stomach-Nom K-Nom rice-Acc eat-adj.suf pain-Past-Decl
b. pay-ka$_i$, Kim-i [pap-ul mek-kose] [____$_i$ apha-ess-ta.]
stomach-Nom K-Nom rice-Acc eat-adj.suf pain-Past-Decl
'Kim ate the rice and as a result had a pain in his stomach.'
(SEQ 'cause and effect')
c. *pay-ka$_i$, Kim-i [pap-ul mek-ess-ko2] [____$_i$ apha-ess-ta.]
stomach-Nom K-Nom rice-Acc eat-Past-Conj pain-Past-Decl
'Kim ate the rice and had a pain in his stomach.' (SEQ or NS)

(20) a. wuncen-ul$_i$, Kim-i [swul-ul masi-ko1] [____$_i$ hay-ess-ta.]
drive-Acc K-Nom alcohol-Acc drink-adj.suf do-Past-Decl
b. wuncen-ul$_i$, Kim-i [swul-ul masi-koseto][_____$_i$hay-ess-ta.]
drive-Acc K-Nom alcohol-Acc drink-adj.suf do-Past-Decl
'Kim drove a car though he drank alcohol a lot.' (SEQ 'nonetheless')
c. *wuncen-ul$_i$, Kim-i [swul-ul masi-ess-ko2] [____$_i$ hay-ess-ta.]
drive-Acc K-Nom alcohol-Acc drink-Past-Conj do-Past-Decl
'Kim drank alcohol (a lot) and drove a car.' (SEQ or NS)

1.4. Generalizations and Their Implications

From the observations above, we can generalize that like other sequential adjunct suffixes such as *-kose*, *-ko1* instantiates a *head-adjunct* structure so that extraction is freely allowed in the sentences with *-ko1*, since the CSC and the ATB are constraints for coordinate structures such as phrases with *-ko2*. Thus, we can summarize as follows:

(21) The distinction between *-ko1* and *-ko2* (for Korean)

		-ko1	*-ko2*
i.	Function	(sequential) adjunct suffix	conjunct suffix
ii.	Meaning	'after', 'cause & effect', 'nonetheless'	'and'
iii.	Instantiating structure	*head-adjunct*(*modifier*)	*coordinate*
iv.	Stem	non-tensed verb (non-finite)	(finite) verbal
v.	Constraints	N/A	CSC and ATB

Observations from the coordination of NTPs in Korean above give us clues about the similarities and differences between English and Korean verbal coordination. Postal (1998) has provided a syntactic explanation for the three types of 'and' in (22) suggested by Lakoff (1986).

(22) a. The stuff which$_i$ Arthur sneaked in and stole ____ $_i$… (*and-then*)
b. [How many dogs]$_i$, can a person have__ $_i$ and still stay sane? (*nonetheless*)
c. That is the drug which$_i$ athletes take__ $_i$ and become strong. (*cause-effect*)

Postal (1998) argues that the phrase of the 'and-then' type in (22a) can be ambiguous between an adjunct and coordinate structure on the basis of syntactic tests such as iterability and deletion. By the same token, phrases like the types 'and-nonetheless' and 'cause-result' in (22b-c) can be analyzed as adjunct structures. This can be summarized as follows:

(23) The distinction adjunct *and* from conjunction *and* (for English)

		adjunct *and*	conjunction *and*
i.	Function	(sequential) adjunct comp	conjunctive
ii.	Meaning	'after', 'cause & effect', 'nonetheless'	'and'
iii.	Instantiating structure	*head-adjunct*(*modifier*)	*coordinate*
iv.	Stem	N/A	N/A
v.	Constraints	N/A	CSC and ATB

The table in (23) showing the characteristics of the English *and* is quite similar to that in (21) for the Korean *-ko*. If Postal's (1998) analysis is correct, we

may argue that the ATB holds as a syntactic constraint in both languages, since ATB violation is attested only when phrases such as NTPs in Korean instantiate a *head-adjunct* structure.

Before presenting my proposal in detail, I will briefly mention some of the problems found in the Adjunct approach of Yi (1994) and Kim (1995) for the phenomena mentioned above. To capture the syntactic generalizations, the Adjunct approach regards all VP conjuncts except a main VP as adjunct phrases like an *after*-phrase.[1] Such an account would, first of all, have to explain why there is no VP coordination in Korean but other coordinations like AP coordination exist. Moreover, though there is no VP coordination, the Adjunct approach still finds it hard to differentiate (1a) from (1b). In other words, it appears that the Adjunct analysis cannot easily account for the fact that extraction out of NTP coordination headed by a non-active verb cannot be allowed but that from NTP coordination headed by an active verb can be allowed.[2] Furthermore, as illustrated in (2) and (3), it would be a puzzle to the Adjunct approach to show how NTP coordination, in principle, can be interpreted either sequentially or non-sequentially and why sentences undergoing extraction out of NTP coordination must have a sequential reading. However, these difficulties the Adjunct approach faces can be easily avoided under our analysis.[3]

2. A Constraint-Based Analysis of Coordinate Structures in Korean

2.1. Theoretical Tools

On the basis of the hypothesis that a set of NTPs may be either adjuncts or conjuncts depending on whether *-ko* is *-ko1* or *-ko2*, I will now present an analysis of these constructions within HPSG (Sag et al. 2003). In HPSG, adjuncts, i.e. modifiers, select their heads so that the MOD value of the adjunct is token-identical to the SYNSEM value of its head. Hence, the *head-modifier* rule in (24) licenses sentences containing NTPs with *-ko1*.

(24) Head-Modifier Rule (Head-Adjunct Rule)

$$[\textit{phrase}] \rightarrow \text{H}\ \boxed{1}\ \begin{bmatrix} \text{COMPS} & \langle\ \rangle \\ \text{STOP-GAP} & \langle\ \rangle \end{bmatrix}\ \begin{bmatrix} \text{COMPS} & \langle\ \rangle \\ \text{MOD} & \langle \boxed{1} \rangle \end{bmatrix}$$

Again, we need to specify the information on what the RELATION of the adjunct *-ko1* can have as its value, since the adjunct suffix *-ko1* may convey one of at least three different sequential readings. To do this, I propose a partial type

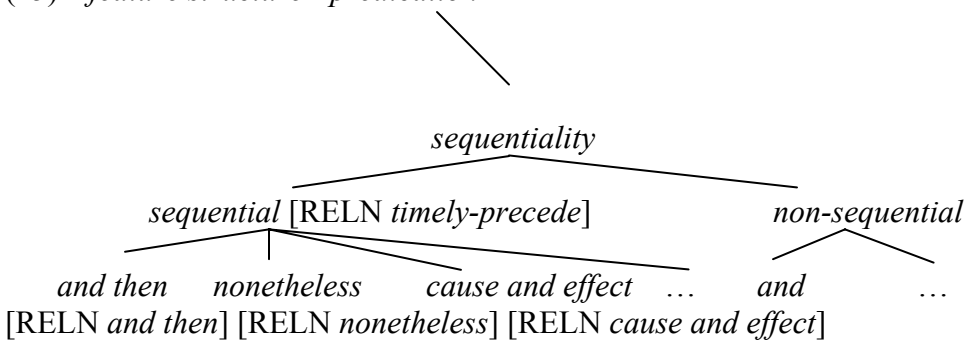
[1] The difference between the two analyses of the Adjunct approach is that Yi (1994) thinks there to be no VP coordination in Korean while Kim (1995) considers all NTPs to be adjuncts. Though both analyses are different in various respects, I will not pursue that issue here.

[2] The NTP coordination with time adverbs also would be a puzzle to the Adjunct approach. For the relevant data, see Chung (2003).

[3] Chung (2003) also has argued against the so-called Coordination approach of Yoon (1994). Due to space constraints, I will not pursue this here.

hierarchy on predication as in (25) and an exemplar lexical rule for the adjunct suffix *-ko1* whose type is 'and-then' as in (26).

(25) *feature structure - predication*



(26) Suffix *-ko1* Lexical Rule

$$\text{INPUT} \quad \left\langle \boxed{1}, \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} & \\ \text{FORM} & \textit{non-finite} \end{bmatrix} \end{bmatrix} \\ \text{ARG-ST} & \boxed{B} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & s_1 \\ \text{RESTR} & \boxed{A} \end{bmatrix} \end{bmatrix} \right\rangle$$

$$\text{OUTPUT} \quad \left\langle \text{F-}\textit{ko1}(\boxed{1}), \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} & \\ \text{FORM} & \textit{non-finite} \\ \text{COORD} & - \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{MOD} & \langle \boxed{4}[\textit{verb } s_3] \rangle \end{bmatrix} \end{bmatrix} \\ \text{ARG-ST} & \boxed{B} \\ \text{SEM} & [\text{RELN} \quad \textit{and then}] \oplus \boxed{A} \end{bmatrix} \right\rangle$$

The sequential reading of the sentence with any type of *-ko1* can be obtained in terms of (25), and a more specific reading would be based on which *-ko1* lexical rule is applied among three different *-ko1* lexical rules.

As for the coordination cases, I postulate two coordination rules for Korean as in (27); one for Symmetric Coordination, where all conjuncts have the same FORM value (for example, [FORM *finite*]), and the other for Asymmetric Coordination, where all conjuncts do not have the same FORM value. In addition, we need the real conjunct suffix *-ko2* as in (28).

(27) (I) Symmetric Coordination Rule for Korean, Based on Sag et al. (2003)

$$\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_0 \\ \text{RESTR} & \langle[\text{ARGS} \langle s_1 \ldots s_n\rangle]\rangle \end{bmatrix} \rightarrow$$

$$\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_1 \end{bmatrix} \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_{n-1} \end{bmatrix} \left(\begin{bmatrix} \text{HEAD} & conj \\ \text{IND} & s_0 \\ \text{RESTR} & \langle[\text{ARGS} \langle s_1 \ldots s_n\rangle]\rangle \end{bmatrix} \right) \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_n \end{bmatrix}$$

(II) Asymmetric Coordination Rule for Korean, Based on Sag et al. (2003)

$$\begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_0 \\ \text{RESTR} & \langle[\text{ARGS} \langle s_1 \ldots s_n\rangle]\rangle \end{bmatrix} \rightarrow$$

$$\begin{bmatrix} \text{FORM} & \boxed{2} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_1 \end{bmatrix} \begin{bmatrix} \text{FORM} & \boxed{2} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_{n-1} \end{bmatrix} \left(\begin{bmatrix} \text{HEAD} & conj \\ \text{IND} & s_0 \\ \text{RESTR} & \langle[\text{ARGS} \langle s_1 \ldots s_n\rangle]\rangle \\ & \oplus \quad \text{T}\ldots \end{bmatrix} \right) \begin{bmatrix} \text{FORM} & \boxed{1} \\ \text{VAL} & \boxed{0} \\ \text{GAP} & \boxed{A} \\ \text{IND} & s_n \end{bmatrix}$$

(28) Suffix (Asymmetric) -*ko2* Lexical Rule

$$\text{INPUT} \quad \left\langle \boxed{1}, \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} verb \\ \text{FORM} & non\text{-}finite \end{bmatrix} \end{bmatrix} \\ \text{ARG-ST} & \boxed{B} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & \boxed{4}s_1 \\ \text{RESTR} & \boxed{A} \end{bmatrix} \end{bmatrix} \right\rangle$$

$$\text{OUTPUT}\ \left\langle \text{F-}ko2(\boxed{1}),\ \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & verb \\ \text{FORM} & non\text{-}finite \\ \text{COORD} & + \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{MOD} & < \quad > \end{bmatrix} \\ \text{ARG-ST} & \boxed{B} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & \boxed{2}\ s_2 \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & and \\ \text{SIT} & \boxed{2} \\ \text{ARGS} & \langle \boxed{4}, \text{REST} \rangle \end{bmatrix} \right\rangle \oplus \boxed{A} \end{bmatrix} \end{bmatrix} \right\rangle$$

For clarity, I will demonstrate how the theoretical tools work for English Coordination. The coordination rule like (27) enables us to represent a coordinate sentence as in (29):

(29)

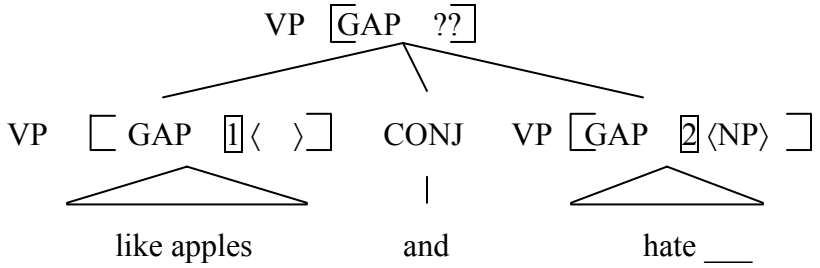
$$\begin{bmatrix} \text{FORM} & \boxed{0} \\ \text{VAL} & \boxed{1} \\ \text{INDEX} & s_0 \\ \text{RESTR} & \boxed{A} \oplus \boxed{B} \oplus \boxed{C} \end{bmatrix}$$

$$\begin{bmatrix} \text{FORM} & \boxed{0} \\ \text{VAL} & \boxed{1} \\ \text{INDEX} & s_1 \\ \text{RESTR} & \boxed{A} \end{bmatrix} \quad \begin{bmatrix} \text{HEAD} & conj \\ \text{INDEX} & s_0 \\ \text{RESTR} & \boxed{B} \left\langle \begin{bmatrix} \text{RELN} & \text{and} \\ \text{SIT} & s_0 \\ \text{ARGS} & \langle s_1, s_2 \rangle \end{bmatrix} \right\rangle \end{bmatrix} \quad \begin{bmatrix} \text{FORM} & \boxed{0} \\ \text{VAL} & \boxed{1} \\ \text{INDEX} & s_2 \\ \text{RESTR} & \boxed{C} \end{bmatrix}$$

Marcia likes Sue | and | Johnny likes OJ

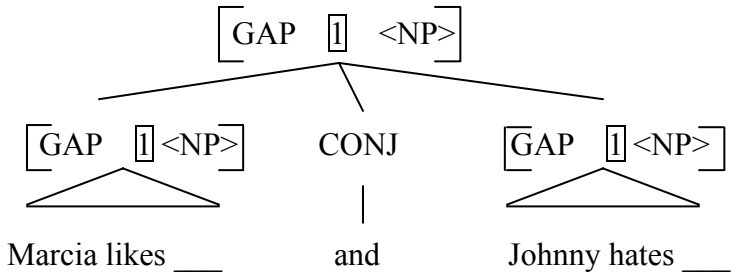
In (29), the FORM value of the first conjunct, *finite*, is token-identical with that of the second conjunct. In addition, the VAL and GAP values of both conjuncts are the same. The configuration in (29) satisfies all the requirements of the coordination rule in HPSG (Sag et al. 2003), so the sentence, *Marcia likes Sue and Johnny likes OJ*, is predicted to be grammatical. Sentence (1b), where it violates the CSC, is also correctly predicted to be ungrammatical because the GAP value of the two conjuncts is different, as illustrated in (30).

(30)



The ATB case in (31), in which all conjuncts have the same GAP value, is predicted to be grammatical by the definition of the coordination rule for English.

(31)



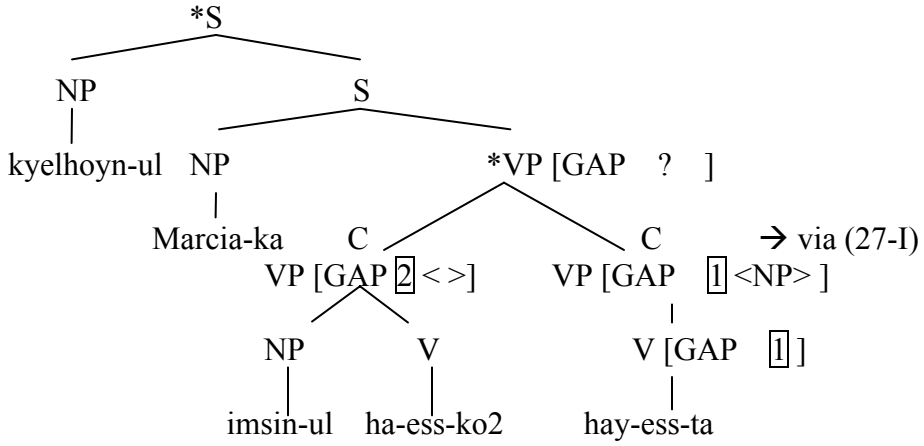
On the basis of the above, I will provide an analysis of Korean verbal coordination in a slightly modified version of HPSG (Sag et al. 2003) in the following section.

2.2. ATB as a Syntactic Constraint in Korean Verbal Coordination

2.2.1. Extraction Out of Real Coordinate Structures

An NP contained in the final VP conjunct cannot be preposed out of the VP, regardless of whether the sentence receives a sequential or non-sequential reading. The impossibility of the extraction out of real tensed or non-tensed coordination just follows under our analysis, as illustrated in (32) (=(2b)).

(32)

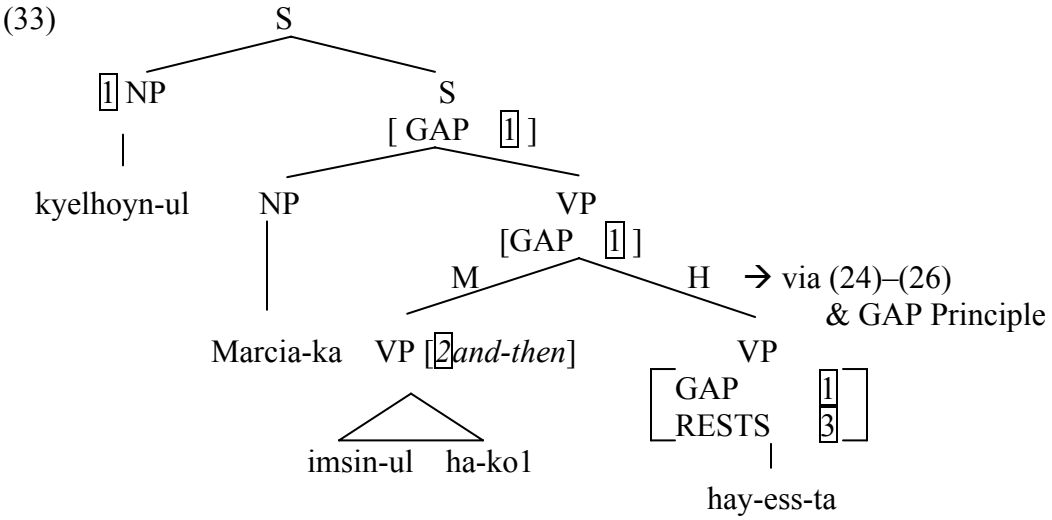


Though sentence (32) can be construed both sequentially and non-sequentially, the information on sequentiality is assumed to be pragmatic, under our analysis. Unlike Lakoff (1986), we claim that the sequentiality delivered from CONTEXT as a RESTRICTION value is not the key factor on whether or not extraction is possible in coordinate structures. Hence, extraction out of the coordinate structures headed by *-ko2* cannot be allowed, as shown in (32). Specifically, the NP, *kyelhoyn-ul*, cannot be extracted from the second conjunct in (32) because both conjuncts must have the same GAP value by the definition of the symmetric coordination rule for Korean in (27-I). As for sequentiality, sentence (32) may have a sequential reading, depending on the CONTEXT value, which does not affect the possibility of the extraction at issue.

2.2.2. Extraction out of *Head-Adjunct* Structures

An NP contained in the main VP in a sentence with NTPs can be preposed out of the VP only when the sentence receives a sequential reading. Further, we have claimed that the extraction is attested only when the phrases with NTPs at issue instantiate *head-adjunct* structures conveying some predication as a subtype of *sequential* in (25). Given (24)–(26), we can represent sentence (3b) as in (33).

(33)



Sentence (33), where an NP is extracted from the final VP, is predicted to be grammatical under our analysis, since it satisfies the requirements of (24)–(26). Specifically, the NP extracted out of the VP in (33) is permissible since the two VPs instantiate a *head-adjunct* structure so that it need not obey the CSC. Hence, extraction in (33) is legal.

3. Conclusion

On the basis of the hypothesis that NTPs in coordination may be either adjuncts or conjuncts, I have argued that the (im)possibility of the extraction from Korean verbal coordination can be predicted by syntactic structures, rather than by appeal

to semantics or pragmatics. This explains various factors about the prosodic, morphological, and syntactic and semantic characteristics of non-tensed phrases in Korean verbal coordination. The fact that syntax is responsible for these characteristics is further supported by the fact that even though both the sequential and non-sequential readings are available in TP coordination, they do not allow extraction in violation of CSC or ATB. This shows that Korean coordination cannot be accounted for in the manner suggested by Lakoff (1986) for English coordination. Hence, Korean coordination observes the ATB and CSC constraints as syntactic constraints. Furthermore, Postal (1998) has claimed that the three types of *and* suggested by Lakoff (1986) can be syntactically defined, which is summarized in (23). If Postal's (1998) analysis is on the right track, we could claim that the verbal coordination in both languages observes the ATB and CSC constraints as syntactic constraints.

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Department of English Language and Literature
Honam University
59-1, Seobong-dong, Gwangsan-gu,
Gwangju, Korea
506-714

sycho@honam.ac.kr

Frequency and Relexicalization of Clustered Codas in Korean

YOUN-JEOUNG CHOI
The University of Texas at Arlington

0. Introduction

In Korean, when a morpheme contains a consonant cluster in its underlying form (such as /salm/ 'life', /talk/ 'chicken'), we observe two outcomes in surface representations. In cases when a morpheme containing a consonant cluster in its coda is followed by either another consonant or by a word boundary, the cluster is simplified by deleting one member of the cluster: /salm + to/ 'life also' → [samdo], /talk/ 'chicken' → [tak]. If, however, a vowel-initial morpheme follows the underlying cluster, both members of the cluster are licensed by the language's syllable structure and thus both consonant surface: /salm + i/ 'life + nominative marker' → [sal-mi], /eps + i/ 'not exist + adverbial marker' → [ep-si].

Contrary to prescriptive accounts in which the resyllabification is claimed to be completely predictable (the second consonant of the clustered codas is assumed to be the onset of the following vowel), as the examples in (1) indicate, observations of contemporary Korean usage suggest that there is variation in terms of how underlying clusters actually surface.

(1) Morpheme-final clustered coda + *i* (nominative marker)

UR	Prescriptively correct form	Observed phonetic forms	
/talk-i/	[tal-ki]	[ta-ki] ~ [tal-ki]	'chicken'
/hulk-i/	[hul-ki]	[hu-ki] ~ [hul-ki]	'soil'
/neks-i/	[nek-si]	[ne-ki] ~ [nek-si]	'soul'
/saks-i/	[sak-si]	[sa-ki] ~ [sak-si]	'wage'
/kaps-i/	[kap-si]	[ka-pi] ~ [kap-si]	'price'
/salm-i/	[sal-mi]	[sa-mi] ~ [sal-mi]	'life'
/tols-i/	[to-li]	[to-li]	'anniversary'

In (1), except for the example /tols/, all of the observed forms show variation. When the observed forms that differ from the prescriptively correct forms are reviewed, there is a deleted consonant: it can be the first consonant of the clustered codas as in /talk + i/ → [ta-ki], /hulk + i/ → [hu-ki], or it can be the

second consonant of the clustered codas as in /neks + i/ → [ne-ki], /saks + i/ → [sa-ki]. (Although the example /tols + i/ shows no variation, it is also the case that the second consonant of the clustered is deleted.)

Throughout the previous research (Kim-Renaud 1974, Whitman 1985, Kim 1987, Oh 1994, Sohn 2002), cluster coda-related issues have been studied. In most of the early studies, however, the variational aspect of the issue was not very much discussed since they focused on the prescriptively correct forms without any observation of reality. Some researchers (Kim-Renaud 1974, Oh 1988, 1994, Sohn 2002) have tried to explain the variation in resyllabification by means of optional rule application. For example, Oh (1988, 1994) suggests a Lexical Resyllabification Rule which is optionally applied to the noun stem. She argues that the rule application triggers both of the consonants in the cluster of the noun stem to survive. Without the rule application, the noun stem behaves like a simple coda word because of Consonant Cluster Simplification (one member of the cluster is deleted by the rule). More recently, Sohn (2002) proposed that some cluster coda nouns undergo relexicalization, resulting in the nouns being simple coda nouns. She claims that this relexicalization going on the input forms is considered as evidence of linguistic change based on the idea of input-output correspondence. This study, basically, starts from the same idea as Sohn in the sense that the nouns undergo relexicalization, and the input-output correspondence motivates the process. In addition to the language-internal motivation, this study investigates language-external aspects of the relexicalization such as frequency. In particular, this study examines the relationship between relexicalization and frequency based on the studies of Bybee (1985, 1998) and Phillips (1998).

According to Bybee (1985, 1998) and Phillips (1998), there is a connection between morphological formation and frequency, and the connection starts from the concept of "emergence" suggested by Hopper (1987). They argue that knowledge of language use is highly affected by the stored lexicon, which is developed by means of high frequency (repetition) throughout the previous utterances. In other words, as for the speakers' productions and understanding of new utterances, the role of linguistic experiences, such as frequency (repetition), plays a more crucial role than abstract grammar.

Bearing in mind the role of frequency in morphological formation, this study analyzes actual productions of the target words (seven monosyllabic nouns having cluster codas) of 55 native speakers of Korean, and tries to characterize the observed variation in the resyllabification of clustered codas in terms of relexicalization. In addition, corpus analysis of Korean is used as a prime tool for measuring frequency. By doing so, this study shows why the relexicalization is related to the frequency of the target words.

1. Methods

This study investigates data drawn from two types of research: (1) corpus analysis of Korean (written and spoken materials), and (2) linguistic experiments (analysis of the actual productions of the target words by the subjects).

1.1. Corpus Analysis

For the corpus analysis, around 330,000 words (260,330 words from written materials and 74,393 words from spoken materials) were examined. By means of a Korean concordance program (*Kuljabi* 2), each occurrence of the seven target words (*kaps* 'price', *neks* 'soul', *talk* 'chicken', *tols* 'anniversary', *salm* 'life', *saks* 'wage', and *hulk* 'soil') in the materials was counted, and the results of the analysis were used as evidence showing the frequency of each target word. The descriptions of the materials are provided in Tables 1 and 2.

Table 1. Description of the written corpus

Title	Genre	Year	Writer	Corpus Size (words)
One Feet Human Mind	Essay	1995	Female	61,000
Father	Novel	1996	Male	44,100
Thorn Fish	Novel	2000	Male	47,430
Inheritance	Novel	2002	Female	61,800
Positive Thinking no. 125-130	Essay	2002	?/contributors	46,000
Total				**260,330**

Table 2. Description of the spoken corpus

Title	Genre	Year	Corpus Size (words)
Kim Han-Kil Show	Talk show	1994-1995	12,437
For Men	Talk show	1995	5,233
News (MBC & KBS)	News	1998	20,328
Sohn Sook Show	Talk show	1996	10,191
Saturday Show	Show	1995	8,787
Meet at Four	Talk show	1994	17,417
Total			**74,393**

1.2. Linguistic Experiment

1.2.1. Subjects

To examine actual productions of the target words, a total of 55 native speakers of the Seoul dialect of Korean were recruited as subjects. Since I focus on the variation within one dialect, only the standard dialect (a dialect spoken in the Seoul and Kyunggi area) was considered as a target dialect. Regarding the standards for selecting subjects, I considered only those who have lived in the Seoul and Kyunggi area from childhood until the present, and who were educated

in this area. Information about the social background of the subjects is collected through a prepared questionnaire. The content of the questionnaire includes questions about age, sex, level of education, and so on.

1.2.2. Materials and Procedures

The target words of this study are seven monosyllabic nouns having morpheme-final consonant clusters: *kaps* 'price', *neks* 'soul', *talk* 'chicken', *tols* 'anniversary', *salm* 'life', *saks* 'wage', and *hulk* 'soil'. The tasks of the subjects are to produce each target word in two different situations. The first situation is that the subjects are asked to produce the target word + *un* (topic marker) through an "echo game." In the echo game, the subjects are asked to produce the target words without any orthographic stimuli. The basic idea behind the echo game is to elicit the subjects' more spontaneous and natural speech productions. The examples in (2) are the basic structure of the sentences used by the researcher and the subjects in this game. The task of the subjects is to produce the sentence A-1 by changing the underlined part after the researcher (in the actual experiment, some dummy words were included to hide the target words).

(2) Test 1: echo game

A. Sentence produced by the researcher:

ku kos-eynun	*<u>tal</u>-to*	*<u>pyel</u>-to*	*epseyo*
there-at	moon-also	star-also	not exist

'There is neither moon nor star.'

1) *oli* 'duck' *talk* 'chicken'
2) *mole* 'sand' *hulk* 'soil'
3) *kwuum* 'death' *salm* 'life'
4) *paykil* 'hundredth day' *tols* 'the first birthday'
5) *sichey* 'corps' *nelk* 'soul'
6) *hyuka* 'vacation' *saks* 'wage'
7) *sangphyo* 'label' *kaps* 'price'

A-1. Sentence produced by the subjects:

ku kos-ey	*<u>pyel</u>-un*	*isseyo*
there-at	star-topic marker	exist

'There is a star.'

1) *talk-un* 'chicken'
2) *hulk* 'soil'
3) *salm* 'life'
4) *tols* 'the first birthday'
5) *nelk* 'soul'
6) *saks* 'wage'
7) *kaps* 'price'

The other situation is that the subjects are asked to read the prepared word list. The word list includes the same seven target words as in the echo game. The subjects' productions made through this task are considered as more like conscious and formal speech production since orthographic stimuli usually affect the behavior of speakers. The word list is provided in (3).

(3) Test 2: reading word list

1) *talk-i* 'chicken-*i* (nominative marker)'
2) *hulk-i* 'soil-*i*'
3) *salm-i* 'life-*i*'
4) *tols-i* 'the first birthday-*i*'
5) *neks-i* 'soul-*i*'
6) *saks-i* 'wage-*i*'
7) *kaps-i* 'price-*i*'

2. Data Analysis and Discussion

Based on the two linguistic experiments—the echo game and the reading word list—actual productions of the target words were elicited. In Tables 3 and 4, each target word is represented by two phonetic forms and for each phonetic form, the raw number of occurrences and its relative frequency are provided.

Table 3. Results of echo game

Target word	Phonetic form	No. of occurrences	Relative frequency
salm + *un* 'life + *un*'	[sal-mun]	36	65%
	[sa-mun]	19	35%
kaps + *un* 'price + *un*'	[kap-sun]	33	60%
	[ka-pun]	22	40%
neks + *un* 'soul + *un*'	[nek-sun]	26	47%
	[ne-kun]	29	53%
saks + *un* 'wage + *un*'	[sak-sun]	7	13%
	[sa-kun]	48	87%
talk + *un* 'chicken + *un*'	[tal-kun]	1	2%
	[ta-kun]	54	98%
hulk + *un* 'soil + *un*'	[hul-kun]	0	0%
	[hu-kun]	55	100%
tols + *un* 'first birthday + *un*'	[tol-sun]	0	0%
	[to-lun]	55	100%

Table 4. Results of reading word list

Target word	Phonetic form	No. of occurrences	Relative frequency
salm+ *un* 'life + *un*'	[sal-mun]	53	96%
	[sa-mun]	2	4%
neks + *un* 'soul + *un*'	[nek-sun]	48	87%
	[ne-kun]	7	13%
kaps + *un* 'price + *un*'	[kap-sun]	41	75%
	[ka-pun]	14	25%
talk + *un* 'chicken + *un*'	[tal-kun]	25	45%
	[ta-kun]	30	55%
hulk + *un* 'soil + *un*'	[hul-kun]	19	35%
	[hu-kun]	36	65%
saks + *i* 'wage + *i*'	[sak-si]	16	22%
	[sa-ki]	39	78%
tols + *un* 'first birthday + *un*'	[tol-sun]	0	0%
	[to-lun]	55	100%

The results presented in Tables 3 and 4, most of all, indicate that there is variation in the resyllabification. In both of the tests, along with the prescriptively correct forms which syllabify both of the consonants, the variational forms which syllabify only one of the consonants in the cluster are also detected. The only case that shows no variation is the example *tols* 'first birthday', which is already relexicalized as a single coda word (now, both of the orthographic forms *tols* and *tol* are used in Korean). Moreover, in most of cases, the variational forms turned out to be the preferred phonetic forms. As a matter of fact, the variational form is not a "variation" anymore, but "linguistic change." The cluster coda words are changing into single coda words. Another noteworthy point in here is that the echo game shows higher frequency of the variational forms than the reading word list test. Without any exception, each target word's relative frequency of the variational form gets lowered in the reading word list test (e.g.. *hulk*: 100% → 65%, *talk*: 98% → 55%, *saks*: 87% → 78%, *neks*: 53% → 13%, and so on). In other words, the subjects tend to delete one member of the cluster more frequently without any orthographic stimuli. On one hand, this result reveals the fact that register plays a role in the behavior of the subjects. When the subjects are asked to read the word list, they try to produce the test items in a more prescriptively correct way. On the other hand, the results confirm the fact that certain words, such as *saks*, are much less sensitive to the register than the rest of the test items. The majority of the subjects produce /saks + V/ as [sa-kV], and this outcome is relatively consistent compared to the other variational phonetic forms.

Depending on the patterns of the variation, the target words can be summarized in three groups. The first group includes words such as *hulk*, *talk*, *saks*, and *tols*, which behave more like single coda words: in both of the tests,

each target word's variational form is preferred to the prescriptively correct form. Differently from the first group, in words such as *kaps* and *salm*, both members of the cluster tend to be syllabified, although the variational forms are still discovered. In the cases of *kaps* and *salm*, the prescriptively correct forms are consistently dominant in both of the tests. Finally, the word *neks* is differentiated from the other groups. In the case of *neks*, depending on the tests, the result comes out differently. While in the echo game the variational form is preferred, in the reading test the prescriptively correct form is highly preferred. This fact suggests that the word *neks* is sensitive to stylistic variation. Bearing in mind the results from the experiments, the frequency of each target word was examined through the corpus analysis. The results of the analysis are presented in Tables 5 and 6.

Table 5. The result of written corpus analysis

Target word	*salm*	*hulk*	*kaps*	*talk*	*neks*	*saks*	*tols*
Number of occurrences	133	66	39	24	13	1	0

(Total number of words in the corpus: 260,000)

Table 6. The result of the spoken corpus analysis

Target word	*kaps*	*salm*	*talk*	*neks*	*tols*	*hulk*	*saks*
Number of occurrences	25	14	3	1	1	0	0

(Total number of words in the corpus: 74,393)

Considering the results, in general, the target items are not high-frequency words. In particular, the words *tols* and *saks* show extremely low frequency. According to the results, except for the word *hulk*, in both of the analyses, the order of frequency among the words appears in a similar way. Basically, the words *salm* and *kaps* show relatively higher frequency than the rest of the target item such as *tols*, *saks*, and *neks*. In the cases of *talk* and *hulk*, while the written corpus presents the words as high-frequency words, in the spoken corpus analysis those two words show low frequency. Although there might be a possibility that characteristics of the corpora affect the results, at this point, further discussion of the corpus is left for future studies. In this analysis, the frequency of the target words refers to the overall frequency summing up both of the corpora. Therefore,

the order of frequency of the target words is summarized as follows: *salm* (200) > *hulk* (66) > *kaps* (64) > *talk* (27) > *neks* (14) > *saks* (1), *tols* (1).

In her study, Bybee (1985) has argued that there is a connection between word frequency and lexical analysis. According to her, since "lexical storage" is based on the memory of speakers accomplished by their language use, word frequency highly affects the process of morphological formation. Also, regarding lexical diffusion of sound change, Phillips (1998:123) suggests that "sound changes which require analysis—whether syntactic, morphological, or phonological—affect the least frequent word first." As Tables 5 and 6 show, in this analysis the words *tols* and *saks* are discovered as the least frequent words. As a matter of fact, in these two words, the deletion of the consonant *s* is very apparent. Due to the low frequency of the words, the morphological information of the words is getting lost, and because of the loss, the sound changes of the two words are reinforced. Especially in the echo game, the results for the four nouns *kaps*, *neks*, *saks*, and *tols* support the connection between the frequency of the words and the degree of sound change by showing a gradual pattern: while the most frequent word, *kaps*, shows the least "sound change," the least frequent word, *saks*, shows the most "sound change." One of the important points with relation to /-s/ cluster codas in Korean is that the consonant *s* is never phonetically realized in coda position. In coda position, it is either deleted or neutralized as *t*. The cases of the four nouns tested here are investigated in this respect. Since the nouns *kaps*, *neks*, *saks*, and *tols* are pronounced as single coda nouns (i.e., [kap], [nek], [sak], and [tol]) in their lexicon, the phonetic realization of *s* through resyllabification by actual language use is considered as a way of reinforcing the status of the consonant *s*. As a result, in the relatively high-frequency nouns such as *salm* and *kaps*, lexical information is applied more clearly with relation to resyllabification. Therefore, less sound change is detected. However, as in the case of *saks* and *tols*, the low frequency affects the lexical analysis such as resyllabification in Korean.

The connection between frequency and relexicalization holds up the cases of /-s/ cluster codas. However, in the cases of *hulk* and *talk*, in spite of their relatively high frequency relative to *salm* and *kaps*, their resyllabification process is much more like the cases of *saks* and *tols*. In particular, the results of the echo game suggest that the two nouns *hulk* and *talk* are already relexicalized as /huk/ and /tak/. Almost no speaker produced the prescriptively correct forms. Even in the reading word list test, the frequency of the prescriptively correct forms is less than 50%. Considering the frequency of the words, this result seems to be exceptional. Not only the low frequency, but also high frequency still causes relexicalization. Regarding the cases of *hulk* and *talk*, the motivation of the relexicalization can be discussed from a somewhat different perspective. When the cluster sequences of the two words are reviewed, differently from the /-s/ sequences, both of the consonants in the cluster, /lk/, are appropriate codas in Korean. In other words, both of them can be phonetically realized in coda positions by deleting one member of the cluster. Although it is extremely rare to pronounce both of the consonants together, in very careful reading, it is also

possible. The point is that there is a difference in the process of the lexical analysis between the clusters /-s/ and /lk/. In the case of /lk/ cluster, the relexicalization is motivated by a physiological reason. In the lexicon, both of the consonants in the cluster /lk/ exist as phonologically and phonetically active segments, while the consonant *s* in the cluster /-s/ does not. Therefore, the sound change from [lk] to [k] occurred in the lexicon based on physiological motivation, and this sound change extended to resyllabification. Even if the /lk/ sequence is resyllabified as a coda and an onset respectively, the physiological movement from liquid to velar stop is still not an optimal sequence of articulation. As for the physiologically motivated sound changes, Phillips (1998) claims that the most frequent words are affected most. Based on the theory of ease of articulation, when a word shows high frequency, it seems reasonable to speculate that the sound change is reinforced forward in an easy way. Unfortunately, since there is no other noun with the /lk/ cluster in its coda, further analysis through frequency comparison is not possible.

Among the seven target words, *salm* is another word in which both of the consonants in its cluster coda are phonetically active: /l/ and /m/ are appropriate codas in Korean. As in the cases of *hulk* and *talk*, the segment /l/ is deleted from the base /salm/ when it is followed by a word boundary or a consonant. Also, in this case, the deletion is considered to be motivated by a physiological reason. Considering the frequency of *salm*, it is expected to be relexicalized as /sam/, like the cases *hulk* and *talk*, but it is not. As the results of experiments show, the subjects tend to resyllabify both of the consonants in the cluster /lm/. One interesting fact in the word *salm* is its morphological background. The noun *salm* originated from the verb *sal-ta* by attaching the nominal suffix *-m*. Therefore, as Kim-Renaud (1979) pointed out, both of the segments have a certain kind of morphological information, and because of that both of the segments show stable status with relation to resyllabification. In fact, the lesser degree of sound change in *salm* can be explained in terms of its different morphological background.

3. Conclusion

In Korean, the variation in resyllabification of the cluster coda nouns is considered as an instance of relexicalization: from cluster codas to single codas. With relation to relexicalization, this study suggests that there is a connection between word frequency and the degree of relexicalization. In particular, the nouns with /-s/ clusters show a pattern depending on their frequency. In the process of resyllabification, most frequent word, *kaps*, tends to be syllabified by both of the coda consonants, while the least frequent word, *saks*, tends to be syllabified by only one consonant, *k*. In addition to word frequency, this study proposes that the relexicalization is also dependent on the cluster types. In the cases of *hulk* and *talk*, differently from the cases of /-s/ coda cluster nouns, relexicalization is due to their high frequency. Also, in the noun *salm*, its morphological background plays a role regarding relexicalization.

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The University of Texas at Arlington
Department of Linguistics & TESOL
BOX 19559-Hammond Hall 403
Arlington, TX 76019-0559

younjeoung@hotmail.com

Compositional Interaction of Sub-Event Aspectual Markers, *-in-* and Reduplication, in Tagalog

JONATHON ERIC CIHLAR
University of Chicago

0. Introduction

Aspectual information is often analyzed in terms of morphology that contributes aspectual operators to the final logical form of a verb, such as IMPERF(Φ) and PERF(Φ). Analyses of this type are well-suited for languages that show a clean correspondence between the morphology and the semantic information they contribute, including cases like Slavic and Romance languages. These operators, however, can be decomposed into time interval/event-oriented semantics representations. Languages of the Philippines, Tagalog in particular, provide morphological evidence that supports decomposing the aspectual properties of events into sub-event intervals. Furthermore, previous analyses give insight that a proper treatment of Tagalog aspect requires a more fine-grained analysis than traditional labels such as imperfective, perfective, and so on.

The primary goal of this discussion is to provide a compositional account of aspect marking in Tagalog verbs because a compositional analysis of Tagalog aspect has yet to appear in the literature. In particular, aspect marking will be shown to be compositional at a level below the event. This discussion will provide an initial discussion of how the aspectual morphology in Tagalog interacts to produce the final interpretations received.

Another important goal of this analysis involves giving some much overdue attention to a family of languages whose tense and aspect systems have not been well-explored. Dahl asserted that more work was merited for Austronesian languages in his 1985 survey of tense-aspect-modality systems of world languages (160-162).

0.1. Outline

Thus, this discussion will explore the Tagalog aspect system in more detail by first providing an outline of Tagalog verbal morphology. Then, the question of whether or not Tagalog verbs are tenseless will be revisited. This question will be addressed by proposing a rigorous test to examine the claim formally. Previous

analyses of Tagalog aspect will be explored to see what insights can be garnered. Additionally, new facts about where aspectual and temporal information is located in Tagalog structures (within the verb or at a higher level) will be offered. Finally, an explanatory, compositional account of aspect in the language can be developed. At the end, a formal compositional account of aspect will be available for work on more complex temporal phenomena in Tagalog or other closely related languages of the Philippines.

1. Background

A few relevant facts about Tagalog verbs and their traditional analyses will help ground the current analysis:

Tagalog verbs are claimed to mark not temporal information, but aspectual information. This claim has been supported by asserting that these forms are ambiguous temporally (Schachter and Otanes 1972).

Previous analyses treat aspectual marking using traditional labels, including perfective and imperfective. However, a third aspect label, "contemplated," is unique to Philippine linguistics. This aspect category corresponds to events not yet completed and not yet begun. This form of the verb is most often used in future tense and with modal operators.

Following the insight of Schachter and Otanes (1972), de Guzman (1978), and Kroeger (1993), these aspectual forms are composed of two overt morphemes, allomorphic variants of the infix *-in-* and reduplication of the first CV sequence of the verbal root. The infix *-in-* appears with events that have begun. Reduplication signals events that are not yet completed. Previous proposals (namely Kroeger 1993:17) have asserted that each of the two morphemes needs a null counterpart to encode the opposite information. Thus, *-in-* will require a null counterpart to mark events not yet begun, and reduplication's counterpart will mark events that are completed.

1.1. Structure of Tagalog Verbs

Generally, Tagalog verbs are formed by combining a root with aspectual affixes: one marking whether the event has begun or not, and the other marking whether or not the event has been completed. Finally, the aspect-marked form combines with an affix (traditionally labeled voice as well as focus) that generally corresponds to which thematic role receives nominative case; the affix also affects the verb valence.[1]

[1] The literature on the status of the voice system is large and a variety of views exist. No particular stance is taken in this discussion.

(1) Sample Tagalog Verb Paradigm[2]

Voice marker	Perfective [*-in-* + $\varnothing_{complete}$]	Imperfective [*-in-* + RED]	Contemplated [$\varnothing_{-begun}$+ RED]
a. *mag-*	nag-basa	nag-ba-basa	ba-basa
b. *-um-*	b-um-asa	b-um-a-basa	ba-basa
c. *-in*	b-in-asa	b-in-a-basa	ba-basa-hin
d. *-an*	h-in-ugas-an	h-in-u-hugas-an	hu-hugas-an
e. *i-*	i-pr-in-ito	i-p-in-i-prito	i-pi-prito

Examples of the paradigm follow in (2)–(4).[3]

(2) I-pr-in-ito ni Lola ang mga longganisa.
OV.PERF.fry GEN grandma NOM PLUR sausage
'Grandma fry (completed) the sausages.'

(3) I-p-in-i-prito ni Lola ang mga longganisa.
OV.IMPERF.fry GEN grandma NOM PLUR sausage
'Grandma fry (incompleted) the sausages.'

(4) I-pi-prito ni Lola ang mga longganisa.
OV.CONTEMP.fry GEN grandma NOM PLUR sausage
'Grandma fry (contemplated) the sausages.'

These forms were traditionally analyzed using past/present/future *tense* labels (Aspillera 1969). This analysis isn't entirely erroneous because speakers assign default tense readings when no temporal adjunct is available. Those readings follow in (5).

(5) Default Temporal Assignments for Aspectual Forms

Tagalog Aspect Label	Temporal Default
Perfective	Past
Imperfective	Present (usually progressive)
Contemplated	Future

[2] (a) Infixation of *-in-* is realized by changing *mag* → *nag*. (b) The *-um-* paradigm of verbs does not fit these generalizations and a slightly different story must be told. (c) Infixation of *-in-* on *-in-* suffixed verbs triggers the final *-in* to be deleted. (d) and (e) The infixation and reduplication appears most clearly in this paradigm.

[3] The abbreviations OV and AV stand for 'object' and 'actor' voice respectively. The case-marking labels are taken from Kroeger (1993) without any commitment to the debate regarding the status of *ang*. For now, the broad aspect labels (e.g., PERF, IMPERF) are used.

2. Are Tagalog Verbs Really Tenseless?

The answer to the above question is a hedged "yes." The real question is whether default temporal readings for the aspectual forms are entailed in the logical content of the verb or are assigned somewhere else after the verb root composes with its aspectual marking. Where does the "hedged" yes come from? If Tagalog verbs were truly tenseless, then they would be expected to be completely ambiguous on their own. However, those verbs have default temporal interpretations. Thus, at some level, Tagalog verbs must be asserted to contain a slot for temporal information because of the default readings, but that slot remains unfilled at the level of the verb. The following test rigorously examines whether or not verbs are devoid of temporal information.

Test: Combine verb forms with adverbs that encode temporal information. If no contradiction results, then the forms are devoid of temporal information, and the temporal information is supplied at some other level of the grammar.

Rationale: Temporal adverbs encode a temporal variable that is specified in relation to utterance time (usually either past, present, or future). If temporal information is not encoded in the verb, then we should expect the verb to be compatible with past, present, or future adverbs (no contradiction).

English

(6) I ate the mango{yesterday, *right now, *tomorrow}

The present and future adverbs in English are illicit because they logically contradict a time specification in the verb. The simplified logical formula (7) illustrates the contradiction for the sentence **I ate the mango right now*.

(7) $\exists t[\text{EAT}(I,m,t) \wedge \underbrace{(t < n)}_{\textit{Past tense}} \wedge \underbrace{(t = n)}_{\textit{Right now}}]$

The logical formula illustrates that the time interval specified by the past tense explicitly excludes the time constant *n* (now) with the less-than operator. This time interval is contradicted by the adverbial *right now* because it tries to establish equality between the same interval and the present time.

Running the same tests for the Tagalog data shows that the verbs forms are compatible with a wide variety time adverbials. The full paradigm is given below where each of the "aspects" (perfective, imperfective, contemplative) is combined with a past, present, and future tense adverb ('yesterday', 'now/today', 'tomorrow').

Tagalog[4]

(8) a. K-in-ain-Ø ko ang mangga kahapon.
PERF.eat.OV I.GEN NOM mango yesterday
'I ate the mango yesterday.'

b. K-in-ain-Ø ko (lang) ang mangga ngayon.[5]
PERF.eat.OV I.GEN (just) NOM mango now
'I (just) have eaten the mango now.'

c. K-in-ain-Ø ko ang mangga bukas #(…)[6]
PERF.eat.OV I.GEN NOM mango tomorrow #(…)
'I will have eaten the mango tomorrow, #(context)'

(9) a. K-in-a-kain-Ø ko ang mangga kahapon #(…)
IMPERF.eat.OV I.GEN NOM mango yesterday #(…)
'I was eating the mango yesterday #(context)'

b. K-in-a-kain-Ø ko ang mangga ngayon.
IMPERF.eat.OV I.GEN NOM mango now
'I am eating the mango now.'

c. K-in-a-kain-Ø ko ang mangga bukas #(…)
IMPERF.eat.OV I.GEN NOM mango tomorrow #(…)
'I will be eating the mango tomorrow #(context)'

(10) a. Ka-kain-in ko ang mangga kahapon #(…)
CONTEMP.eat.OV I.GEN NOM mango yesterday #(…)
'I was about to eat the mango yesterday #(context)'

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[4] The object voice forms of the verbs have been chosen here because they illustrate the morphology most clearly. A consequence of this choice is that the nominative argument 'mango' must always receive a definite interpretation, which would make these examples infelicitous in a context where a specific mango has not yet been introduced into the discourse.

[5] Speakers prefer an alternate form to this construction (*ka-* recent perfectives) that explicitly specifies temporal information at the verb level, though they do report that this example is okay.

[6] Several of these examples are only felicitous when they appear with some other context. This behavior patterns with languages like English very closely. To illustrate, take example (8c). The English correspondent, *I will have eaten a mango tomorrow*, is hard to imagine uttered out of the blue. This utterance feels better with context like the following: *I will have eaten a mango tomorrow when you arrive*. Most of my consultants felt that sentences where the default interpretations are distant from the temporal adverbs (say perfective with future tense) are only acceptable with the appropriate context.

b. Ka-kain-in ko ang mangga ngayon.
CONTEMP.eat.OV I.GEN NOM mango now
'I am about to/will eat the mango now.'

c. Ka-kain-in ko ang mangga bukas
CONTEMP.eat.OV I.GEN NOM mango tomorrow
'I will eat the mango tomorrow.'

Other evidence

Existential constructions are not specified for tense and are compatible with past/present/future adverbs. A default present tense reading is assigned to all these constructions in the absence of other temporal information.

(11) May dalawa-ng mangga sa mesa {kahapon, ngayon, bukas}.
EXIST 2.LNK[7] mango LOC table yesterday, now, tomorrow.
'There were/are/will be two mangoes on the table yesterday/today/ tomorrow.'

(12) Wala.ng pera sa bangko {kahapon, ngayon, bukas}.
NOT EXIST.LNK money LOC bank yesterday, now, tomorrow.
'There wasn't/is/will be money in the bank yesterday/today/tomorrow.'

A class of so-called 'pseudo-verbs' also provides evidence. These verbs are verbs of ability, needing, wanting, and so on.

(13) Pwede mo-ng bumili ng sapatos {kahapon, ngayon, bukas}.
can you.LNK buy.INF GEN shoe(pair) {yesterday, now, tomorrow}
'You can/could/will be able to buy shoes yesterday, now, tomorrow.'

(14) Gusto ni Imelda-ng bumili ng sapatos {kahapon, ngyaon, bukas}.
want.GEN Imelda.LNK buy.INF GEN shoe(pair){yesterday, now, tomorrow}
'Imelda wanted/want/will want to buy shoes {yesterday, now, tomorrow}.

These tests have shown that all the inflected forms of Tagalog verbs are compatible with past, present, and future time adverbials. Therefore, Tagalog verbs do not encode any *explicit* temporal information at the level of the verb.

3. Previous Analyses

A popular approach to Tagalog aspect has been to decompose the classes into two binary features, [±completed] and [±begun] (Schachter and Otanes 1972, de Guzman 1978, Kroeger 1993). These features generate a four-way typology, in

[7] LNK = 'linker', a morpheme that has several functions, none of which are discussed here.

which the three aspects can be classified: perfective [+begun, +completed], imperfective [+begun, −completed], and contemplated [−begun, −completed]. Two of these features have overt morphological realizations (sometimes characterized as modality[8]).

(15) Aspect Typology (Kroeger 1993)

	[+completed] Ø$_2$	**[−completed] RED**
[+begun] *-in-*	Perfective	Imperfective
[−begun] Ø$_1$	**	Contemplated

The typology overgenerates a contradictory category of events, [−begun, +completed], which needs to be ruled out. The infinitive form of the verb sometimes appears in that slot because it matches the surface realization; however, the semantic features specified in that combination simply do not make sense. Despite its insight, the analysis does not show the compositionality of the internal event structure that Tagalog demonstrates.

Associating these forms (perfective, imperfective, contemplated) with more classical aspectual operators IMPERF(Φ) and PERF(Φ), a couple of problems surface:

1. These operators are more appropriate to explain interactions of aspect where there is a neat one-to-one correspondence between morphology and these operators (i.e., Slavic). This analysis would miss the fact that morphemes overtly mark internal event properties.
2. The contemplated aspect doesn't correspond to a traditional operator, so a new one would have to be invented whose properties may well not be borne out crosslinguistically.
3. Verbal reduplication marks non-completion of events across aspects, and this analysis would not account for critical entailments of non-completion. The infix *-in-* marks events that have some degree of initiation; this entailed information also needs to be accounted for.

4. Entailments of Event (Non)Initiation and Non(Completion)

The featural analysis will be tested by trying to tease apart the beginning and end point information. An analysis of Tagalog verbs must account for the fact that the (non)initiation and (non)culmination of the eventualities in question are encoded in the core semantic content of the aspectual markers. This property can be shown through explicitly trying to cancel the [±begun] with *inumpisa* 'started' and with

[8] These markers lie at the boundary between mood and aspect. Here, a purely aspectual analysis is pursued because the evidence suggests that the markers only encode information about the event structure. Furthermore, these markers interact independently with other clearly modal morphemes in the language, such as *sana* 'hope/want'.

tinapos 'finished' for [±completed]. Contradictions arise from trying to cancel the information; therefore, the information is not defeasible, and they are entailed.

Perfective ([+begun, +completed]): try [−begun, −completed]

(16) #I-pr-in-ito ni Lola ang mga longganisa kahapon, pero *hindi* niya *inumpisa* ito.
'Grandma fried the sausages yesterday, but she didn't start this.'

(17) #I-pr-in-ito ni Lola ang mga longganisa kahapon, pero *hindi* niya *tinapos* ito.
'Grandma fried the sausages yesterday, but she didn't finish this.'

Imperfective ([+begun, −completed]): try [−begun, +completed]

(18) #I-p-in-i-prito ni Lola ang mga longganisa kahapon, pero *hindi* niya *inumpisa* ito.
'Grandma was frying the sausages yesterday, but she didn't start this.

(19) #I-p-in-i-prito ni Lola ang mga longganisa kahapon at *tinapos* niya ito.
'Grandma was frying the sausages yesterday and she finished this.'

In example (19), the reference times of the frying and the finishing of the frying are the same.

(20) I-p-in-i-prito ni Lola ang mga longganisa kahapon noong dumating ang mga bisita, *tapos tinapos* niya ang pagpiprito.
'Grandma was frying the sausages yesterday when the visitors arrived, later she finished the frying.'

Contemplated ([−begun, −completed]): try [−begun, −completed]

(21) #I-pi-prito ni Lola ang mga longganisa kahapon, *tapos inumpisa* niya ito.
'Grandma was about to fry the sausages yesterday, afterwards she started this.'

Example (21) should be enough evidence to assert that trying to culminate the event is out, since the nature of events demands that events not begun be not culminated. However, to exhaust the argument, *ginawa* 'did', which encodes both begun and culminated eventualities, is used here to attempt to close off both ends of the event.

(22) #I-pi-prito ni Lola ang mga longganisa kahapon, *tapos ginawa* niya ito.
'Grandma was about to fry the sausages yesterday, afterwards she did this.'

Speakers report that example (19) is contradictory on its own, but it can be repaired by moving the reference time as in (20). Example (22), however, bears "anti-initiation" and "anti-culmination," as speakers report strongly that the event never starts and consequently never culminates.

5. A Compositional Analysis

The intuitions of the traditional feature-based analysis will be useful to capture the internal event properties. However, to show the compositionality of how reduplication interacts with infixes like *-in-*, a sub-event analysis in the spirit of Parsons (1990) will prove necessary. However, unlike Parsons, this analysis does not separate the thematic roles of the arguments from the predicate and apply them to the event variable introduced.

5.1. Semantics for *-in-*

To account for the semantics of *-in-*, an INITIATE predicate is employed. INITIATE works much like Parsons' CULMINATE, except that it differs in indicating that an event has begun.

(23) $[\![\text{-}in\text{-}]\!] = \lambda P.\lambda e.\lambda t[\text{INITIATE}(e, t) \wedge P(e)]$

(24) $[\![\emptyset_{\text{-begun}}]\!] = \lambda P.\lambda e.\neg\lambda t.\neg\lambda t'[\text{INITIATE}\ (e, t) \wedge \text{CULMINATE}(e, t') \wedge P(e)]$

The formula in (24) guarantees that there is no time ever that the event will culminate. As will be seen, the culmination information is redundant, but yet not in conflict with the information that will be represented in the semantics for reduplication. By encoding a time variable in these formulas, an assertion is made that temporal information exists at the verb level, though it remains unspecified.

5.2. Semantics for Reduplication

Parsons (1990) defines a predicate CULMINATE(e, t) that marks the completion of an event e at a time t. To account for the semantic contribution of verbal reduplication (event non-completion), negating CULMINATE (or, equivalently, negating any time interval it applies to) is necessary. The variable t' is used to provide clear distinctions between the beginning and end points.

(25) $[\![\text{RED}]\!] = \lambda P.\lambda e.\lambda t.\neg\exists t'[\text{CULMINATE}(e, t') \wedge t < t' \leq t_{ref} \wedge P(e)]$

An abstract over times must be introduced since a time variable was introduced in the semantics for *-in-* / $\emptyset_{\text{-begun.}}$ Thus, the order of composition is assumed to be Root + [±begun] and finally [±completed]. Furthermore, a free time variable, t_{ref}, is introduced to account for reference time, whose value is supplied either by an adverbial or through existential closure, which would provide the default interpretations seen before in the table in (5).

Diagramatically, the following timeline scenario is represented:

(26) $\neg\exists t'[\text{CULMINATE}(e,t')]$ *may* $\exists t'[\text{CULMINATE}(e, t')]$

-----|----------|--------

Begin t_{ref}

A null counterpart must exist in order to contribute the entailed event closure.

(27) $[[\emptyset_{completive}]] = \lambda P.\lambda e.\lambda t.\lambda t'[\text{CULMINATE}(e, t') \wedge t < t' \wedge P(e)]]$

The final truth conditions are presented for each of the verb forms of the 'Grandma frying sausages' example. The arguments of the predicate FRY have been suppressed for clarity. The semantics of the *i-* voice suffix are likewise not considered here. The time variables have been existentially closed at this point.

Perfective *i-pr-in-ito*

(28) $\exists e\exists t\exists t'[\text{FRY}(e) \wedge \text{INITIATE}(e, t) \wedge \text{CULMINATE}(e, t') \wedge t < t']$

Imperfective *i-p-in-i-prito*

(29) $\exists e\exists t\neg\exists t'[\text{FRY}(e) \wedge \text{INITIATE}(e, t) \wedge \text{CULMINATE}(e, t') \wedge t < t' \leq t_{ref}]$

Contemplated *i-pi-prito*

The composition yields a redundancy but no contradiction here. The redundancy is highlighted in italics.

(30) $\exists e\neg\exists t\neg\exists t'\neg\exists t''$ $[\text{FRY}(e) \wedge \text{INITIATE}(e, t) \wedge \text{CULMINATE}(e, t') \wedge$ $\textit{CULMINATE}(e, t') \wedge t < t'' \leq t_{ref}]$

6. Conclusions and Future Work

This analysis has captured the relevant facts about Tagalog aspect in a compositional, formal event semantics framework. Particularly, Tagalog aspect has shown to be compositional at a sub-event level mainly by the presence of the morphology. Evidence has been presented that Tagalog verbs are indeed devoid of any *explicit* temporal information. However, those verbs have been asserted to have an underspecified slot available to pick up default temporal readings if no other temporal adverb is supplied. Finally, additional facts have been presented that demonstrate that the semantic contribution of these markers is contained in their lexical entries.

This work has been an initial sketch of the formal properties of the Tagalog aspect system, and much more interesting work remains. As a start, examining how these aspectual markers interact with Vendlerian aspect classes would be interesting, mainly because nuanced readings like inceptives arise from particular

combinations. Another interesting area would be to see how these markers affect temporal anaphora, if at all. Such a discussion would help support/refute the question as to what degree Tagalog verbs bear temporal information. Furthermore, examining how aspect and modal operators interact in the language would lend insight to the question of whether aspect in the language is modality to some degree. Finally, all of these questions could be explored crosslinguistically within the family of Philippine languages as well as Austronesian in general.

Acknowledgments
Maraming salamat to all my consultants who patiently provided judgments on some/all of the data within: Marlon Abayan, Raphael Mercado, Renato Ortega, Larry Sansano, Susan Tapia, and Sheila Zamar. I would also like to thank Anastasia Giannakidou, Jason Merchant, Mayu Yoshihara, and the members of the fall 2003 linguistics research seminar at the University of Chicago as well as participants in the 30th Annual Meeting of the Berkeley Linguistics Society for their useful comments and discussions. All errors are my own.

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Department of Linguistics
University of Chicago
1010 E. 59th St.
Chicago, IL 60637

jcihlar@uchicago.edu

Attribute Networking: A Sociolinguistic Technique for Modeling Subjective Social Space*

ROBIN DODSWORTH
The Ohio State University

0. Introduction

Recent approaches to studying the social meaning of linguistic variation have given a central role to speakers' subjective experiences and locally recognized social categories, relying heavily on ethnographic methods. While such approaches have made great strides toward explaining individual- and community-level linguistic performance, they sacrifice some of the objectivity and systematicity of "first-wave" approaches, in Eckert's (2002) terms.

This paper introduces a network-based technique, *attribute networking*, as an attempt to represent subjective conceptions of local social structures in a way that facilitates quantitative analysis, as the social networks framework does. The approach aims to find empirical justifications for delineating subjective social categories and abstracting from them. It also takes steps toward modeling perceived connections between local, concrete social facts and broader structures (cf. Milroy and Milroy 1992, Eckert 2000). It is not intended to replace but to complement existing methods. The technique is first described and then illustrated with a study of /l/ vocalization in Worthington, Ohio, a Columbus suburb.

1. Attribute Networking

The use of networks presented here draws on Bearman, Faris, and Moody's (1999) network-based representation of a series of events in the Chinese Revolution. In their model, nodes represent single events, and ties between nodes represent temporal relationships. Attribute networking, the present technique, uses networks to model community members' stated conceptions of local social processes and categories. Its networks are not *social* networks: nodes represent socially meaningful characteristics of people and places in the community, and a tie

* Many thanks especially to Don Winford for commenting on numerous drafts and for his continuing encouragement. Thanks also to others whose suggestions have greatly improved the paper: Jim Moody, Galey Modan, Keith Johnson, Mary Beckman, and Scott Schwenter.

between two nodes denotes a perceived association between the two attributes that the nodes represent. For instance, (1) indicates that according to at least one informant, living on the east side of Worthington and holding a professional degree are associated with one another. (1) does *not* mean the informant believes *everyone* in East Worthington holds a professional degree, nor that everyone in Worthington who holds a professional degree lives in East Worthington.

(1)

E. Worthington hold professional degree

In this respect, attribute networks are similar to social networks: a tie between two people in a social network does not indicate that they socialize exclusively with each other, nor that they spend all or even most of their time together.

The social perceptions represented in the network are gathered from ethnographic interviews during which informants are asked to talk about the community's social space. A single attribute network is constructed to represent as much information as possible from each ethnographic interview. The process is illustrated here with an excerpt from an interview with Ann, one of the Worthington informants. The boldface words in the excerpt map onto attributes in the matrix in (2). A matrix represents the same information as a network.

> There are a lot of people that are educators that live [in **Worthington proper**], a lot of professors at OSU…it's mostly **professional** people. Now, that said, in the **outskirts** of Worthington which is considered Columbus land but Worthington schools, there are a lot, and where most of the **apartments** are, I would say that that's where a lot of the **single parent** families live, and they would not necessarily be the professionals but more of the clerical or even factory workers…That would be the **non-professionals**, a lot of, in those areas…

(2)	W proper	Professionals	Outskirts	Non-professionals	Single parent	Apartments
W proper	0	1	0	0	0	0
Professionals	1	0	0	0	0	0
Outskirts	0	0	0	1	1	1
Non-professionals	0	0	1	0	1	1
Single parent	0	0	1	1	0	1
Apartments	0	0	1	1	1	0

A 1 represents a stated association between two attributes (i.e., a link or tie), and a 0 represents the lack of a stated association. Some potential attributes from Ann's interview, such as being a clerical worker, are not represented in the matrix; the level of detail used in representing the spoken discourse as a matrix can vary. In Ann's case, it seemed that clerical and factory workers exemplified the category "non-professional."

An individual attribute network is understood to represent the speaker's perceptions of the community's social space. Clearly this way of eliciting and encoding subjective information carries a set of complications. Unlike the excerpt from Ann's interview, speakers often do not talk about their conceptions of social space in a way that translates easily into sets of nodes and ties. Many speakers described sets of social attributes but either did not link them to one another very explicitly, or did so with considerable hedging. Speakers also discussed sets of social characteristics that were not easily represented with discrete nodes. Other complications, including the likelihood that no speaker is likely to mention all the attributes that he/she considers socially salient, are minimized by intercalating the individual networks from every interview into an aggregate network (AN).

The AN is the union of individual networks. Shared nodes appear only once. A tie between nodes X and Y is valued according to the number of individual networks in which it appears. Therefore, the AN unites individuals' conceptions of the social space to form a system in which diverse views are represented, points of agreement among informants are apparent, and the elements of social space can be seen in relation to one another. The AN has the ability—valuable in the Worthington study—to represent disagreement among community members' conceptions of the social space because any attribute can be linked to a set of other attributes that conflict with one another. A second advantage of the AN is that it need not contain discrete categories because all nodes may be connected. In the Worthington AN, nodes that represent relative affluence and nodes that represent relative poverty are co-members of a connected set of nodes, just as members of a social network may be more or less central but still linked, directly or indirectly. This characteristic facilitates a treatment of social categories as fluid, overlapping entities with dynamic, negotiable boundaries, as in Mendoza-Denton's (1997) study in which social categories are "parts of a single coherent system that is always fluid, always changing, precariously equilibrated, and constantly innovating on itself" (37).

Third, and most relevant to Milroy and Milroy's (1992) search for a general social theory, the AN can show links between individuals' conceptions of the local community's social structure and macro-level phenomena, as well as between separate dimensions of social identity. As an example of the former, some Worthington informants linked career-motivated transience to the perceived lack of community involvement in West Worthington. Mobility, a macro-social phenomenon, thus interacts with community involvement, a particularly important aspect of Worthington identity.

The AN is used to identify the most broadly salient aspects of social identity in the community. The goal is to find nodes or subsets of nodes that are structurally important as determined by quantitative criteria. Structurally important nodes are likely to represent characteristics that many community members consider socially meaningful, because they are mentioned by multiple informants and/or are linked to multiple nodes. Other nodes are likely to be connected to one another only through these important nodes, except in

particularly dense networks. For those reasons, the characteristics associated with important nodes are good candidates for social variables in quantitative analysis. However, isolated nodes may not provide an accurate picture of the range of social identities in the community, especially if identities are assumed to be dynamic and fluid. An alternate strategy (left for future work) is to consider dense or central subsets of nodes and evaluate their meaning with respect to the rest of the aggregate network.

2. An Illustration of Attribute Networking: /l/ Vocalization in Worthington

2.1. Worthington

Worthington, Ohio, was established by settlers from New England in 1803, predating Columbus by nine years. Although Worthington is considered a northern suburb of Columbus, an ongoing period of urban expansion has led Columbus to completely surround Worthington. During the 1970s, Columbus and Worthington agreed to define the boundary of the latter's affluent school district such that it encompassed not only the entire city of Worthington but also some of the surrounding areas of Columbus. Since then, countless residential neighborhoods have emerged in those areas and their populations have exploded. Unlike 20 years ago, the majority of students attending Worthington City Schools live in Columbus. Yet Worthington, now a city of close to 15,000 people compared to over 700,000 in Columbus, remains politically and socially distinct despite being swallowed by urban growth. Ninety-four percent of its residents identify as white, in contrast to 67.9% in Columbus, and its 2000 median annual household income of close to $70,000 dwarfed the Columbus median of under $40,000. Perhaps the most important component of Worthington's distinctiveness is what many residents call its "colonial feel," or the collective consciousness of its New England roots. Old Worthington, the space occupied by the original 1803 village, is governed by a set of strictly enforced architectural guidelines geared toward maintaining a colonial atmosphere. A village green lies at the center of Old Worthington, and several original New England-style buildings still stand as museums or churches. Regular public events, such as the annual Founder's Day, refer to the city's heritage.

Yet these traditions preserve not historical knowledge but collective imagination and distinctive community identity. A Worthington resident in her 80s who has served as the local historical society's curator explained that Worthington's historical consciousness, of which high property values are partly a byproduct, has been cultivated only since the mid-twentieth century. The choice of Worthington as a testing ground for attribute networking rests primarily on two facts. First, Worthington consciously constructs and maintains an identity that makes it a cohesive, distinct community. Second, the fact that it is (arguably) the most economically and socially homogeneous Columbus suburb precluded the possibility of the study presupposing familiar class-based categories, forcing the search for locally perceived social structures (cf. Rickford 1986).

2.2. Finding and Interviewing Community Members

The linguistic data presented here is extracted from 21 ethnographic interviews, each lasting approximately one hour. The speakers lived either in Worthington or in surrounding areas inside the school district and ranged in age from 15 to over 80. All speakers younger than 30 grew up in Worthington and all speakers over 30 had lived in Worthington for at least 20 years. Informants were recruited using a "friends of friends" process. During the interviews, informants were asked to talk about what types of social groups or divisions, or what types of people, existed in Worthington (cf. Mendoza-Denton 1997:71).

2.3. The Worthington Aggregate Network

Intercalating the individual networks from the 21 interviews yielded an AN with 138 nodes. The network consists of one large component containing 100 nodes (pictured in the appendix) as well as 14 small components. The large component can be viewed as having two sections, connected only through the nodes labeled "live in Worthington proper" and "sense of community." The larger and smaller sections roughly correspond to living outside and inside the Worthington city limits, respectively. Strikingly, only 17 ties have values greater than 1—recall that a tie's value indicates the number of speakers who have stated an association between the nodes it connects—and the highest value is 5 out of a possible 21 (the number of speakers). The lack of high-valued ties may indicate disagreement: if all informants had been in perfect agreement as to the community's social structure, then many ties would have values near the maximum of 21, the only low values resulting from differences in the ways that informants stated their perceptions or from differences in what informants remembered or were willing to say. In that case, the ability to represent conflicting views is critical.

Several quantitative measures were employed to identify the structurally important nodes in the aggregate network.

1) *Betweenness centrality*: the relative number of geodesics, or shortest paths between two nodes, that a node lies on (Wasserman and Faust 1994). This property identifies nodes that are responsible for uniting other nodes and holding the network together. For example, given that the node representing living in Worthington's outskirts lies on the geodesic between the nodes representing more crime and paying Columbus taxes, the latter two attributes can be assumed to be related to one another only insofar as they are both properties of living in the outskirts. The two nodes with the highest betweenness centrality corresponded to living in Worthington proper and having a sense of community.

2) *Degree*: the number of ties incident to a node, or the number of nodes it is adjacent to. Nodes with high degrees are likely to represent attributes that more than one informant has mentioned, so degree is an indicator of how broadly recognized a given attribute is. The nodes with the highest degree corresponded to living in an apartment, living in Worthington proper, and living in the outskirts.

3) *Incidence with at least one tie valued greater than 1*. A tie's value reflects the number of individual networks it appears in, or the number of informants who

have expressed the association. The higher a tie's value, the more likely it reflects a perceived social fact that is recognized throughout the community. A node incident to a high-valued tie therefore represents an attribute that multiple informants have mentioned in connection with another attribute. The node incident to the greatest number of valued ties, and also to the highest-valued tie, corresponded to living in an apartment.

4) *Cutpoints*: nodes whose deletion would create more components (distinct sets of connected nodes). Therefore, a cutpoint holds together at least two sets of nodes that would be disconnected from one another without that node (Wasserman and Faust 1994). Cutpoints may connect densely linked clusters of nodes that represent separate ideas. An interesting cutpoint in the aggregate network is the node representing having a sense of community. It connects the two sections of the largest component; one section roughly corresponds to living in Worthington proper, and the other roughly corresponds to living in the outskirts. Cutpoints are never at the extreme periphery, though not every cutpoint is a particularly central node.

5) *Continuous coreness*: treats nodes as having varying degrees of coreness based on the strength of their ties. A node whose ties have high values thus has a greater degree of coreness than a node with low-valued ties (Borgotti and Everett 1999). The 11 nodes selected by this metric are nearly a proper subset of the nodes incident to ties valued greater than 1.

All calculations were performed by the network software UCINET (Borgotti et. al. 2002). (3) shows the number of nodes selected by each metric, and the criteria for node selection in each case.

(3) **Measures of node importance**	**Criteria for node selection**	**No. of selected nodes**
Normalized betweenness centrality	At least one standard deviation above the mean	11
Normalized degree	At least one standard deviation above the mean	10
Incident to a tie valued greater than 1	All	21
Cutpoints	All	21
Continuous coreness	At least one standard deviation above the mean	11

(4) **Structurally important attributes**	**What each attribute refers to**
Live in Worthington proper	Space inside the W political boundary
Live in the outskirts	Outside the W political boundary, inside school district
Live in Old Worthington	Space of the original 1803 village
No community involvement	No participation in W organizations
Live in Colonial Hills	Neighborhood in W proper
Live in a "grand" house	(Unclear)
Live in an apartment	(Self-evident)

The attributes in (4) were selected by all five metrics and were therefore taken to be the most broadly recognized among the informants. For that reason, it was hypothesized that they would interact systematically with sociolinguistic variables in Worthington. The first four attributes were used as the basis for constructing independent variables for a VARBRUL statistical analysis of /l/ vocalization. The other three attributes were either too vague to permit confident categorization of speakers or not applicable to any of the informants. The first independent variable corresponded to location of residence and had three variants: 1) Old Worthington, 2) Worthington proper but outside Old Worthington, and 3) the outskirts. The second independent variable encoded whether the speaker was generally involved in the community, according to his/her own estimation. Finally, independent variables were established for sex and age.

2.4. /l/ Vocalization

Post-vocalic (dark, coda) [ɫ] differs from pre-vocalic [l] in that it involves greater retraction of the tongue body and a delayed raising of the tongue tip (Sproat and Fujimura 1993). In several varieties of English, the tongue tip may be raised only minimally, resulting in little or no alveolar contact and producing a "vocalized" variant (Hardcastle and Barry 1985). /l/ vocalization has been documented in several varieties of English (e.g., Ash 1982, Carver 1993, Horvath and Horvath 2002) and is common in southern and central Ohio.

A study of /l/ vocalization in Worthington was performed using 724 tokens of coda /l/ extracted from the 21 interviews. The set of tokens includes /l/ occurring syllable-finally as in ***all*** or *al**most***, as the first segment in a coda consonant cluster as in *co**ld***, and as a syllabic segment as in *litt**le***. Just as [l] and [ɫ] are not categorically distinct (Sproat and Fujimura 1993), the vocalized and unvocalized variants of post-vocalic /l/ clearly encompass overlapping sections of a continuum. It follows that categorizing tokens as vocalized or unvocalized is not entirely straightforward unless objective acoustic criteria are used (and even they will be somewhat arbitrary). In an effort to sidestep the danger of the analyst's category boundary between [ɫ] and the vocalized variant being either too narrow or too broad to capture important variation patterns, three linguists, all native English speakers who do not vocalize /l/, were asked to categorize the tokens as closer to [ɫ] or closer to another unspecified sound (i.e., vocalized). A token was coded as vocalized if at least two of the three listeners judged it to be. 114 of the 724 tokens were coded as vocalized.

The tokens were also coded for the social factors described above as well as the following linguistic factors:

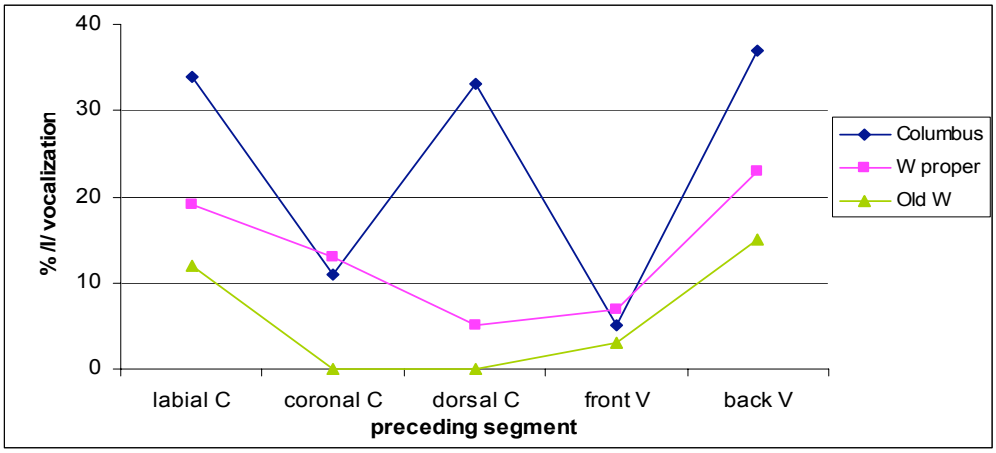
1) morpheme-final vs. morpheme-internal
2) preceding segment: labial, coronal, or dorsal consonant, or vowel (all vowels were initially coded as distinct)
3) following environment: pause, labial, coronal, or dorsal consonant, or vowel (vowels were not differentiated); note that when preceding a pause, /l/ could not occur in a consonant cluster.

In the first VARBRUL run, the significant factor groups were preceding segment, following segment, and location of residence. Preceding vowels were subsequently grouped as front or non-front. Another run using only the three significant factor groups yielded the results in (5)–(7). The application value is the vocalized variant, the input is .122, and χ^2/cell is .7799.

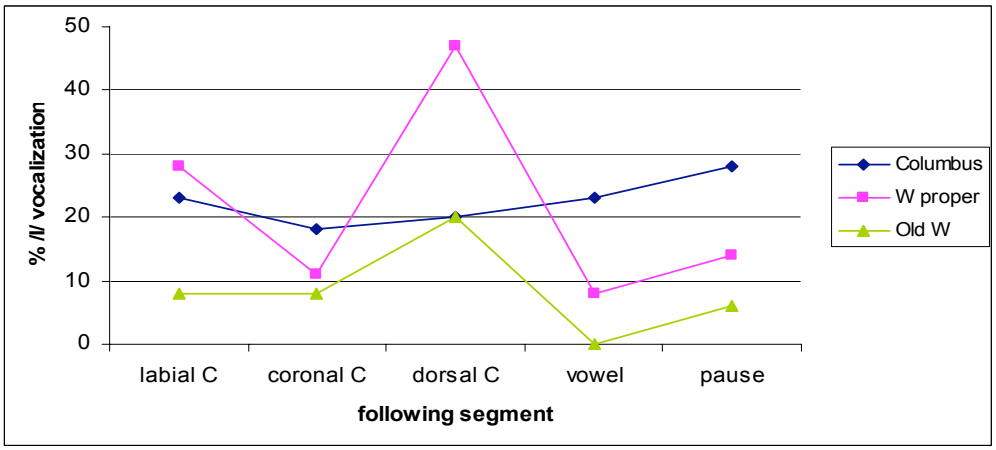
(5) Significant factor groups and weights

Preceding segment	Weight	Following segment	Weight	Location of residence	Weight
Labial consonant	.651	Labial consonant	.654	Old Worthington	.296
Coronal conson.	.393	Coronal conson.	.441	Worthington proper	.503
Dorsal consonant	.337	Dorsal consonant	.775	Outskirts	.619
Front vowel	.284	Vowel	.391		
Back vowel	.695	Pause	.524		

(6) Interaction between preceding segment and location of residence



(7) Interaction between following segment and location of residence



As shown in the cross tabulations in (6) and (7), Columbus speakers follow a strikingly different pattern from Worthington speakers, in particular with respect to their high rate of vocalization before dorsal consonants. The following segment seems not to matter for Columbus speakers, in contrast with its strong effect for both groups of Worthington speakers. In summary, Worthington speakers vocalize /l/ less frequently than speakers in the surrounding Columbus area, and their vocalization is conditioned differently by linguistic factors. Further, speakers in Old Worthington vocalize /l/ less frequently than speakers outside of Old Worthington but within the city limits.

3. Discussion of Results

Although the network technique identified a social characteristic that interacts with /l/ vocalization, it cannot directly explain the interaction. Even so, the aggregate network embeds each attribute within a structured system of attributes, revealing direct and indirect connections among attributes, thereby taking a step toward explaining their contextual importance. There is a node labeled "no community involvement"—one of the seven most structurally important nodes—as well as a node labeled "community involvement." Both of these nodes are adjacent to nodes representing locations: having no community involvement is adjacent to "outskirts," "west of the Olentangy River," and "Worthington Hills" (a neighborhood in the outskirts); "community involvement" is adjacent to "Worthington proper." Thus the relationship between community involvement and place of residence is well represented in the network, reflecting the fact that many speakers addressed the links between geography and community. One of the most elaborate discussions of this theme was provided by Rita, who lives in Old Worthington, has strong community involvement, and vocalizes /l/ rarely:

> I guess I see the boundaries of Worthington as, um, the communities that do get involved, the parts of the communities that do get involved.
>
> …
>
> And now I think you know there are no boundaries between Worthington and Polaris [a mall north of Worthington]. I mean it's all, there's no *physical* definition. And the way things uh, in Columbus, and therefore in Worthington, are growing and developing and expanding as, as far as they can go I don't think there *is* gonna be anything that that defines one community to the next. Um, and I guess that's just, that's just city development, I don't know. I don't know, pretty soon we're gonna look like Tokyo, where, one, one city just, just flows right into the next.
>
> …
>
> We're too big. We're too big, already. Be*cause* we don't know each other. Be*cause* we're not, involved, you know because, because you can now say "Oh well this is the Worthington *school* district," but you pay Columbus *taxes*, but are you, are you affiliated with Worthington? Are you, you know, are you *involved*? And I think maybe it's because they're too far out and, and don't feel a connection, I don't know.

Other speakers draw similar connections between urban growth and the loss of community identity and cohesion. Dana, a resident of the outskirts, described her neighborhood as "community sprawl," lacking cohesion, and noted that people

living inside the city limits of Worthington are highly conscious of that boundary. Dana herself does not feel like a true member of the Worthington community. Thus Rita, Dana, and others perceive a connection between geography and one's status and involvement in the community.

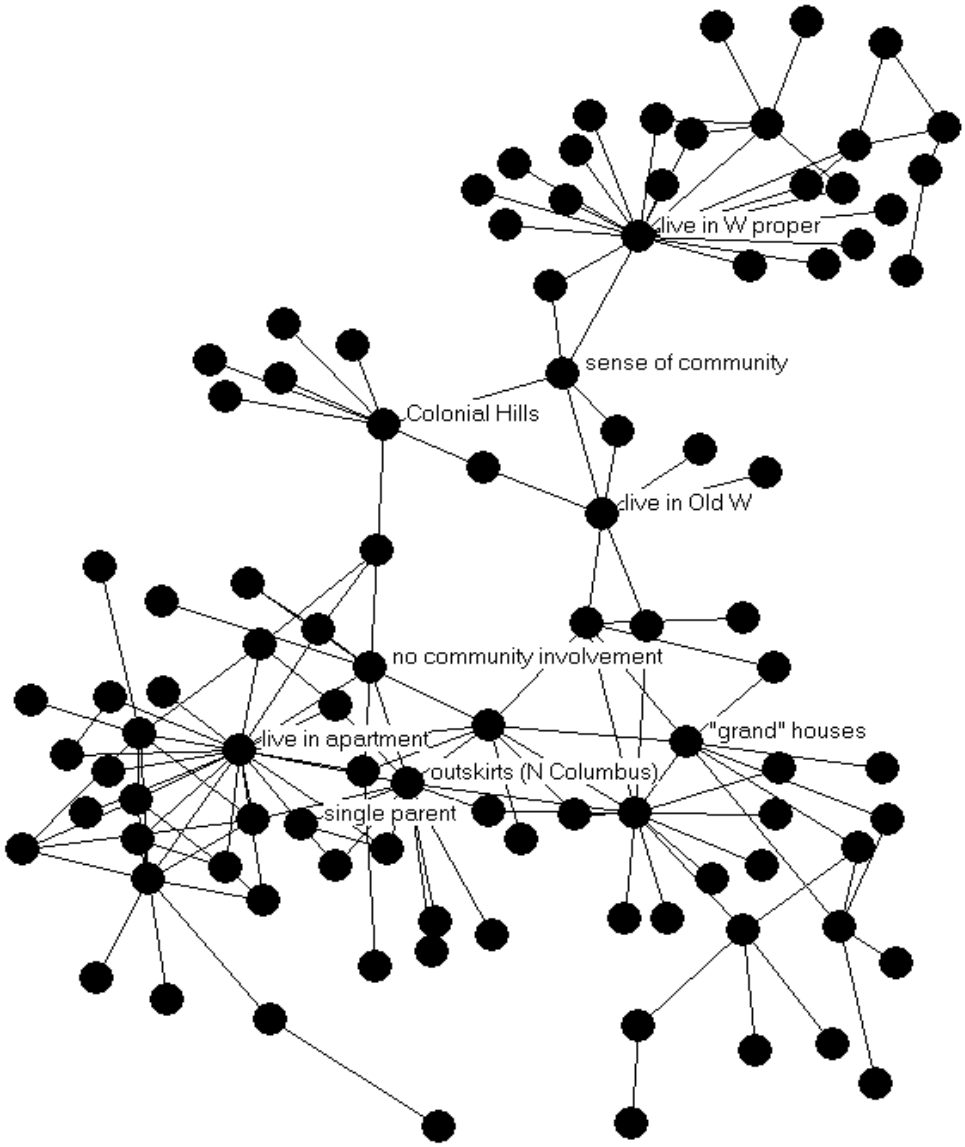
My analysis of these facts is that resistance to /l/ vocalization is part of the effort to maintain Worthington's identity as a community distinct from Columbus, a task that is increasingly difficult as Columbus annexes and develops areas surrounding Worthington. Thus the pattern of linguistic variation presented here is a product of and a tool in the construction of a range of stances regarding Worthington's community identity in the face of urban sprawl. By not vocalizing /l/ (unlike a great many speakers in central Ohio), speakers like Rita resist the disappearance of the Worthington community. Ethnographic observation (not described here for lack of space) suggests that there exist two broad groups: people who want to preserve a certain amount of exclusivity and closeness in the Worthington community, and people who recognize this desire in others but either do not take part in it or actively dismiss it. Resistance to /l/ vocalization among people with strong civic involvement mirrors their unwillingness to let go of Worthington's identity as a small, relatively affluent town distinct from Columbus and its sprawl. Many of the speakers who do not share in this resistance are like Dana in that they live outside the city boundary and therefore do not benefit from the prestige or affluence associated with Worthington except through the school system. Within the two broad groups, of course, there is variation both in ideology and in use of the linguistic variables. There is also ideological variation among Old Worthington residents; some of them resist any efforts to exclude Columbus residents from the Worthington community, and those who work to preserve Worthington's identity have varying reasons for doing so. Accordingly, individuals use linguistic variables in unique ways to construct their own styles. I leave these topics for future work.

4. Conclusion

Attribute networking is potentially useful to sociolinguists because it can be used to represent subjective information in a way that facilitates quantitative linguistic analysis. Linguistic variation is analyzed with respect to social variables that are not analyst-imposed but rather derived directly from community members' conceptions (cf. Rickford 1986), following the ethnographic tradition. Divergence among community members' views of social space is easily represented, and widely recognized social boundaries and issues are likely to be identified. Finally, by virtue of being a network-based technique, attribute networking can show perceived connections between concrete, local social phenomena and broader, abstract categories and processes; in Worthington, for example, there is a strongly felt connection between geography and community status. The technique thus has the potential to contribute to current efforts to unite the particular and the universal (Meyerhoff 2002:543), as well as efforts to link observable social network patterns to abstract categories such as class (Milroy and Milroy 1992).

Clearly this paper does not exhaust attribute networking's potential. The paper does not, for instance, exploit the fluid, interconnected nature of categories in the aggregate network, a property that makes attribute networking compatible with the community of practice concept. However, I hope to have demonstrated that it can be useful in exploring some questions of interest to variationists.

Appendix: Largest component of the Worthington aggregate network



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222 Oxley Hall
1712 Neil Ave.
Columbus, OH 43210-1298

dodswor@ling.ohio-state.edu

Zero Marking in French Impersonal Verbs: A Counter Trend to Clitic Morphologization?*

BONNIE B. FONSECA-GREBER
Bowling Green State University

0. Introduction

An ever-expanding body of work on spoken French shows that subject clitics are losing their clitic status and are becoming increasingly bound to the verb as inflectional prefixes (Ashby 1977 (France), Auger 1994 (Quebec), Fonseca-Greber 2000 (Switzerland)). This process of morphologization brings spoken French back in line typologically with other Romance languages as a pro-drop language (Fonseca-Greber 2000). Yet an apparent contradiction appears in the data. At a time when clitic use is on the rise in most linguistic contexts, why do certain impersonal verbs appear *sans* clitic, apparently in flagrant violation of the general trend toward morphologized verbal prefixes? A corpus analysis invokes markedness to provide a functional explanation of what appears to be a new and separate change.

1. Background: Language Change and Spoken French

The traditional account of French presented in reference grammars and much linguistic work alike describes French pronouns as shown in (1), where the disjunctive pronouns, in **bold**, are assumed not to act as subjects, whereas the subject (and object, in *italics*) clitics are still assumed to be the actual subjects (and objects), despite their non-canonical pronominal behavior as clitics (Kayne 1975). <u>Underlined</u> in (1) are the 3rd person subject clitics, which are the focus of this paper. This corpus shows that a classification such as given in (1) is no longer descriptively adequate for spoken French.

(1) Traditional Account of French Pronouns

1Sg.	je—*me*, **moi**	1Pl.	nous—*nous*, **nous**
2Sg.	tu—*te*, **toi**	2Pl.	vous—*vous*, **vous**
3Sg.	<u>il, elle</u>—*le*, *la*, *lui*, *se*, **lui**, **elle**	3Pl.	<u>ils, elles</u>—*les*, *leur*, **eux**, **elles**

* I thank the speakers who consented to have their conversations recorded for the corpus, Linda R. Waugh for her mentoring and stimulating discussions, and the BLS audience for their comments.

This analysis of the change that is resulting in the emergence of zero marking in spoken French is grounded in morphologization, markedness, and functional approaches to language. To assess the degree of morphologization in cases of language change, Schwegler (1990) proposes the following set of tests: prefixes (a) can reduce the morphological bulk of individual forms and of the paradigm as a whole, (b) undergo systematic allomorphy (e.g., devoicing, consonant and/or vowel reduction, liaison), (c) cannot be separated from the verb stem by a pause, (d) do not allow any non-affixal material to be intercalated between prefix and stem (see also Zwicky and Pullum 1983), (e) appear in a fixed order and, as inflectional prefixes, precede the verb, (f) are obligatory, and (g) are repeated with every new tensed verb, even in a sequence of verbs; to this, Fonseca-Greber (2000) adds (h) are reprised together with stems as a single indivisible unit when speakers self-repair.

Markedness constraints, although perhaps not a unified concept (Hume 2004), also influence which forms change and how (Benveniste 1966, Jakobson 1971, Bybee 1985).

(2) Marked and Unmarked Forms

	Unmarked	**Marked**
Person	3rd person	1st and 2nd person
Number	Sg.	Pl.
Gender	Masc.	Fem.

As the table in (2) shows, the 3M.Sg. is the unmarked form, across all three dimensions of Person, Number, and Gender. Third person, Benveniste's (1966) non-person, can refer to a fixed, objective entity, to an unfixed, non-objective entity, or to no entity at all. Therefore, it has the widest range of possible contextualizations (i.e., contextual meanings), because it does not necessarily involve the speech situation, as do 1st and 2nd person. Within the 3rd person, singular and masculine are unmarked, iconically bearing less complex morphological markers than plural and feminine, which bear more complex morphological marking. The combination of these factors accounts for why 3M.Sg. *il-*, the unmarked form, is used for impersonals and why it has been referred to as a dummy pronoun.

In addition to these language-internal factors, language-external factors such as functional constraints drive language change, such that "…language is structured so as to be suitable for communication" (Waugh and Monville-Burston 1990:14). These functional factors include (a) frequency, (b) least effort for the locutor, and (c) maximal perceptual distinctiveness for the interlocutor.

Language changes that occur as a result of morphologization driven by functional and markedness constraints can lead to the development of a Zero Sign/Zero Morph, as shown in (3).

(3) *Clermont-Ferrand* Preterite (Ronjat 1937:193, in Bybee 1985:55)

1Sg.:	canté-te	1Pl.:	canté-tem
2Sg.:	canté-tes	2Pl.:	canté-tetz
3Sg.:	canté-#	3Pl.:	canté-ton

The symbol -# in the 3Sg. of the Clermont-Ferrand preterite is not just a "nothing" but a "significant nothing," which distinguishes 3Sg. from all the other forms in the paradigm, each with its own distinct morphological expression, instead of being just an inflectionless stem. It is Jakobson's "zero sign," "the opposition of something with nothing" (Jakobson 1971:213), and Bybee's "zero morph," a non-overt morpheme that serves to distinguish that member from all the other members of the category (Bybee 1985:52).

This study then attempts to provide a principled explanation for the pattern of prefix (non)-use in the impersonal verbs appearing in a corpus of Conversational Swiss French in order to better understand the nature of the morphological changes occurring in the pre-verbal zone. Markedness and functional considerations, in conjunction with morphologization would predict that:

- verbs where a subject NP is missing—or impossible—would be a favorable environment for early clitic morphologization because of (a) their frequency and (b) the lack of any other means of identifying the grammatical person
- verbs where a full subject NP is present would be a favorable environment for late clitic morphologization because of (a) their infrequency in discourse (Lambrecht 1987) and (b) the presence of the full NP that enables the listener to identify the referent easily even in the absence of the prefix (L. Waugh, p.c.)
- clitics occurring with verbs where a subject pronoun is present would morphologize into prefixes sooner than those with a full NP subject but later than those with a null subject, because these light referential subjects provide greater referential content that verb marking alone but not as much as a definite NP
- if, within the new prefixal verb paradigm, a zero morph were to develop—a very common morphological change cross-linguistically because of the unmarked status of the 3Sg.—it would emerge first in the impersonal verbs, which (a) exist only in the 3rd person and (b) cannot take a referential subject, thereby eliminating the possibility of communicative breakdown or misunderstanding between speaker and interlocutor
- inflectional prefixes would follow French preferred syllable structure: CV.

2. Data and Method: Corpus of Conversational Swiss French (CSF)

The CSF corpus contains ±117,000 words, 13,666 finite verbs, 8½ hours, 7 of spontaneous, naturally occurring conversations. It was recorded by the researcher or one of the participants among family or friends, in Tucson, Arizona, or French-speaking Switzerland, and transcribed in modified orthography by the researcher.

Participants were 14 educated, middle-class speakers of Standard Swiss

French, engaged in spontaneous, face-to-face everyday conversation, frequently over food. In his *Varieties of Contemporary French*, Offord states, "Indeed it is best to consider the standards of Belgium and Switzerland as the same as standard French, with minor modifications…" (Offord 1990:18). He goes on to state that these modifications are lexical or phonological. Thus it is implied that morphosyntactically there is no difference between the French of Switzerland and the French of France, and that therefore the findings of this corpus should be generalizable to Metropolitan French.

Transcription and coding conventions were as follows: *je-* = hyphen shows prefixal status of former clitic; Ø = null subject; (I) = subject overtly expressed in English translation, null in French; (i)-vont = incomplete clitic morphologization (variable use); ≡ = impossibility of referential subject; # = zero morph. Finite verbs were coded and tallied for (non)-presence and position of subject clitics and overt subject pronouns. Discourse markers and clefts were coded but excluded from the total tallies of finite verbs.

3. Results

As the table in (4) shows morphologization of the subject clitic into an inflectional prefix is complete or all but complete throughout the paradigm.

(4) Finite Verb Stems Preceded by a Subject Clitic

Prefixes	**Tokens**	**%**	**Prefixes**	**Tokens**	**%**
1Sg.: je-	*n* = 4,121	100%	1Pl.: on-	*n* = 1,335	100%
2Sg.: tu-	*n* = 2,126	100%	2Pl.: vous-	*n* = 216	100%
3Sg.: il-, elle-, ça-	*n* = 3,744	91.5%	3Pl.: ils-, elles-	*n* = 1,288	93.6%

The 1st and 2nd person subject clitics have fully morphologized into inflectional prefixes marking person and number. Overall, morphologization is approaching completion in the 3rd person and is proceeding according to the functional properties of the subject, when one is expressed, spreading from pronouns to NPs to quantifiers. Obligatoriness was the only one of Schwegler's (1990) tests failed, probably due to functional properties of the subject, combined with prescriptive pressure and the influence of written French on these literate speakers. These factors may be conspiring to make change occur more slowly than it would otherwise. Still, in all environments, prefixation is more advanced than generally assumed. The rest of this paper will focus on an apparent counter trend in the 3rd person data, but for the typological implications of the broader change from clitic to prefix, see Fonseca-Greber (2000) and Fonseca-Greber and Waugh (2003a, 2003b).

3.1. Completed Morphologization in the 3rd Person

3.1.1. 3Sg. Verbs That Disallow a Referential Subject

Morphologization is complete with 3Sg. verbs that disallow a referential subject, as in weather verbs, (5), and impersonal verbs, (6):

(5) *parce quandt i-pleut ici c'est pas: c'est—c'est—ça va t'vois..m'alors quandt i-pleut là-bas c'est pas souvent non plus mais alors ça-rince alors…*(S2, I)
[because when ≡ 3M.Sg.-rain-PRES here 3N.Sg.-be-PRES not 3N.Sg.-be-PRES 3N.Sg.-be-PRES 3N.Sg.-go-PRES 2Sg.-see but well when ≡ 3M.Sg.-rain-PRES there 3N.Sg.-be-PRES not often not more but well ≡ 3N.Sg.-rinse-PRES]
''cuz when (it) rains here (it)'s no:t (it)'s—(it)'s—(it)'s no big deal (y')know..but there when (it) rains—which isn't very often either—(it) *pours*...'

(6) *i-m-semble que c'est Baggins* (S1, I)
[≡ 3M.Sg.-1Sg.Dat.-seem-PRES that 3N.Sg.-be-PRES Baggins]
'(it) seems to me that (it)'s Baggins'

3.1.2. 3Sg. Verbs that Allow a Referential Subject

Morphologization is also complete with 3Sg. verbs that allow a referential subject under certain conditions such as the null subject condition in (7), and when the overt subject is one of the "new" subject pronouns, *lui*, (8), *elle*, or *ça*.

(7) Ø *i-pr'nait toute la largeur..* (S1, I)
[Ø 3M.Sg.-take-IMPERF all the width]
'(he) took up the whole door..'

(8) *lui il-achète de la viande* (S4, II)
[he 3M.Sg.-buy-PRES of the meat]
'*he* buys meat'

3.1.3. 3Pl. Verbs that Allow a Referential Subject

Morphologization is complete in only one environment of the 3Pl., the null subject condition of verbs allowing referential subjects, (9).

(9) Ø *c-est les Républicains..* Ø *i-font le boulot à moitié* (S1, IV)
[Ø 3N.Sg.-be-PRES the Republicans Ø 3M.Pl.-do-PRES the job halfway]
'(it)'s the Republicans..(they) do a half-baked job of it'

3.2. Incomplete Morphologization of the 3rd Person

3.2.1. 3Sg. and 3Pl. Verbs with Full NP Subjects

Although over 90%[1] of the 3rd person verbs in the corpus are preceded by an inflectional prefix, there are still two environments where morphologization is not complete, 3Sg. and 3Pl. verbs with full NP subjects, (10) and (11) respectively.

[1] As a point of comparison, in much first and second language acquisition research, a morpheme is considered acquired when it occurs in 90% of its obligatory contexts.

(10) *la mentalité -est différente* (S1, I)
[the mentality -be.PRES different]
'(it)'s a different mentality'

(11) *les gens -m'appréciaient* (S1, I)
[the people -1Sg.Acc.-appreciate-IMPERF]
'the people appreciated me'

Given the heavy referential content of the full NP, functional constraints would predict that this would indeed be the last environment to morphologize because the subject can be successfully identified even in the absence of the prefix.

But this leaves us with a puzzle to ponder: although more environments have morphologized in 3Sg. than in 3Pl., the overall percentage of clitic use is *lower* with 3Sg. than with 3Pl. as shown in (4), counter to markedness predictions.

3.3. The Next Change: Internal Restructuring of the Prefixal Paradigm

In an example of Jakobson's dynamic synchrony (Waugh and Monville-Burston 1990), as the first change—clitic morphologization, which gives rise to the prefixal verb paradigm—nears completion, having reached it in many but not all environments, a second change is beginning—an internal restructuring of the new prefixal verb paradigm through the development of a 3Sg. zero morph—a common change cross-linguistically but one which for the moment is restricted to a subset of the 3Sg.: impersonal verbs. As such, it is not the counter example to clitic morphologization that it first appears to be; rather than being a lagging environment, it is in fact the leading edge of a new change, in an environment that precludes communicative misinterpretation: the impersonal, which exists only in the 3Sg., 1st and 2nd person prefixes being ungrammatical with it, as in (12) and (13), and which cannot take a referential subject, as in (14) and (15):

(12) *≡ *je-faut*/*≡ *je-faus*/*≡ *tu-faut*/*≡ *tu-faus*
[1Sg.-necessary to/2Sg.-necessary to]
*'(I) necessary to'/ *'(you) necessary to…'

(13) ≡ *(i)-faut*
[3Sg.-necessaries to]
'it's necessary to…'

(14) **Jean (i)-faut*/**Lui (i)-faut*/* *Ø (i)-faut* (where Ø = *Jean* or *Lui*)
[Jean (3Sg.)-necessary to/ He (3Sg.)-necessary to/ Ø (3Sg.)-necessary to]
*'Jean necessaries to'/ *'He necessaries to…'/*'Ø necessaries to…'

(15) ≡ *(i)-faut*
[(3Sg.)-necessary to]
'it's necessary to…'

With respect to this new change, three stages of change in progress emerge in the corpus: (a) environments where morphologization is complete, but where zero marking is not yet begun, (16)–(20), discussed in section 3.3.1, (b) variable zero marking, (21)–(28), discussed in section 3.3.2, and (c) categorical zero marking (29)–(32), discussed in section 3.3.3.

3.3.1. Completed Morphologization, Zero Marking Not Yet Begun

This section shows that clitic morphologization, the first change, is complete but that the second change, zero marking, has not yet begun with weather verbs, (16), repeated from (5) above, and a subset of lower-frequency impersonal verbs, *plaire* 'to please', (17) and (18), and *sembler* 'to seem', (19) and (20).

(16) *parce quandt i-pleut ici c'est pas: c'est—c'est—ça va t'vois..m'alors quandt i-pleut là-bas c'est pas souvent non plus mais alors ça-rince alors*...(S2, I)
[because when ≡ 3M.Sg.-rain-PRES here 3N.Sg.-be-PRES not 3N.Sg.-be-PRES 3N.Sg.-be-PRES 3N.Sg.-go-PRES 2Sg.-see but well when ≡ 3M.Sg.-rain-PRES there 3N.Sg.-be-PRES not often not more but well ≡ 3N.Sg.-rinse-PRES]
''cuz when (it) rains here (it)'s no:t (it)'s—(it)'s—(it)'s no big deal (y')know..but there when (it) rains—which isn't very often either—(it) *pours*...'

(17) *i-me-plaît moins que le Nyew Q*... (S8, IV-A)
[≡ 3M.Sg.-1Sg.Dat.-please-PRES less than the New Q]
'I don't like it as much as the New Q…'

(18) *ça-me-plaît le boulot..* (S1, I)
[≡ 3N.Sg.-please-PRES the work]
'I like the work..'

(19) *i-m-semble que c'est Baggins* (S1, I) (repeated from (6) above)
[≡ 3M.Sg.-1Sg.Dat.-seem-PRES that 3N.Sg.-be-PRES Baggins]
'(it) seems to me that (it)'s Baggins'

(20) *ça-m-semble que ça-s-voit tout l'année..* (S5, II)
[≡ 3N.Sg.-1Sg.Dat.-seem-PRES that 3N.Sg.-REFLEX-see-PRES all the year]
'(it) seems to me that you see it all year'

In the corpus, 100% of weather verbs (n = 33) and of *plaire* and *sembler* tokens (n = 54) appear with prefix, although in alternation between *il-*, (17) and (19), and *ça-*, (18) and (20). Thus with these impersonal verbs, clitic morphologization is complete but the change to zero marking has not yet begun. The *il-~ça-* prefix

alternation could be due, phonologically, to the preferred CV syllable structure of French and/or, semantically, to a restriction of *il-* to [+animate, +male] and to a concurrent emergence of a neuter prefix, *ça-* (Fonseca-Greber 2000), via a language-internal change or through contact with English.

3.3.2. Variable Zero Marking: *falloir, paraître, suffire*

Variable zero marking occurs with three impersonal verbs, the high-frequency *falloir* 'to be necessary' in (21) and (22), as well as *paraître* 'to appear' in (23)–(25) and *suffire* 'to suffice, be enough' in (26)–(28).

(21) *tu-comprendras pourquoi i-faut faire gaffe les distances..* (S1, V)
[2Sg.-understand-FUT why ≡ 3M.Sg.-necessary-PRES do attention the distances]
'you'll understand why y've gotta pay attention to the distances'

(22) *# -faut qu'il arrête de fumer..* (S13, V)
[≡3Sg.#-necessary-PRES that 3M.Sg.-stop-PRES to smoke]
'he's gotta stop smoking'

(23) *mais i-paraît qu'il-a-tourné comme ça..* (S12, VI)
[but ≡ 3M.Sg.-appear-PRES that 3M.Sg.-PRET-turn like that]
'but (it) appears (he) turned like that..'

(24) *something like that ça-paraît pas énorme deux inch m'enfin bon..* (S1, III)
[something like that ≡ 3N.Sg.-appear-PRES not enormous two inch b'finally well]
'something like that (it) doesn't seem like a lot two inches but anyway…'

(25) *# -paraît que c-est formidable..* (S11, V)
[≡ 3Sg.#-appear-PRES that 3N.Sg.-be-PRES great]
'(it) appears (it)'s great..'

(26) *i-suffit que t-as des problèmes* (S1, V)
[≡ 3M.Sg.-suffice-PRES that 2Sg.-have-PRES INDEF.Pl.- problems]
'all it takes is for ya t'run into trouble'

(27) *apparamment ça-leur-suffit pas…* (S4, II)
[apparently ≡ 3N.Sg.-3Pl.Dat.-suffice-PRES not]
'apparently (it) wasn't enough for them...'

(28) *c-est horrible parce que # -suffit que toi t-es arrivé* (S3, I)
[3N.Sg.-be-PRES horrible be.cause ≡ 3Sg.#-suffice-PRES that you 2Sg.-PRET-arrive]
'(it)'s awful because all it takes is for you to turn up..'

In the corpus, 56% of *falloir* (*n* = 200) tokens appear with prefix, *i*-; 44% are zero-marked, #-. If this were a case of delayed clitic morphologization, this 56% *i* use would show lower clitic/prefix use than all but the quantifiers, which is the most delayed environment. More likely, however, given the functional considerations discussed earlier, is that with this high-frequency verb, the change to zero marking is well underway with the zero-marked form occurring almost as frequently as the prefixed form; further support for this comes from the next environment: *il y a*, discussed in 3.3.3. Tokens are insufficient for individual analyses of *paraître* (*n* = 12) and *suffire* (*n* = 17), but both appear in three-way alternation: *i*- ~ *ça*- ~ #-, in contrast with *falloir*, where only *i*- and #- occur.

3.3.3. Completed Zero Marking: *il y a* → *ya,* etc.

Zero marking has gone to completion and is already categorical in a very high-frequency verb construction, the existential *il y a* 'there is/there are'.

(29) *ya pas une traduction de ça?* (S6, III)
[≡ 3Sg.#-exist-PRES not a translation of that?]
'isn't there a translation for that?'

(30) *ben ya-eu Teddy..après ya-eu Craig..* (S1, I)
[well ≡ 3Sg.#-exist-PRET Teddy after ≡ 3Sg.#-exist-PRET Craig..]
'well there was Teddy..then there was Craig..'

(31) *parce qu'yavait-eu c'tte histoire en: mm..en Irlande* (S4, II)
[be.cause ≡ 3Sg.#-exist-PPERF that story in mm in Ireland]
'b'cause there'd been that story in: uhm..in Ireland'

(32) *yenavait plus..* (S10, IV-B)
[≡ 3Sg.#- PART-exist-IMPERF no.more]
'there weren't any more of 'm..'

In the corpus, 0% of *il y a* (*n* = 510) tokens appears with the prefix *i*- in the existential construction in various tenses. In other words, zero marking is 100% with *il y a*. Here, the second change, the development of the zero morph, is already complete. Although it has been argued that the *il* of *il y a* was never present historically in spoken French, this would in no way invalidate this analysis but rather serves to further substantiate it, given Jakobson's (1990) concept of dynamic synchrony on which it is based, wherein multiple changes are in progress concurrently, albeit at various stages, and influenced by various registers and time frames, just as we have seen with the two changes, morphologization and zero marking, discussed in this paper.

The table in (33) summarizes zero marking across the three environments.

(33) Summary of Zero Marking

	Prefixes	**%**	**Zero marking**	**%**
Weather verbs (*n* = 33), *plaire, sembler* (*n* = 54)	i-, ça-	100%	#-	0%
falloir (*n* = 200), *paraître*, *suffire* (*n* = 29)	i-, (ça-)	56%	#-	44%
ya/yena (*n* = 510)	i-	0%	#-	100%

Finally, the emergence of zero marking accounts for why, in the table in (4), "clitic" use appears, counter-intuitively, to be less frequent with 3Sg. than 3Pl.

3.3.4. French Preferred CV Syllable Structure

Examples from French Creole, (34), and child language, (35), show that /i/ is a dispreferred syllable onset.

(34) Reunion Creole
le (<(i)l + est) = be PRES. (Green 1988:457)

(35) bébé ours l'est dans sa chambre (L.) (Jakubowicz and Rigaut 1997:75)

Yet the /l/ of the prefix *il-* has already been lost in order to avoid consonant clusters in consonant initial stems, such as *-faut*. From here it is only a small step to losing the overt manifestation of the 3Sg. morpheme entirely. Hence, phonological factors may be conspiring with markedness principles and functional considerations to fuel the development of a zero morph in the impersonals of conversational French.

4. Discussion and Conclusions

This paper shows that two separate but interrelated changes are in progress in the pre-verbal zone of Conversational Swiss French:

- the older and nearly complete morphologization of the subject clitics into inflectional prefixes of person and number, thus transforming French once again into a pro-drop language (see Fonseca-Greber 2000)
- and, as a result of the first change, the internal restructuring of the new prefixal verb paradigm through the emergence of a zero morph, restricted for the present to a communicatively clear subset of the 3Sg.: impersonal verbs.

Thus the functional predictions are borne out as follows:

- verbs where a subject NP is missing, (7)—or impossible, (5) and (6)—*do* constitute a favorable environment for early clitic morphologization, presumably because of (a) their frequency and (b) the lack of any other way to identify the grammatical person
- verbs where a full subject NP, (10) and (11), is present *do* constitute a favorable environment for late clitic morphologization, presumably because of

(a) their infrequency in discourse (Lambrecht 1987) and (b) the presence of the full NP that enables the listener to identify the referent easily even in the absence of the clitic (L. Waugh, p.c.)

- clitics occurring with verbs where a "new" optional subject pronoun, (8), is present *do* morphologize into prefixes sooner than those with a full NP subject but later than those with a null subject, presumably because these light referential subjects provide greater referential content than verb marking alone but not as much as a definite NP
- if, within the new prefixal verb paradigm, a zero morph were to develop—a very common morphological change cross-linguistically because of the unmarked status of the 3Sg.—it does emerge first in the impersonal verbs, (22), (25), (28), (29)–(32), which (a) exist only in the 3rd person and (b) cannot take a referential subject, thereby eliminating the possibility of communicative breakdown or misunderstanding between speaker and interlocutor
- verb stems and/or their prefixes do tend to follow French preferred syllable structure: CV, (18), (20), (22), (24), (25), (27), and (28).

In conclusion, this corpus analysis reveals that the absence of the prefix *i(l)-* with certain impersonal verbs in French (*falloir*, *paraître*, *suffire*, *il y a*) is not a counter example to clitic morphologization. Now that clitic morphologization is complete in all but two environments, a new change is starting: a restructuring within the new prefixally inflected verb paradigm, in the form of the development of a semantically significant zero morph capable of distinguishing the unmarked 3Sg. from each of the other persons. A cross-linguistically frequent change, it is starting in French with impersonal verbs because these verbs exist only in the 3Sg. and cannot take a subject NP, thus they remain uniquely identifiable with or without their prefix and so are not functionally problematic in terms of successful communication. These findings should, of course, be corroborated by a larger corpus as well as with other varieties of spoken French.

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Department of Romance Languages
203 Shatzel Hall
Bowling Green State University
Bowling Green, OH 43403

bfonsec@bgnet.bgsu.edu

Anti-Homophony Effects in Dakelh (Carrier) Valence Morphology

SUZANNE GESSNER and GUNNAR ÓLAFUR HANSSON
University of Victoria and *University of British Columbia*

0. Introduction

In Dakelh (Carrier), as in many other Athapaskan languages, valence prefixes and "inner subject" prefixes interact in a complex pattern involving a combination of consonant deletion and/or fusion and, in certain conditions, what looks like epenthesis. In this paper we investigate this apparent epenthesis effect, which is otherwise unexpected in this environment in Dakelh and is problematic in several aspects (Gessner 2003). We propose that the epenthesis should be understood as an *anti-homophony effect* (Crosswhite 1999, Blevins 2004a, b) serving to systematically maintain a surface distinction between paradigmatically related forms differing in valence. We demonstrate how the anti-homophony effect is best understood in a *diachronic-evolutionary* context rather than a synchronic-phonological one: "epenthesis" is really the blocking of syncope (as a regular historical sound change). The account constitutes a striking parallel to the explanation of so-called antigemination effects as the result of syncope blocking through homophony avoidance, as proposed by Blevins (2004a, b).

1. Background

1.1. Language Background

The focus of this paper is the Lheidli dialect of Dakelh (a.k.a. Carrier), a Northern Athapaskan language of central interior British Columbia.[1] The Lheidli dialect is not extensively documented (Poser 2001, 2002, Bird 2002, Gessner 2003) and is extremely endangered, with fewer than 10 fluent native speakers. Lheidli is one of 12 Dakelh dialects; the language as a whole is estimated to have 1,000 speakers (Yinka Déné Language Institute 2004). All cited Dakelh data derives from the first author's fieldnotes, except those marked P01 which are from Poser (2001).

[1] We sincerely thank speakers Margaret Gagnon, Mary Gouchie and Josephine Paul for providing the Dakelh data. Thanks also to Juliette Blevins, Andrew Garrett and Gary Holland for helpful comments. Fieldwork was supported by SSHRC Doctoral Fellowship 752-2000-2102, a Killam Trust Predoctoral Fellowship and a Jacobs Research Fund grant, all to the first author.

1.2. Valence Prefixes

The Athapaskan verb consists of a root, carrying the main lexical meaning, and multiple prefixes serving to mark subject and object agreement, tense, aspect, voice and valency, as well as adverbial and more abstract "thematic" notions. Traditionally, the verb word has been analyzed as consisting of three components: the *root* (usually called "stem" in the Athapaskanist literature), and two discrete prefixal domains known as the *conjunct* and *disjunct* domains (terms attributed to Li 1946). The verb root (typically /CV(C)/) is immediately preceded by one of a set of voice or valence prefixes traditionally known as "classifiers"; their position is indicated by the shaded box in (1).

(1) Dakelh verb template:[2]

DISJ. #	Obj	Con	S_O	W/D/Nq	Cng	Inc	Neg	Mod/Asp	S_I	Val	=ROOT

D-Stem ↑ C-Stem (conjunct domain) ↑ V-Stem

In Dakelh, the phonological forms of the valence prefixes are Ø-, /d̥-/, /ɬ-/ and /l-/; an example of each is illustrated in (2).

(2) Valence prefixes ("classifiers") in Dakelh verb forms:

Ø-	nʌb̥e	/n # Ø - **Ø** = b̥e/ cur#3sgS-**val**=*swim*	's/he is swimming'	
/d̥-/	nad̥ai	/na # Ø - **d̥** = ai/ hab#3sgS-**val**=*eat*	's/he ate'	P01
/ɬ-/	jɪɬtʃud̥	/j - ɪ - Ø - **ɬ** = tʃud̥/ obv-asp-3sgS-**val**=*grab*	's/he is grabbing it'	
/l-/	nʌlg̊ai	/n # Ø - **l** = g̊ai/ cur#3sgS-**val**=*run*	's/he is running'	

The /ɬ-/ valence can serve as a transitivizer or causativizer, *adding an argument* to a verb, while the /d̥-/ valence marks functions such as the passive, reflexive, reciprocal and iterative, *removing an argument* from a verb. The /l-/ valence is usually seen as a portmanteau morph, combining the syntactic and semantic properties of the /ɬ-/ and /d̥-/ prefixes (see, e.g., Young and Morgan 1987, 1992.)[3]

Apart from these productive uses, there are also many instances where the appearance of a valence prefix with a particular verb seems to be idiosyncratic; in those cases, the prefix must be specified in the lexicon as part of that verb's sub-categorization. Because of their puzzling nature, valence prefixes are a common

[2] Obj = object agreement; Con = conative; S_O = outer subject agreement (1p, 3dp); W/D/Nq = Wh-class/D-class/N-class absolutive argument qualifier; Cng = conjugation prefixes marking aspect; Inc = inceptive; Neg = negative; Mod = mode; Asp = aspect; S_I = inner subject agreement (1/2/3s, 1d, 2dp); Val = voice/valency. The symbols '#' and '=' indicate the disjunct-conjunct and prefix-root boundary, respectively. The disjunct domain prefixes are not shown in detail in (1).

[3] Alternatively, /l-/ valence can be interpreted as underlying /d̥-ɬ-/ with D-Effect (Howren 1971).

topic of investigation in the Athapaskan literature (see Hoijer 1946; Krauss 1969; Kibrik 1993, 1996; Thompson 1996; Hale 1997; Rice 2000a, b; Gessner 2001).

Recall that /ɬ-/ marks transitivity or increased valence (e.g., causativity), while /d̥-/ is typically valence-decreasing (passive, reflexive). This, and the status of /l-/ as being (in some sense) a combination of /ɬ-/ and /d̥-/, means that the opposition /l-/ : /ɬ-/ is parallel to the opposition /d̥-/ : Ø-, as well as to Ø- : /ɬ-/, as illustrated in (3). Thus a great number of active vs. passive or causative vs. base form pairs are distinguished solely by a morphological alternation in /ɬ-/ vs. /l-/, as in (3b).

(3) Examples of valence alternations:

a. Ø- ~ /ɬ-/ alternations:

Intransitive	*Transitive*
tʰetʰʌn	jʌtʰɛɬtʰʌn
tʰe-Ø-Ø=tʰʌn	j-tʰe-Ø-**ɬ**=tʰʌn
fut-3sS-val=freeze$_{IA}$	obv-fut-3sS-val=freeze$_{IA}$
'It is going to freeze.'	'S/he is going to freeze it'
ʌtso	jʌɬtso
Ø-Ø=tso	j-Ø-**ɬ**=tso
3sS-val=cry$_{IA}$	obv-3sS-val=cry$_{IA}$
'S/he is crying'	'S/he is making him/her cry'

b. /l-/ ~ /ɬ-/ alternations:

Intransitive	*Transitive*
xʷenʌlmʌl	xʷeːnʌɬmʌl
xʷe#n-Ø-**l**=mʌl	xʷe#j-n-Ø-**ɬ**=mʌl
inc#nq-3sS-val=roll$_{IA}$	inc#obv-nq-3sS-val=roll$_{IA}$
'It is rolling'	'S/he is rolling it'
d̥ʌnʌlmʌɬ	jʌd̥ʌnʌɬmʌɬ
d̥-n-Ø-**l**=mʌɬ	j-d̥-n-Ø-**ɬ**=mʌɬ
dq-cng-3sS-val=boil$_{IA}$	obv-dq-cng-3sS-val=boil$_{IA}$
'It is boiling'	'S/he is boiling it'

2. Valence-Subject Interaction

2.1. Fusion, Deletion, Epenthesis

The valence prefix is in turn directly preceded by one of the so-called "inner subject" prefixes, marking person and number: 1Sg /s-/, 2Sg /in-/, 1Du /id̥ʌd̥-/, 2Du/Pl /h-/ (3Sg is Ø-; 1Pl /ts'-/ and 3Du/Pl /h-/ are the "outer subject" prefixes, located further away from the root). The positions of these two prefix classes in the verb template are highlighted in (4), repeated from above.

(4) Inner subject and valence prefixes in the Dakelh verb template:

DISJ. #	Obj	Con	S_O	W/D/Nq	Cng	Inc	Neg	Mod/Asp	S_i	Val	=ROOT

As shown in (5), the /ɬ-/ and /l-/ prefixes interact with the consonant of a preceding subject prefix, if any, by a complex pattern in the Lheidli dialect (Poser 1999); illustrative examples follow in (6).

(5) Interaction of "inner subject" prefixes with valence prefixes /ɬ-/ vs. /l-/:

	/s-/ (1Sg)	/ɪn-/ (2Sg)	Ø (3Sg)	/id̥ʌd̥-/ (1Du)	/h-/ (2Du/Pl)
/ɬ-/	s-	ɪɬ-	ɬ-	id̥ʌl-	ɬ-
/l-/	**ɬʌ-**	ɪl-	l-	id̥ʌl-	**ɬʌ-**

(6) Examples of subject-valence interactions in Lheidli Dakelh:

a. /ɬ-/ valence:

Prefixes	*Transcription*	*Morpheme Gloss*	*Gloss*
/s-ɬ-/	d̥ʌnʌ**s**mʌɬ	Ø-d̥-n-**s-ɬ**=mʌɬ 3sO-dq-cng-1sS-val=boil$_{IA}$	'I am boiling it.'
/ɪn-ɬ-/	d̥ʌn**ɪɬ**mʌɬ	Ø-d̥-n-**ɪn-ɬ**=mʌɬ 3sO-dq-cng-2sS-val=boil$_{IA}$	'You$_{sg}$ are boiling it.'
/Ø-ɬ-/	jʌd̥ʌnʌ**ɬ**mʌɬ	j-d̥-n-**Ø-ɬ**=mʌɬ obv-dq-cng-3sS-val=boil$_{IA}$	'S/he is boiling it.'
/id̥ʌd̥-ɬ-/	d̥ʌn**id̥ʌl**mʌɬ	Ø-d̥-n-**id̥ʌd̥-ɬ**=mʌɬ 3sO-dq-cng-1dS-val=boil$_{IA}$	'We$_d$ are boiling it.'
/h-ɬ-/	d̥ʌnʌ**ɬ**mʌɬ	Ø-d̥-n-**h-ɬ**=mʌɬ 3sO-dq-cng-2dpS-val=boil$_{IA}$	'You$_{dp}$ are boiling it.'

b. /l-/ valence:

Prefixes	*Transcription*	*Morpheme Gloss*	*Gloss*
/s-l-/	nʌ**ɬʌ**g̊ai	n#**s-l**=g̊ai cur#1sS-val=run$_{IA}$	'I am running.'
/ɪn-l-/	n**ɪl**g̊ai	n#**ɪn-l**=g̊ai cur#2sS-val=run$_{IA}$	'You$_{sg}$ are running.'
/Ø-l-/	nʌ**l**g̊ai	n#**Ø-l**=g̊ai cur#3sS-val=run$_{IA}$	'S/he is running.'
/id̥ʌd̥-l-/	n**id̥ʌl**g̊ai	n#**id̥ʌd̥-l**=g̊ai cur#1dS-val=run$_{IA}$	'We$_d$ are running.'
/h-l-/	nʌ**ɬʌ**g̊ai	n#**h-l**=g̊ai cur#2dS-val=run$_{IA}$	'You$_d$ are running.'

Of particular interest is the apparent *epenthesis* in 1Sg and 2Du/Pl forms with /l-/ valence, which is otherwise anomalous within Lheidli phonology (Gessner 2003). The 1Sg vs. 3Sg pairs in (7) give further illustration of the mapping /s-ɬ-/ → [ɬʌ-].

(7) Additional examples contrasting 1Sg and 3Sg:

1Sg Subject	*3Sg Subject*
x^{w}ʌnawd̥ɛ**ɬʌ**noh	x^{w}ʌnawd̥ɛ**l**noh
/x^{w}-na#u-d̥e-**s-l**=noh/	/x^{w}-na#u-d̥e-**Ø-l**=noh/
inc-hab#con-thm-1sS-val=forget$_{PA}$	inc-hab#con-thm-3sS-val=forget$_{PA}$
'I forgot'	's/he forgot'
nad̥ɛ**ɬʌ**d̥ʌz̲	nad̥ɛ**l**d̥ʌz̲
/na#d̥e-**s-l**=d̥ʌz̲/	/na#d̥e-**Ø-l**=d̥ʌz̲/
down#thm-1sS-val=fall$_{PA}$	*down*#thm-3sS-val=fall$_{PA}$
'I fell down'	's/he fell down'

Epenthesis in 1Sg and 2Du/Pl forms with /l-/ valence is a characteristic shared by all dialects in the Southern branch of Dakelh (Poser 1999); in the Nak'albun-Dzinghubun branch (including the Nak'az̲dli dialect described by Morice 1932) we find *fusion* without any concomitant epenthesis:

(8) Epenthesis with /l-/ valence; no corresponding epenthesis with /ɬ-/:

				Lheidli	*Nak'az̲dli*
	1Sg	/…+s+l+CV(C)/	→	…ɬʌ̲CV(C)	…zCV(C)
	2Du/Pl	/…+h+l+CV(C)/	→	…ɬʌ̲CV(C)	…ɬCV(C)
cf.	1Sg	/…+s+ɬ+CV(C)/	→	…sCV(C)	…sCV(C)
	2DuPl	/…+h+ɬ+CV(C)/	→	…ɬCV(C)	…ɬCV(C)

Epenthesis cannot be a purely prosodically driven phenomenon here, for two reasons. First, in the output form, [ʌ] is breaking up what would otherwise simply be a *bi*consonantal cluster (coda + onset); such ɬC or lC clusters are otherwise not prohibited or avoided in any way at the valence-root boundary, cf. the 2Sg and 3Sg forms in (5)-(6) above. Secondly, other triconsonantal SUBJ-VAL-ROOT input sequences are always resolved by fusion of C1 and C2, or deletion of C1 or C2, without resorting to epenthesis, e.g., /s+ɬ+C/ → [sC] and /(i)n+l+C/ → [(i)lC].[4]

2.2. Epenthesis as an Anti-Homophony Effect

We propose that the apparent epenthesis effect should be understood in relation to the function it plays within the paradigm of morphological oppositions. Were it not for epenthesis, 1Sg and 2Du/Pl intransitive forms with /l-/ valence would have a surface realization identical to that of the corresponding transitive forms with /ɬ-/ valence. The epenthetic [ʌ] can be viewed as serving the purpose of systematically maintaining a surface distinction between related verb forms

[4] For an Optimality-Theoretic analysis of consonant fusion in similar contexts in a related Northern Athapaskan language, Dené Soun'liné (previously known as Chipewyan), but without any of the epenthesis effects observed in Dakelh, see de Lacy (2002).

differing in valence alone (active vs. passive, causative vs. base). Epenthesis is thus a paradigmatic homophony avoidance effect (cf. Crosswhite 1999; Blevins 2004a, b).

Given the regular strategy used to resolve CCC clusters at the SUBJ-VAL-ROOT boundary, /s-/ and /l-/ should fuse into [s-], and likewise /h-/ and /l-/ should fuse as [ɬ-]. The expected vs. the observed outcomes of subject-valence interactions are outlined schematically in (9), accompanied by relevant examples in (10).

(9) Expected vs. actual outcome in 1Sg and 2Du/Pl with /l-/ valence:

				expected:	*actual:*
	1Sg:	/-s-l-CV(C)/	→	**-sCV(C)	-ɬʌCV(C)
	2Du/Pl:	/-h-l-CV(C)/	→	**-ɬCV(C)	-ɬʌCV(C)
cf.	1Sg:	/-s-ɬ-CV(C)/	→	-sCV(C)	
	2Du/Pl:	/-h-ɬ-CV(C)/	→	-ɬCV(C)	

(10) Examples of /ɬ-/ ~ /l-/ valence alternations where ambiguity would result:

a. Transitive (/ɬ-/ valence)[5]

1Sg Subject	*3Sg Subject*	
nʌnʌ**s**ʔi	nʌnʌ**ɬ**ʔi	P01
n#n-**s-ɬ**=ʔi	n#n-**Ø-ɬ**=ʔi	
thm#imp-1sS-val=hide$_{IA}$	thm#imp-1sS-val=hide$_{IA}$	
'I am hiding [object]'	'S/he is hiding [object]'	

b. Reflexive (/l-/ valence)

1Sg Subject	*3Sg Subject*	
nʌn**ɬʌ**ʔi[6]	nʌnʌ**l**ʔi	P01
n#n-**s-l**=ʔi	n#n-**Ø-l**=ʔi	
thm#imp-1sS-val=hide$_{IA}$	thm#imp-1sS-val=hide$_{IA}$	
'I am hiding myself'	'S/he is hiding her/himself'	

cf. if no epenthesis:
nʌnʌs**ʔi (= 1Sg trans.) or **nʌnʌ**ɬ**ʔi (= 3Sg trans.)

Assuming that the presence of epenthetic [ʌ] is in fact motivated by a pressure to maintain a valence distinction, an account viewing this as a genuinely *synchronic* effect (phonological epenthesis triggered by constraints on paradigm homophony avoidance) is still faced with three fundamental problems:

[5] These examples are extracted from a sentence with an overt NP object, so no object agreement (/j-/ obviative) is marked on the verb, unlike those 3Sg transitive forms shown in (2), (3), and (6a).
[6] The actual entry in Poser (2001) is *nanlhu'i* (= [nanɬʌʔi]), glossed as 'I am hiding out'; the [a] is unexpected given that the related forms all have [nʌ…].

(11) Problems for a synchronic-phonological account:

a. Since fusion of /s-/ and /ɬ-/ produces [s], preserving [strident] over [lateral], why would fusion of /s-/ and /l-/ yield [ɬ] (plus the epenthetic vowel), apparently preserving [lateral] over [strident]? (Cf. the account of fusion effects in Dené Soun'liné proposed by de Lacy 2002.)

b. Why does /s-l-/ not yield [z-] as it does in the Nak'azdli dialect, cf. (8)? This would preserve the contrast with /s-ɬ-/ → [s-] without resorting to epenthesis, while also circumventing the markedness paradox in (a) above.

c. If homophony avoidance is of such great importance in the synchronic grammar, why is a contrast between transitive and intransitive forms *not* upheld in the 1Du, where we find [id̥ʌl-] for both /id̥ʌd̥-ɬ-/ and /id̥ʌd̥-l-/?

The account we propose in the following section provides something of a "Gordian Knot" solution to all of these problems. In our view, /ɬʌ-/ is simply an unanalyzable portmanteau allomorph from the synchronic point of view, simultaneously an exponent of subject agreement and valence. The presence of [ʌ] in that allomorph is indeed to be explained as being due to paradigmatic homophony avoidance, but only from a strictly *diachronic-historical* perspective.

3. Paradigmatic Homophony Avoidance as a Diachronic Effect

As argued above, the full details of the homophony avoidance effect seen in subject-valence interactions in Dakelh cannot adequately be explained from a synchronic standpoint. However, we contend that the facts *can* be accounted for under a diachronic-historical analysis, as outlined in (12).

(12) Central claims:

i. The "epenthetic" vowel in the […ɬʌCV(C)] forms is not due to any epenthesis taking place; historically speaking, it was there all along.

ii. The presence of [ʌ] in these forms is instead due to a *failure of syncope*, which would otherwise have deleted that vowel (and did so elsewhere).

iii. Homophony avoidance has thus asserted itself by *blocking an otherwise regular sound change*.

iv. This is a clear parallel to the reinterpretation of "antigemination" effects by Blevins (2004a, b); both are due to homophony avoidance blocking syncope in certain forms.

3.1. "Epenthesis" as Blocking of Syncope

Among the valence prefixes as reconstructed for Proto-Athapaskan (henceforth PA) by Krauss (1969), the ancestors of Dakelh /l-/ and /d̥-/ contained a vowel following the consonant, as shown in (13a). By contrast, /ɬ-/ did not contain such a vowel (13b), nor did the relevant subject agreement prefixes like 1Sg /s-/ (13c):

(13) Valence and 1SgSubj prefixes in Proto-Athapaskan (Krauss 1969):

a. /l-/ < **łə-* b. /ɬ-/ < **ł-* c. /s-/ < **š-*
/d̥-/ < **də-*

Note that both /l-/ and /ɬ-/ go back to PA forms containing a voiceless lateral. The generally voiced character of the /l-/ reflex of PA **łə-* throughout most daughter languages is due to *intervocalic voicing*. In the vast majority of verb forms, one or more prefixes precede the valence prefix (cf. (1) above), and virtually all of these are reconstructed as having been vowel-final in PA. The effects of intervocalic voicing can also be seen in other prefixes in the conjunct domain, e.g., perfective [s̪(ʌ)-]~[z̪(ʌ)-] < PA **sə-* (occurring in the position labelled "Cng" in (1)).[7] In precisely the 1Sg and 2Du/Pl forms at stake here, PA **łə-* was preceded by **š-* or **h-* and hence *not* intervocalic; thus the *ł* remained voiceless. Subsequent to intervocalic voicing, a regular sound change of *syncope* deleted the *ə* of **łə-* and **də-*, and also in other **Cə-* prefixes in similar environments (Krauss 1969).

We suggest that this syncope was blocked in the 1Sg and 2Du/Pl of **łə-* valence forms, so as not to collapse these with their transitive **ł-*valence counterparts. We suggest, that is, that the functional pressure of homophony avoidance asserted itself by curtailing a regular sound change. The historical developments of the relevant forms are summarized in (14). On the left is the PA state of affairs, in the middle the result of intervocalic voicing (where applicable), and on the right the current state of affairs after syncope and various cluster simplifications.

(14) Sound changes from Proto-Athapaskan to present-day Dakelh (Lheidli):

a.	1Sg	**(…V)-š-łə-C…*	>	**(…V)-š-łə-C…*	>	(…V)-**łʌ**-C…	[no syncope]
	2Sg	**(…)-in-łə-C…*	>	**(…)-ĩ-lə-C…*	>	(…)-ɪ-l-C…	
	3Sg	**(…V)-łə-C…*	>	**(…V)-lə-C…*	>	(…V)-l-C…	
	2Du	**(…V)-h-łə-C…*	>	**(…V)-h-łə-C…*	>	(…V)-**łʌ**-C…	[no syncope]
b.	1Sg	**(…V)-š-ł-C…*	>	**(…V)-š-ł-C…*	>	(…V)-s-C…	
	2Sg	**(…)-in-ł-C…*	>	**(…)-ĩ-ł-C…*	>	(…)-ɪ-ɬ-C…	
	3Sg	**(…V)-ł-C…*	>	**(…V)-ł-C…*	>	(…V)-ɬ-C…	
	2Du	**(…V)-h-ł-C…*	>	**(…V)-h-ł-C…*	>	(…V)-ɬ-C…	

Two potential counterarguments should be addressed here. First, it might be argued that the "blocking" merely reflects the *phonological* conditioning of a sound change, e.g., that syncope was phonotactically restricted so as not to apply in CC_C or C_CC contexts. This interpretation cannot be correct, as the CCC clusters which syncope was prevented from creating, such as **š-ł-C*, were in fact phonotactically permissible in the language. Secondly, it is conceivable that

[7] When /l-/ < **łə-* is initial, its reflex remains voiceless in Dakelh, e.g. Lheidli [**ł**ʌjʌl], Nak'azdli [**ł**jʌl] /Ø-l=jʌl/ 'it (generic) is white', cf. [nʌ**l**jʌl] /n-Ø-l=jʌl/ 'it (n-class) is white' (Poser 1999).

homophony avoidance served not to *block* syncope (a sound change), but to *trigger* the reintroduction of the syncopated vowel based on some other form or forms elsewhere in the paradigm (an analogical change). Unfortunately, however, such forms are nowhere to be found; the only forms where the vowel remained intact (on any cogent interpretation of syncope and its conditioning) are precisely those forms where, on our account, its presence is due to homophony avoidance.

Let us now address the problems listed in (11) above. The diachronic syncope-blocking account provides a simple solution to the dilemma of why, synchronically, /s+ɬ/ yields [s] whereas /s+l/ yields [ɬ] (followed by [ʌ]), and why the latter would not instead result, e.g., in [z]. Viewed from the diachronic perspective, the difference is merely one of deleting the first vs. the second member of what was historically a **sɬ* cluster, as summarized in (15).

(15) Cluster simplification patterns involving fricative-fricative sequences:

a. **(…V)-s-~~ɬ~~-C(V…) > (…V)sC(V…)*
Deletion targets **ɬ*, the middle consonant in a $C_1C_2C_3$ cluster.

b. **(…V)-~~s~~-ɬə-C(V…) > (…V)ɬəC(V…)*
Deletion targets **s*, the coda consonant in a C_1C_2 cluster.

In the case of /ɬ-/ valence forms, the valence prefix was a vowelless **ɬ-*, directly abutting the root-initial consonant, so the cluster was in fact triconsonantal /sɬC/. The fact that it is the middle consonant /ɬ/ that gets deleted is hardly surprising, as it is the one lacking all perceptual cues from VC and CV transitions. In /l-/ valence forms, by contrast, the prefix was **ɬə-* and the cluster was thus genuinely biconsonantal /sɬ/. Here deletion targets the coda rather than the onset, again the segment with comparatively weaker perceptual cues (Wilson 2001). In sum, the choice is not between "preserving" [strident] over [lateral] or vice versa, as it would be in a synchronic fusion/deletion account, but falls out from the C- vs. CV- shape the two prefixes had at the time when cluster simplification occurred.

What about 1Du forms, where we find [id̥ʌl-] in /l-/ and /ɬ-/ valence forms alike, in apparent defiance of homophony avoidance? Though the issue cannot be fully addressed here, we suggest that the very form /id̥ʌd̥-/ of the 1Du prefix is due to a secondary analogical development. Nak'albun dialects of Dakelh, as well as closely related languages, have 1Du /id̥-/. As one instantiation of the so-called "D-Effect" (Howren 1971) the /d̥/ of this /id̥-/ fuses with a following /ɬ-/ or /l-/ prefix, yielding voiced [l] in both cases and thus neutralizing the valence contrast; the same is true of the second /d̥/ of the Lheidli /id̥ʌd̥-/ variant. The original form of the 1Du prefix may well have been something like **idə-*, which would have given rise to a syncope alternation [id̥ʌ-]~[i(d̥)-] depending on the environment (the parentheses indicating fusion with a following C). Lheidli [id̥ʌ(d̥)-] is a blend of these two alternants, levelling the [id̥ʌ] sequence across all 1Du forms (cf. a similar development in Pacific Coast Athapaskan mentioned in Krauss 1969).

3.2. Syncope Blocking in Other Paradigm Slots

In addition to 1Sg and 2Du/Pl forms, the same unexpected [ɬʌ-] portmanteau morph shows up in certain 3Sg forms, where the /l-/ valence is immediately preceded by either perfective /s̪-/ or negative /s-/ with no intervening vowel. The two forms in (16) both appear to be in the /s̪/-perfective, contrasting in valence.

(16) "Epenthesis" in 3Sg perfective forms: /s̪-ɬ-/ → [ɬ] but /s̪-l-/ → [ɬʌ]

a. jʌnɛ**ɬ**ɬʌs 'S/he kneaded it' P01
j-n-e-**s̪-Ø-ɬ**=tɬʌs
obv-nq-asp-**prf-3sS-val**=knead$_{PA}$

b. ne**ɬʌ**tɬʌs 'It has been kneaded' P01
n-e-**s̪-Ø-l**=tɬʌs
nq-asp-**prf-3sS-val**=knead$_{PA}$

Forms like (16b) likely also arose by syncope blocking in the **ɬə-* (> /l-/) valence prefix, motivated by homophony avoidance, though with some further complications. For example, the direct juxtaposition of /s̪-/ with the valence prefixes in 3Sg forms is itself due to syncope, as /s̪-/ < PA **sə-* (Krauss 1969).

Finally, the /d̥-/ valence prefix (< PA **də-*) also shows "epenthesis" (i.e., syncope) alternations [d̥-]~[d̥ʌ-] in Lheidli (Gessner 2003). The occurrence of [d̥ʌ-] coincides precisely with those contexts where syncope would have produced an impermissible consonant cluster, which would in turn have triggered *deletion* of the /d̥/. This is precisely what happens in the vast majority of related languages, whereas Lheidli and other Southern Dakelh dialects never syncopated such forms in the first place. As forms with /d̥-/ valence are primarily in opposition to forms with Ø- valence, blocking of syncope (and of the concomitant deletion of /d̥/) can be explained as a homophony avoidance effect here as well.

3.3. A Near-Parallel: Antigemination Effects

Our diachronic account of the mysterious "epenthesis" in Dakelh valence markers constitutes a striking parallel to many of the cases of apparent antigemination effects discussed by Blevins (2004a, b). There too blocking of syncope, previously viewed as a phonological effect (resistance to gemination, e.g. by the OCP), is instead argued to result from paradigmatic homophony avoidance. Syncope would collapse pairs contrasting …C_iVC_i… vs. …C_iC_i…, or else (in languages which actively employ degemination) …C_iVC_i… vs. …C_i…

For example, in Tonkawa (Blevins 2004a) the syncope seen in forms like /picna-oʔ/ → [picnoʔ] 'he cuts it' or /ke-topo-oʔ/ → [ketpoʔ] 'he cuts me' is blocked when the vowel is flanked by identical consonants, as in /hewawa-oʔ/ → [hew**a**woʔ] 'he is dead' or /ke-totopo-oʔ/ → [ket**o**topoʔ] 'he cuts me repeatedly'. As Blevins shows, Tonkawa resolves geminates by degemination, such that

applying syncope in the latter cases would in fact have resulted in **[hewoʔ], **[ketopoʔ] (presumably subject to further syncope giving **[ketpoʔ]).

Tonkawa forms where a potential syncope target is flanked by identical consonants are the result of reduplication (e.g., /hewawa-/ is reduplicated from a base /hewa-/, and /CV-totopo-/ forms contrast with nonreduplicated /CV-topo-/). Syncope, with concomitant degemination, would have completely neutralized such contrasts between reduplicated and non-reduplicated forms of the same verb.

In terms of their diachronic origin, such instances of "antigemination" effects are essentially parallel to the Dakelh developments discussed here. In both cases syncope (as a regular historical sound change) is blocked by considerations of homophony avoidance within paradigms of contrasting forms.

4. Summary

The mysterious "epenthesis" found in 1Sg and 2Du/Pl forms with /l-/ valence in Lheidli and other southern dialects of Dakelh finds a coherent explanation in a diachronic account. The synchronic V~Ø alternation results not from epenthesis but from syncope blocking, which has served to prevent crucial voice/valence distinctions from being collapsed. Our account explains not only the vowel, but also the voiceless lateral, of the seemingly unexpected [ɬʌ-] morph. Finally, the Dakelh development provides an interesting parallel to "antigemination" effects as reinterpreted by Blevins (2004a, b), since both arise through the blocking of syncope for reasons of paradigmatic homophony avoidance.

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University of Victoria
PO Box 3045
Victoria, B.C. V8W 3P4

gessner@uvic.ca

University of British Columbia
Buchanan E270, 1866 Main Mall
Vancouver, B.C. V6T 1Z1

ghansson@interchange.ubc.ca

An Intergenerational Study of Hupa Stress*

MATTHEW GORDON and EDMUNDO LUNA
University of California, Santa Barbara

0. Introduction

Among Edward Sapir's greatest contributions to the study of American Indian languages is the body of Hupa texts he transcribed during the summer of 1927. Recently compiled and analyzed in a published volume edited by Victor Golla and Sean O'Neill (2001), Sapir's field notes mark stress, which has been relatively understudied in Hupa and more generally Pacific Coast Athabaskan. Aside from brief descriptions of stress and prosody in Woodward (1964) and Golla (1970) and a small phonetic study of tone by Goddard (1928), there are to the best of our knowledge no published analyses of Hupa prominence. This paper compares the Hupa stress patterns transcribed by Sapir with results of a study of stress based on spoken data recorded almost 70 years later at a time when the language continued to be spoken fluently by fewer than a dozen speakers.

1. Previous Descriptions of Hupa Stress

There is little previous work on Hupa stress. Woodward (1964:199) briefly comments on the stress system, stating "usually the long syllable (CVˀ or CVCC where the final cluster involves neither /ʔ/ nor /h/) of a polysyllabic word receives a primary stress." She further remarks, "when a polysyllabic word consists entirely of short syllables, there is a tendency to place a somewhat heavier stress on the penult." Golla (1970:40-41) also reports a weight effect, suggesting "long vowels are more highly stressed than adjacent short vowels with the long vowel of a closed syllable most highly stressed." He also alludes to a declination effect spanning a sentence such that the "first syllables of a sentence are more prominent in stress and higher pitch than those that follow."

* Many thanks are due to Victor Golla and Danny Ammon for their helpful logistical advice and suggestions. A great debt of gratitude is owed to the speakers of Hupa for teaching me about their language. Thanks to the American Philosophical Society for making available a microfilm copy of Edward Sapir's 1927 field notes on Hupa and to Sean O'Neill for supplying an electronic version of the Hupa texts. Thanks also to the audience at the 2002 SSILA meeting in San Francisco and BLS for comments. Any errors are solely the authors' responsibility.

Both Woodward and Golla point to the greater weight of long vowels relative to other syllables and also suggest some role for consonants in the weight system albeit in different capacities. Golla's description suggests an overall declination effect that presumably makes earlier syllables more stressed than lighter syllables, whereas Woodward states that the penult is the default location of stress.

2. An Analysis of Stress in Sapir's Hupa Texts

2.1. Methodology

For the first part of the present study, stress patterns were analyzed for 18 of the 77 stories transcribed by Sapir. Of the 18 stories examined here, nine were narrated by Sam Brown, three by Emma Frank, five by Jake Hostler, and one by John Shoemaker. Throughout the texts, Sapir marked stress with an acute accent mark. The vast majority of words are marked with a single stress mark, though there are some that have no stress mark, or, in rare instances, have multiple stress marks.[1] This paper is based on all words with a single stress mark in the examined stories.

The location of stress was tracked according to several factors and entered into a database. First, distance of the stress from both the left edge and the right edge of the word was tracked, in order to ascertain whether stress tended to fall a fixed distance from the word edge. Second, the internal structure of the stressed syllable, i.e., open vs. closed, long vowel vs. short vowel, and the structure of other syllables in the word were examined in order to determine whether stress was sensitive to syllable weight in Hupa. Third, morphological structure was also evaluated in order to assess potential preferences for stressing roots over affixes or vice versa, a phenomenon found elsewhere in Athabaskan (see section 4.2).

In cases where a single word with the same pattern appeared multiple times within the same story, only one token was counted toward the tabulation of stress patterns. This was done in order to avoid biasing the study toward stress patterns found in very frequent words. If, however, the same word displayed different stress patterns within the same story, each variant pattern counted toward the tabulations in proportion to its frequency relative to other variant patterns. Thus, for example, if a word appeared three times in the same text, once with initial stress and twice with second syllable stress, the initial stress pattern contributed 0.33 to the sum total of words with initial stress, while the second syllable stress pattern counted 0.67 toward the total for words with peninitial stress.

2.2. Results

2.2.1. The Two-Syllable Window

Overall a total of 2,230 words containing a single stress mark were found in the examined texts. Strikingly, 2,020 (91%) of these words position stress on one of the first two syllables. Only 157 (7%) words had stress on the third syllable, and 52 (2%) had stress on a syllable after the third one. A similar preference for stress

[1] Words with multiple stresses are rare enough that no reliable inferences about the possibility of secondary stress are possible (see section 3.2.3 for further discussion of secondary stress).

on one of the first two syllables was observed for all four narrators: Sam Brown (1,152 of 1,268 words have stress on one of first two syllables), Emma Frank (297 of 324), Jake Hostler (486 of 544), and John Shoemaker (76 of 87). Examples of stress falling on the first, second, and later syllables appear in (1). Hyphens separate roots from a following enclitic. The text and the line number for each example are in parentheses. Translations are from Golla and O'Neill (2001).

(1) **Initial stress**

tsʰámehstɬ'oːn	'woman'
	Emma Frank's method of doctoring 34
xóntah	'house'
	The origin of the Misq'id Jump Dance 13
tʰóː-tʃ'inʔ	'to the river'
	The village that blasphemed 4
Peninitial stress	
xotáːjaʔkʲ'eʔeʔil	'They swim down the river'
	The village that blasphemed 5
ʍixéːq'eʔ	'Spit of mine'
	Emma Frank's method of doctoring 40
kʲ'ohqît-neʔ	'Ye must pound acorns'
	Power over the grizzly bear 5
Stress after 2nd syllable	
naʔtehstíjaj	'He went back home'
	The hated suitor 24
mil-xotáːjaʔeʔil	'With it they swim downstream'
	The village that blasphemed 6
ʍiq'oʔohtîneː	'Help me (ye)!'
	The hated suitor 44

The heavy preference for placing stress on one of the first two syllables cannot be attributed to a preponderance of disyllabic words in Hupa, since over 75% (1,680 of 2,230) of the words in the database have at least three syllables. Hupa words characteristically consist of a monosyllabic root preceded by one or more prefixes and optionally one or more enclitics. The strong tendency to confine stress to one of the first two syllables thus means that roots are often unstressed. This does not imply, however, that there is an active avoidance of root stress. Indeed there are several instances of stressed roots in the database where other phonological factors such as the two-syllable window and syllable weight effects (see section 3.2.2) would independently predict stress on the root. Examples of root stress in (1) include [kʲ'oh{qît}neʔ] 'You (pl.) must pound acorns' and [{tʰóː}tʃ'inʔ]'to the river'. Rather, it suggests that stress in Hupa was largely blind to morphological structure at the time of Sapir's work. The two-syllable window is also consistent with Golla's (1970) description of prominence declination, which implies stronger stress closer to the left edge of a word.

2.2.2. Syllable Weight

Within the two-syllable window at the left edge of a word, the location of stress is largely predictable with two factors being relevant. First, there is a preference for initial stress over second-syllable stress, all else being equal. Second, the likelihood of attracting stress is a function of syllable weight, where weight adheres to a four-level hierarchy. Long vowels are heaviest (CVV), followed by syllables containing a short vowel and a coda other than /h/ or glottal stop (CVC), followed by open syllables containing a short vowel (CV), followed by syllables closed by a glottal (either glottal stop or /h/) (CVH): CVV > CVC > CV > CVH.

This hierarchy interacts with the preference for initial stress to produce a continuum of likelihood of initial stress over second-syllable stress. The greater the weight of the first syllable relative to the second syllable, the greater the skewing toward initial stress. Conversely, the tendency for initial stress decreases as the weight of the first syllable diminishes relative to the second syllable. Thus the likelihood of initial stress is highest when the first syllable is CVV and the second is CVH, while initial stress is least likely when the first syllable is CVH and the second is CVV. When the first two syllables are equivalent in weight, stress favors the initial syllable. Example words illustrating the preference for initial stress and the relevance of syllable weight appear in (2).

(2)	**CVV > CVC**	q’antʃ’úːltʃʷil	‘a young man’
			A war btn the Hupa and Yurok 56
	CVV > CV	xotáːjaʔkʲ’eʔeʔil	‘They swim down the river’
			The village that blasphemed 5
	CVV > CVH	jehjáːkʲ’itiltal	‘Let us go in stamp-dancing’
			The Kick Dance 38
	CVC > CV	kʲ’eʔílxiw-mil	‘When she’s finished’
			The Kick Dance 26
	CVC > CVH	meʔnílkʲit	‘He fears it’
			Power over the grizzly bear 57
	CV > CVH	naʔkʲ’ítʰaʔaʔaw	‘again starts singing’
			The Kick Dance 35
	Initial in tie	tánlaŋʍoʔ-tiŋ	‘several times’
			The Kick Dance 15

Table 1 provides the number of words with initial stress and the number of words with second-syllable stress as a function of the weight of the initial (x-axis) and second (y-axis) syllables. The percentage of words with initial stress appears in parentheses. The number of cases of initial stress appears before the slash and the number of cases of peninitial stress comes after the slash. As Table 1 shows, there is an increasing tendency toward initial stress as the weight of the first syllable increases relative to the second syllable, i.e., as one moves down and to the right of the table. For example, only 9% of the words with a CVV second syllable after a CVH initial have initial stress. When, however, the first syllable is CVV and the

second is CVH, 99.2% of words have initial stress. The bias for initial stress is evident when the first two syllables are equal in weight, in which case stress falls on the first syllable greater than half the time with the likelihood of initial stress increasing (roughly) as a function of the weight of the first two syllables.

2.2.3. The Role of Weight in Stress to the Right of the Two-Syllable Window

The relevance of weight in the first two syllables raises the question of whether instances of stress occurring after the first two syllables might be attributed to a weight effect. Thus stress might fall to the right of the two-syllable window if a syllable outside of the window is heavier than either of the first two syllables. For example, we might ask whether a CVV third syllable tends to attract stress from an initial CV.CV sequence due to its heavier status. For this to be established, two facts must be demonstrated. First, one must show that, in words with third-syllable stress, the third syllable tends to be heavier than the first two. Second, it must be established that, in words with stress on one of the first two syllables, there is not a heavier syllable after the second syllable.

Table 1. Number of words with initial or peninitial stress as a function of weight

		Initial syllable			
		CVH	**CV**	**CVC**	**CVV**
Second syllable	**CVV**	8.5/85.5 (9.0%)	54/168 (44.3%)	39.8/60.2 (39.8%)	164.5/28.5 (85.2%)
	CVC	27.3/74.8 (26.7%)	142.5/107.5 (57%)	88/23 (79.3%)	157.8/11.2 (93.4%)
	CV	31/48 (39.2%)	64.9/39.3 (62.3%)	31/5 (86.1%)	157/4 (97.5%)
	CVH	9.5/5.5 (63.3%)	116.7/17.3 (87.1%)	81/15 (84.4%)	152.8/1.2 (99.2%)

The hypothesis that stress migration to the right of the two-syllable window is a weight effect was tested against a subset of the data (12 of the 18 stories). For these stories, there were a total of 99 tokens with stress on the third syllable. Of these 99 words, the third syllable was CVV in 51, CVC in 24, and CV or CVH in 24. Of the 51 words with stress on a CVV third syllable, 46 lacked a CVV syllable among the first two syllables. Of the 24 with stress on a CVC third syllable, 16 lacked a heavier or equivalently heavy syllable, i.e., CVV or CVC, among the first two. Based on these data, it might seem that weight is responsible for stress falling to the right of the second syllable. However, of the 24 words with stress on a CV or CVH third syllable, 18 have a syllable at least as heavy as CV among the first two. This result argues against the hypothesis that stress only tends to drift to the right of the first two syllables if there is a heavier syllable after the second syllable. More tellingly, 132 words in the corpus have stress on a

non-CVV syllable within the two-syllable window *despite having a CVV syllable to the right of the window*. This figure far exceeds the 46 words with stress on a CVV third syllable and no CVV syllable among the first two. We may thus conclude that while many cases of stress to the right of the two-syllable window are consistent with a preference for placing stress on heavy syllables, stress is not consistently attracted by heavy syllables outside of the window.

2.2.4. Summary of Patterns in Hupa in Sapir's Texts

In summary, Sapir's transcriptions suggest a strong tendency to restrict stress to one of the first two syllables in a word without any preference for stressing roots over affixes. Within the two-syllable stress window at the left edge of a word, initial stress is preferred, although this preference weakens as the weight of the second syllable increases relative to the weight of the first syllable. Syllable weight operates along a four-way weight hierarchy: CVV > CVC > CV > CVH. Most of the isolated cases of stress falling outside of the first two syllables of a word involve a heavy syllable attracting stress away from lighter syllables within the two-syllable window. Nevertheless, the attraction of stress by a syllable outside of the first two is a relatively rare phenomenon regardless of weight.

3. An Acoustic and Phonological Study of Modern Hupa

3.1. Methodology

An analysis of stress was conducted based on approximately 100 words elicited in isolation by two Hupa speakers in 1995 and on a shorter list of approximately 25 words uttered by a third speaker. Most of the words were recorded onto a high quality portable analog cassette recorded using a noise cancelling unidirectional microphone. The recorded words ranged from two to seven syllables long and differed in their morphological composition and the structure of syllables comprising the word. In addition, for two of the speakers, stress patterns were transcribed for a smaller set of words not recorded. Recorded data were digitized at 16 kHz using Kay Elemetrics CSL and acoustic analysis was performed using Scicon's MacQuirer. Three measurements were taken for each of the syllables in the word. First, the duration of each vowel was measured from a waveform in conjunction with a spectrogram. Second, intensity was measured at the mid point of each vowel from an intensity curve. Finally, the fundamental frequency value at the mid point of each vowel was taken from a pitch trace.

3.2. Results of the Acoustic/Phonological Study

Based on the examined data, two factors are relevant for predicting the location of stress in modern Hupa: syllable weight and morphological structure.

3.2.1. The Role of Syllable Weight in Modern Hupa Stress

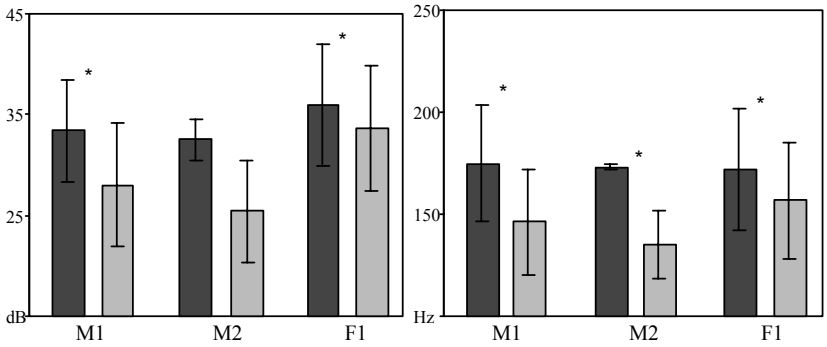
Impressionistic transcriptions of stress and acoustic measurements point to the preferential attraction of stress by long vocoids, including long vowels and vowels followed by a glide. The corpus includes many words containing a single long

vocoid, which consistently attracts stress over other syllables regardless of position. Words illustrating the attraction of stress by long vocoids appear in (3).

(3)	k’ɪlé:xɪtʃ	‘boy’	ná:tɬ’aʔ	‘backwards’
	tʃ’ɪɬɪq’á:w	‘he’s fat’	q’antʃú:ltʃʷɪl	‘teenage boy’
	tʃɪmé:l	‘lizard’	nájdɪɬ	‘we go about’
	é:bɪlos	‘apple’	mɪq’ost’áw	‘nine’

Acoustic results are consistent with the attraction of stress by long vocoids. For all three speakers, long vocoids have greater intensity and higher fundamental frequency than short vowels in words with a single long vowel. Results for intensity and f0 for the three speakers are depicted graphically in Figure 1. Pairwise comparisons for both intensity and f0 between short (unstressed) vowels and long (stressed) vowels reach statistical significance at minimally $p < 0.05$ in unpaired t-tests for all speakers, except for M2, for whom the intensity difference failed to reach significance, likely due to the relatively small number of tokens.

Figure 1. Intensity (left) and fundamental frequency (right) of stressed (dark bars) and unstressed (light bars) vowels in words containing one long vowel. Asterisks mark statistically significant comparisons; error bars mark standard deviations.



In words containing multiple long vocoids, the first long vocoid is more prominent than subsequent ones, as the examples in (4) show.[2]

(4)	mé:ne:skɪt	‘I was afraid’	ná:jne:l	‘I played’
	nó:k’ɪne:jo:t	‘dog’	k’é:ne:s	‘it’s tall’

Acoustic results generally line up well with these patterns though not all potential correlates of stress are used to cue stress in words with multiple long vowels. In

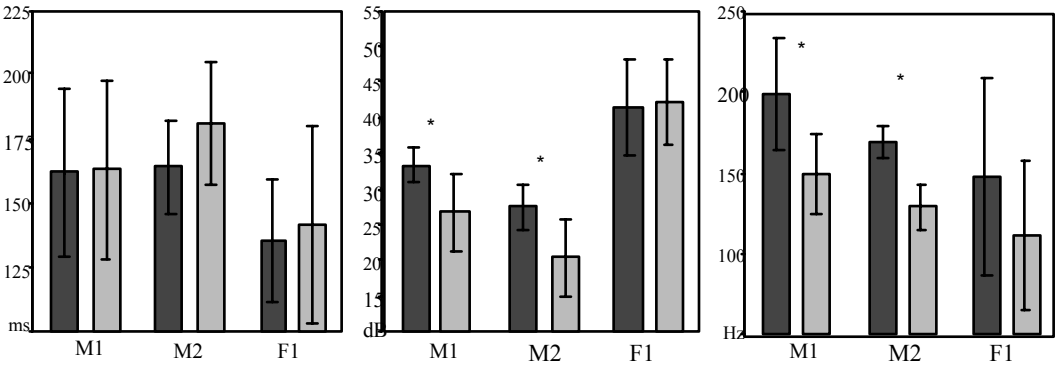
[2] There is one word in the corpus with an extra-long vocoid, i.e., a long vowel followed by a glide. In this word, [no:ˡna:wtsʰe:] ‘door’, the extra-long vocoid attracts stress from an earlier long vowel.

particular, duration does not reliably distinguish stressed and unstressed long vowels. Results by speaker are shown in Figure 2. Intensity and f0 reliably distinguish stressed and unstressed long vowels, with pairwise comparisons for individual speakers reaching significance in unpaired t-tests for the two male speakers but not for the female speaker. Nevertheless, the female speaker shows the same tendency for higher f0 on stressed long vowels as the male speakers, though this difference is not statistically reliable. Duration does not reliably distinguish stressed and unstressed long vowels. In fact, unstressed long vowels are longer than stressed long vowels for the second male speaker though this difference is not statistically reliable. It is likely that the greater length of unstressed long vowels is attributed to final lengthening, as some of the unstressed long vowels were in final position (see section 3.2.2).

3.2.2. The Role of Morphology in Modern Hupa Stress

In words lacking a long vowel, a preference for stressing roots over affixes rears its head. Most roots in Hupa, as in other Athabaskan languages, are monosyllabic. In words containing a monosyllabic root and lacking long vowels, stress falls on the root syllable, which is necessarily heavy due to a restriction requiring that roots end in a CVV or CVC syllable. Words illustrating root stress appear in (5).

Figure 2. Duration, intensity, and fundamental frequency of stressed (dark bars) and unstressed (light bars) vowels in words with more than one long vowel.



(5)	nɪ{tɬ’ít s’}	‘it’s hard’	ʍɪ{tʃ’án}eʔ	‘my apron’
	nɪ{q’ós}	‘your neck’	{tínkʲ’}ɪtɪŋ	‘four times’
	xo{tʃ’ít}	‘I know him’	wuʍ{xít’}nɛʔɛn	‘I swallowed it’

Syllable weight interacts with the attraction of stress by roots in two cases. First, short voweled syllables closed by a glottal, either /h/ or glottal stop, optionally pass stress to the initial syllable even if this syllable is not part of the root. Thus, the words in (6) have two variants.

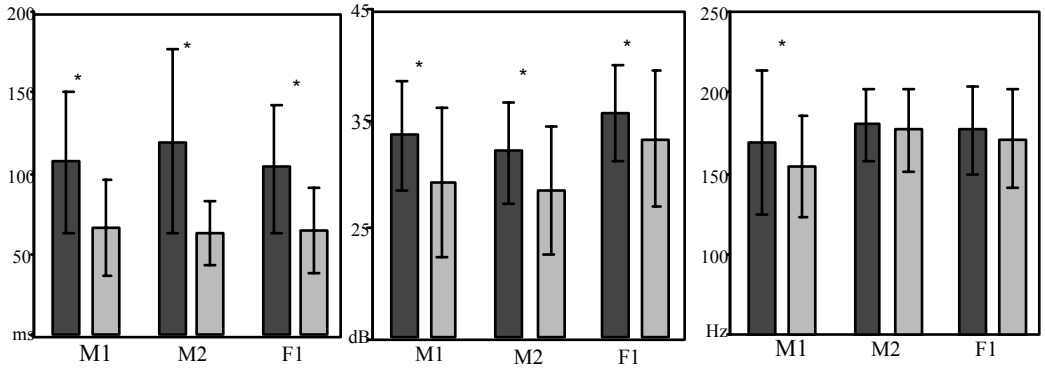
(6)	ʍí{taʔ} / ʍɪ{táʔ}	'my mouth'	ní{t'ah} / nɪ{t'áh}	'your pocket'
	x^wí{laʔ} / x^wɪ{láʔ}	'his hand'	{q'ínaʔ} / {q'ɪnáʔ}	'also'

The second case in which weight interacts with morphology arises in polysyllabic roots. Such roots preferentially stress CVC over CV, a preference that manifests itself in words lacking a CVV prefix. Thus in a polysyllabic root with a single CVC syllable and one or more CV syllables, the CVC syllable attracts stress. In polysyllabic roots with multiple CVC, the first one typically is stressed. Examples of stress patterns in polysyllabic roots without a long vowel are in (7).

(7)	{míntɪtʃ}	'wildcat'	{aláʃ}	'nasty'
	noh{xóntah}	'our house'	{tʃ'áhlaʔqateʔ}	'sunflower'
	{xóltʃeh}	'skunk'	{táhmɪneʔ}	'lichen'

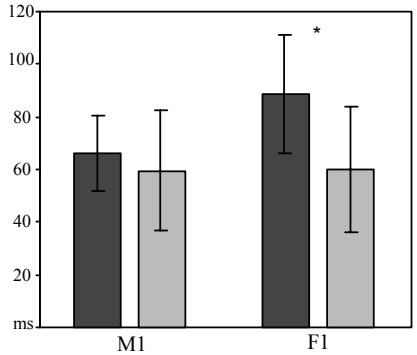
Stressed short vowels typically have greater duration and intensity and higher f0 than unstressed short vowels in the same word, as Figure 3 shows.

Figure 3. Duration, intensity, and fundamental frequency of stressed (dark bars) and unstressed (light bars) short vowels in words lacking a long vowel.



One question raised by the use of duration as a signal of root stress is the potential confounding factor of final lengthening, since most of the short stressed vowels are word-final. In order to assess this possibility, another duration analysis was conducted excluding vowels in final syllables. Results are shown in Figure 4 for the first male speaker and the female speaker, the two speakers for whom there was sufficient data to make the comparison. The duration difference between stressed short root vowels and unstressed non-final affixal vowels still obtains. The duration difference between stressed and unstressed vowels, however, is smaller. Thus, both stress and final position cause lengthening, a pattern also found by Tuttle (in press) in Apache, another Athabaskan language.

Figure 4. Duration of stressed (dark bars) and unstressed (light bars) short vowels in non-final syllables.



3.2.3. Secondary Stress

The examined data failed to show convincing evidence for secondary stress. While non-primary stressed long vowels were more intense than unstressed short vowels for the female speaker, this trend was not observed for either of the male speakers. Furthermore, f0 was actually lower for non-primary stressed long vowels relative to unstressed short vowels for the second male speaker and the female speaker, with the other male speaker showing virtually no difference in f0.

4. Discussion

4.1. Comparison of Stress in Sapir's Hupa and Modern Hupa

The stress patterns found in Sapir's texts and those discovered in the analysis of Hupa as spoken 68 years after Sapir's work are similar in certain respects but different in others. Both sources of data observe the weight hierarchy CVV > CVC > CV > CVH. In Sapir's data, this hierarchy is relevant within the two-syllable window at the left edge of a word. In the more recent data, different portions of the weight hierarchy are applicable in different contexts. CVV is heavier than other syllables throughout the word, as reflected in the ability of CVV to attract stress both in the root and in affixes. CVC is heavier than CV only within the root, since root CVC attracts stress from a CV syllable to its left but prefixal CVC does not. Finally, the light status of CVH relative to all other syllables is evident in the root, where CVH (a subset of CVC) optionally rejects stress in the root, the only context where CVH could be stressed. Also common to both data sources is a leftward attraction of stress. In Sapir's data the leftmost syllable bears stress if the first two syllables are equal in weight. In the later data, the leftmost CVV attracts stress over a CVV to its right. Likewise, the leftmost CVC in a root characteristically carries stress over another CVC to its right.

The distinction between CVC and CV in the root is one manifestation of the increased role of morphology in the more recent data. Whereas the stress system in Sapir's data is insensitive to the distinction between roots and affixes, the root is stress-attracting in the later data. In this newer data, a root syllable carries stress unless there is a prefixal CVV to the left of the root. The two-syllable window

effect is thus no longer relevant in the recent data, being replaced with an attraction of stress by roots.

One possible explanation for the difference in stress patterns between the two data sources is attributed to a difference in the nature of the data. Sapir's data come from narratives while the later data are drawn from words uttered in isolation. It is conceivable that words in isolation have different prominence patterns from those uttered in connected speech. This hypothesis assumes that Sapir's transcriptions of stress are not based on re-eliciting individual words after hearing them in larger phrases. If Sapir were going back and listening to words individually for transcription purposes, then his stress transcriptions could also be based on words uttered in isolation, as in the later data. In this case, we would need to look elsewhere for an explanation of the differences in results.

Another more interesting possibility is that the difference in the two studies reflects a genuine difference between two prosodic stages in Hupa. Assuming this to be the case, we may tentatively speculate on how the two-syllable window effect could have been replaced by root-sensitive stress. One possibility is that final lengthening (section 3.2.2) has gradually attracted stress to final syllables. Because the root typically is word-final, final stress could easily be equated with root-final stress. In support of this hypothesis, non-final short vowels are phonetically short and often are completely elided, particularly in open syllables. Their short duration and potential to delete would make short vowels less suitable docking sites for stress. In contrast, words containing a prefinal long vowel would be less resistant to stress shift due to the inherently greater length of long vowels.

4.2. Stress in Hupa and Elsewhere in Athabaskan

Hupa shares with several other Athabaskan languages its attraction of stress by roots, including the Northern Athabaskan languages Tanana (Tuttle 1998), Ahtna (Kari 1990, Tuttle 2003), Tahltan (Alderete and Rob in press), Witsuwit'en and Fort Ware Sekani (Hargus in press), and in Hare Slave nouns (Rice 1989, 1990). Tuttle (in press) finds that roots also attract stress in the southern Athabaskan languages Western and Jicarilla Apache (see also McDonough 1999 on Navajo).

Syllable weight effects are also observed in other Athabaskan languages besides Hupa. In Tanana, all heavy syllables attract stress, where heavy syllables are closed syllables and those containing a full, i.e. long, vowel. Alderete and Rob (in press) report interesting weight effects in Tahltan that resemble those found in Hupa in certain respects. They find that, although primary stress typically falls on the root, there are certain forms in the corpus where a prefixal CVV syllable pulls stress off the root, a pattern analogous to that observed regularly in the synchronic Hupa data. Strikingly, they also find that CV(C)CVC root-final syllables in disyllabic roots show a deviation from the initial stress pattern found in CVCV disyllabic roots. CV(C)CVC roots place stress on a final CVC, parallel to the attraction of stress by CVC within Hupa roots. Hargus (2001, in press) reports a four-way weight hierarchy for stress in Witsuwit'en with long vowels heaviest, followed by non-reduced short vowels, followed by closed syllables containing a

reduced vowel, followed by open syllables containing a reduced vowel. Hargus (in press) also finds that vowel quality (but not the distinction between open and closed syllables) is relevant for stress in Fort Ware Sekani.

There is relatively little work on the acoustic correlates of stress in Athabaskan languages to which the present study can be compared. Tuttle (1998) finds that duration is the most reliable correlate of stress in Minto and Salcha Tanana, with f0 and intensity playing a supporting role in Salcha but not reliably in Minto. As Tuttle suggests, the lesser role of f0 (and perhaps intensity which is often correlated with f0) in Minto plausibly finds a functional explanation: tone is used to signal morphological and lexical contrasts in Minto but not Salcha. This accords with Hargus' (in press) study of stress in Witsuwit'en and Fort Ware Sekani, in which she shows that non-tonal Witsuwit'en relies more on f0 to cue stress than tonal Fort Ware Sekani. For both languages, duration and intensity are the most reliable correlates of stress.

Compared to these northern Athabaskan languages, Hupa's correlates of stress are quite robust, as duration, fundamental frequency, and intensity are all used to mark stress. The clear acoustic presence of stress is perhaps not surprising, since Hupa, like other Pacific Coast Athabaskan languages, lacks lexical tone. Thus, fundamental frequency is free to be used as a marker of stress.

5. Conclusions

This paper has examined stress patterns from two different sources on Hupa corresponding to two different stages in the history of the language separated by 68 years. Both sets of data are sensitive to the same syllable weight hierarchy: CVV > CVC > CV > CVH. This weight hierarchy is manifested in different ways during the two stages of Hupa. In the Sapir data, weight is relevant within a two-syllable window at the left edge of a word, with stress preferentially falling on the initial syllable if the first two syllables are equivalent in weight. In the more recent acoustic data, stress falls on the leftmost CVV syllable and on the root in the absence of any prefixal long vowels. Within the root, stress preferentially falls on the leftmost closed syllable. Syllables closed by a glottal optionally reject stress in any context unless there is no other syllable containing a non-glottal coda. Hupa at both stages examined in this paper shares with certain other Athabaskan languages its sensitivity to syllable weight in its stress system. Furthermore, the later data follow the tendency for root stress in Athabaskan languages.

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Department of Linguistics
University of California
Santa Barbara, CA 93106

mgordon@linguistics.ucsb.edu
ecluna@umail.ucsb.edu

Scope of Negation and Clause Structure in Japanese[1]

CHUNG-HYE HAN, DENNIS RYAN STOROSHENKO, YASUKO SAKURAI
Simon Fraser University

0. Introduction

Japanese has two ways of forming sentential negation: regular negation with *-na* inflected on the main verb, as in (1a), and *wa*-negation with the so-called topic marker *-wa* on the main verb followed by auxiliary *suru* inflected with *-na*, as in (1b).[2]

(1) a. Donald-ga orenji subete-o tabe-na-katta.
Donald-NOM orange every-ACC eat-NEG-PST
'Donald did not eat every orange.'

b. Donald-ga orenji subete-o tabe-wa shi-na-katta.
Donald-NOM orange every-ACC eat-TOP do-NEG-PST
'Donald did not eat every orange.'

The purpose of this paper is to provide a unified syntactic analysis of the two types of negation based on data concerning the scope of negation and a quantified object NP (object QNP), extracted through psycholinguistic experimentation using a technique known as the Truth Value Judgment Task (TVJT) (Crain and Thornton, 1998). We will argue that the findings of our experiment support a view that the negation projection is placed low in the clause structure, within the lexical vP domain.

This paper is organized as follows. In section 1, we consider lexical and syntactic approaches to Japanese negation and conclude that the data calls for the syntactic approach with a negation projection (NegP) in the clause structure. We then present an argument that the scope interaction between negation and the object QNP makes a great test for the position of NegP in Japanese. We point out, however, that the data cannot be used as it is presented in the literature on this topic because the scope judgments reported there conflict with each other, making it impossible for us to make any coherent conclusions. This raises a question as to the validity of the methodology employed in extracting these scope judgments. In section 2, we present the TVJT experiment that we conducted in order to extract more reliable scope judgments. After a discussion of the particulars of our experiment, we present our findings followed by their implications for the syntax of negation in Japanese.

[1]We thank the audience at BLS 30 for helpful questions and comments. The work reported in this paper was supported by SSHRC #410-2003-0544 to the first author.

[2]We gloss *-wa* as TOP 'topic marker' for lack of a better term, but stay neutral as to the discourse function of this marker.

1. Negation Projection

1.1. Motivating a Negation Projection

In principle, negation *-na* can be incorporated into the clause structure in two alternative ways: lexically or structurally. Under the lexical approach, *-na* is a derivational morpheme, entering the syntactic derivation as a single syntactic unit along with the verb it is affixed onto. Under the structural approach, *-na* is an inflectional morpheme, projecting its own functional projection (NegP), and combining with the verb in morphology.

The form of the tense inflection on the verb occurring with *-na* appears to support the lexical approach. In Japanese, the tense inflection on the adjective is distinct from the verb. For example, while the past tense morpheme on the verb *tabe* 'eat' is *-ta* as in (2a), the one on the adjective *oki* 'big' is *-katta* as in (2b). It turns out that negated verbs pattern with adjectives, not with verbs, taking the adjective tense inflection, as in (2c).

(2) a. Jiroo-ga piza-o tabe-**ta**.
Jiroo-NOM pizza-ACC eat-PST
'Jiroo ate pizza.'

b. Hon-wa oki-**katta**.
book-TOP big-PST
'The book was big.'

c. Jiroo-ga piza-o tabe-**na**-**katta**.
Jiroo-NOM pizza-ACC eat-NEG-PST
'Jiroo did not eat pizza.'

This patterning of tense inflection seems to suggest that *-na* is a derivational morpheme that derives an adjectival category. However, there are at least two facts that support the structural approach to *-na*. First, syntactically, negated verbs still behave like verbs. For example, transitive verbs usually assign an accusative case to their internal arguments as in (2a), while transitive adjectives usually assign a nominative case to them as in (3). The internal argument in negated verbs bears accusative case, hence patterning as a verb, not as an adjective, as in (2c).

(3) Noriko-wa Shuya-ga suki desu.
Noriko-TOP Shuya-NOM fond of be
'Noriko is fond of Shuya.'

Further evidence supporting the structural approach comes from the fact that *-na* triggers weak island effects. While object extraction from an embedded clause across a negative matrix predicate is possible as in (4a), adjunct extraction in the same context is not possible (Hoji, 1985; Miyagawa, 2002). In (4b), only the reading in which the time of Shuya's thinking is questioned is available.

(4) a. Nani-o$_i$ Hanako-shika [Taroo-ga t_i kat-ta to]
what-ACC$_i$ Hanako-only Taroo-NOM t_i buy-PST COMP
omottei-na-i-no?
think-NEG-NPST-Q
'What does only Hanako think that Taroo bought?'

b. Shuya-ga itsu Noriko-ga suupu-o non-da to
Shuya-NOM when Noriko-NOM soup-ACC drink-PST COMP
omo-ana-katta-no?
think-NEG-PST-Q
'When didn't Shuya think Noriko drank soup?'

According to Rizzi (1990), an empty operator in [Spec,NegP] is responsible for weak island effects in negative sentences. The same type of weak island effect found in Japanese negative sentences thus provides evidence for an empty operator in [Spec,NegP], which in turn is evidence for positing a phrasal projection for negation.

1.2. Placement of the Negation Projection

We have so far established that Japanese negation projects a NegP. The question now is where in the clause structure NegP is projected, and whether there are two different positions for NegP, given that Japanese has two ways of forming sentential negation, regular and *wa*-negation, as was illustrated in (1). The fact that the two negations cannot be combined to form a double negation, as in (5), suggests that there is only one NegP position in Japanese clause structure.

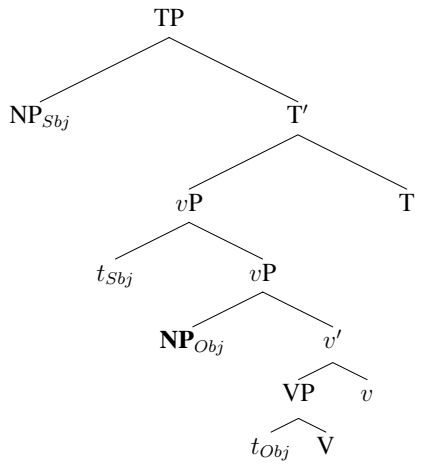
(5) * Donald-ga orenji subete-o tabe-**na**-wa shi-**na**-katta.
Donald-NOM orange every-ACC eat-NEG-TOP do-NEG-PST
'Donald didn't not eat every orange.'

The issue of determining the exact position of NegP turns out to be a difficult one, even though there is a good diagnostic for it, namely scope interaction between negation and object QNP. Two independently motivated background facts about Japanese syntax make scope facts informative. First, scope for argument NPs is fixed before, and not at, LF in Japanese, as independently motivated by Scope Rigidity effects (Kuno, 1973; Kuroda, 1979; Hoji, 1985). That is, the scope of argument QNPs is determined by the surface c-command relationship, without recourse to QR or reconstruction. Thus, a sentence with canonical SOV word order containing quantifiers in both subject and object NPs only exhibits the reading in which the subject scopes over the object, as in (6).

(6) Dareka-ga ooku-no hitobito-o hihanshi-ta.
someone-NOM many-GEN people-ACC criticize-PST
'Someone criticized many people.'
($\surd$some>many, *many>some)

Second, it is standardly assumed that the object NP in Japanese undergoes object raising to [Spec,vP] to check accusative case, forming a multiple specifier with the external argument, the subject, as in (7) (Chomsky, 1995; Koizumi, 1995; Miyagawa, 2001).

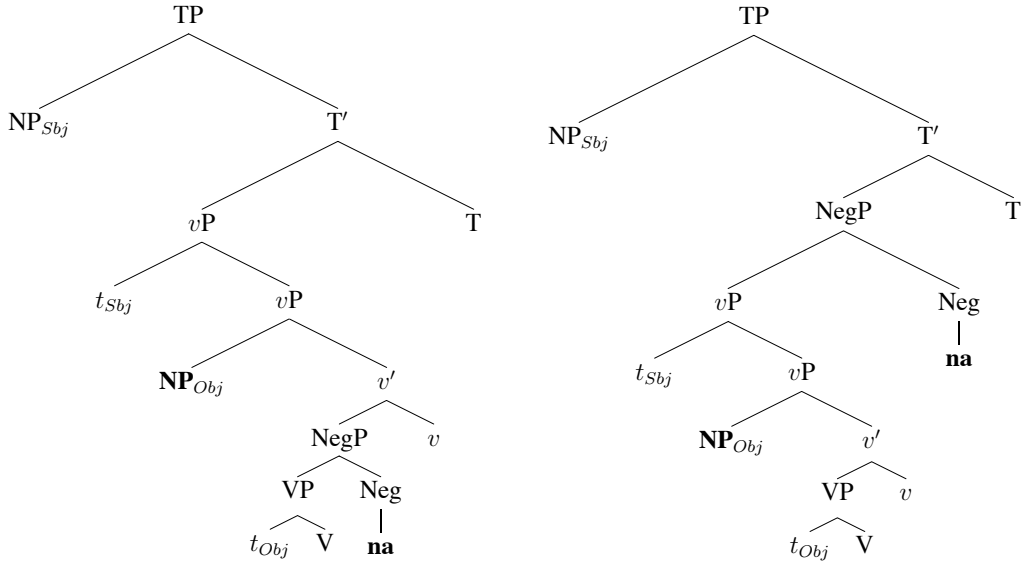
(7)



Positing multiple specifiers of v, one for the external argument and the other for the purposes of accusative case checking, captures the tight connection between the external argument and accusative case, as reflected in Burzio's Generalization. In passives, v would be defective, neither having the ability to check accusative case nor host an external argument, hence lacking both of the specifiers.

Putting the two background facts together, a prediction emerges. Starting with the clause structure in (7), there are two possible positions for NegP in principle: NegP could be low in the clause structure within vP as in Hypothesis 1 in (8a), or it could be higher in the clause structure above vP as in Hypothesis 2 in (8b).

(8) a. Hypothesis 1 b. Hypothesis 2



Further, given Scope Rigidity, in a negative sentence with an object QNP in its canonical position, the relative scope of negation and the object QNP will directly reflect their relative positions with respect to each other. This then means that the two hypotheses in (8) make different predictions: Hypothesis 1 predicts that object

QNP scopes over negation, and Hypothesis 2 predicts that negation scopes over object QNP. The predictions are clear, but unfortunately, the claims made in the literature about this topic are not.

1.3. Disagreement in the Literature

When examining the relationship between sentential negation and an object QNP, there are ultimately three possible relations: Neg > Q, Q > Neg, or ambiguity in which, for a given sentence, either relation can hold. In examining the existing literature on the subject, all three of these positions can be found, with the further complication that opinions can vary depending upon the type of negation being used. Kuno (1980) enters this discussion with the claim that verbally-adjoined negation takes scope only over the immediately preceding verb, but amends this claim when examining a case with an object QNP:

(9) Pai-o zenbu tabe-rare-na-katta.
Pie-ACC all eat-can-NEG-PST
'I could not eat all the pie.'

For examples like (9), Kuno claims that the reading should primarily be Neg > Q, despite his earlier claim that negation should take the narrowest possible scope. The alternative reading of Q > Neg is given as a possible secondary reading. The notion that an object QNP should take scope over negation arises in Yatabe (1996), where it is claimed that all quantifiers in Japanese should take scope over negation. In this analysis, readings of Neg > Q are not attained whatsoever.

The possibility of outright ambiguity emerges in Ota and Kato (1986), where examples such as (9) are given as equally Neg > Q or Q > Neg, without hedges such as referring to primary or secondary readings. In attempting to solve a separate syntactic puzzle, Miyagawa (2001) uses both subject and object QNP scope judgments as a source of evidence. Here, while the overall appraisal seems to agree with Kuno in that Neg > Q seems to be the preferred reading when encountering an object QNP, Miyagawa notes that for some consultants, Q > Neg was also possible. Thus, while Kuno and others seem to believe that regular negation sentences are subtly ambiguous, Miyagawa introduces the notion that they may only be so for some native speakers.

There is much less said in the literature on the subject of the relative scope between object QNP's and *wa*-negation. This being the case, what little there is to be found is noteworthy in that unlike the discussion of regular negation's scope, all discussions of *wa*-negation scope are consistent. There is general agreement with the stance taken in Ota and Kato (1986) that in *wa*-negation, negation should always scope over the object QNP.

2. Experimental Investigation

Given the conflicting claims in the literature on the scope judgments, we cannot use them as they are to make any conclusions as to which hypothesis is superior. What could be the source of the disagreement in the literature? One possibility might be the methodological problem in the elicitation of scope judgments. Some speakers may have difficulty in identifying a reading associated with a sentence without a sufficient discourse context. Another possibility might be that the disagreement actually reflects speakers' grammars. It is possible that different speakers have

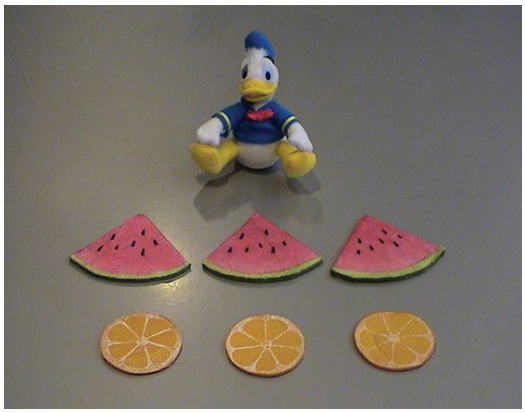
different grammars, resulting in the apparent disagreement in scope judgments. To address these issues, we designed a psycholinguistic experiment using the TVJT technique and extracted scope judgments that we think clearly reflect speakers' grammars.

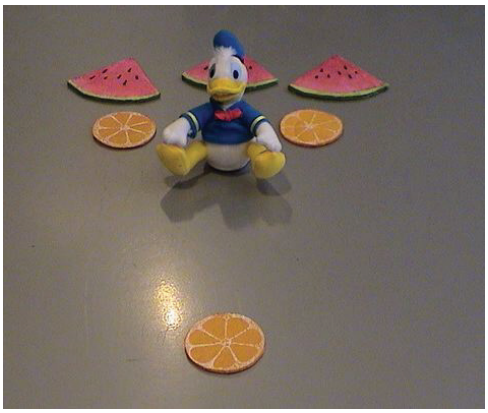
2.1. Methodology

The TVJT involves two experimenters. One experimenter acts out short stories in front of the participant using toys. The other experimenter plays the role of a puppet (e.g., Mickey Mouse) who watches the scenario alongside the participant. At the end of the story, the puppet makes a statement about the story. The participant's task is to determine whether the puppet understood the story and say whether it told the truth or not.

To test how speakers interpret a sentence with negation and an object QNP, such as *Donald didn't eat every orange*, an experimenter enacts a story, using Donald Duck, three oranges, and three watermelons. Donald Duck is hungry and finds three oranges and three watermelons. He then eats all three watermelons, but eats only two oranges. In figure (10), the picture in the left is a shot of the beginning of the scenario, and the one in the right is a shot of the end of the scenario. After the enactment is over, the puppet is prompted to say what just happened. It then makes the statement in (11).

(10) Context





(11) Puppet statement:
"I know what happened. **Donald didn't eat every orange.** Am I right?"

In this story, the reading in which negation scopes over the object QNP (Neg $>$ $\forall$) yields true, and the reading in which the object QNP scopes over negation ($\forall$ $>$ Neg) yields false. So if a participant accepts (11) in this context, then we can conclude that the grammar makes available the wide scope reading of negation. But if a participant rejects (11), we can conclude that it must be because the grammar does not generate Neg $>$ $\forall$ interpretation.

The TVJT provides rich discourse contexts in a simple method, with not much memory load on the participants. It has been shown to work in several languages, such as English and Kannada in Lidz and Musolino (2002) and Korean in Han et al. (2003), and to work with both adults and children as young as 4 years old (Crain

and McKee, 1985; Crain and Thornton, 1998; Lidz and Musolino, 2002; Han et al., 2003).

The overall design of our experiment and the stories we used in the TVJT are closely modelled after the work reported in Han et al. (2003). We designed the experiment to test 2 factors with 2 levels each: negation type (regular neg vs. *wa*-neg) $\times$ scope ($\forall >$ Neg vs. Neg $> \forall$). The experiment was thus divided into 4 different conditions, each condition testing for the $\forall >$ Neg or Neg $> \forall$ reading in sentences containing regular or *wa*-negation. For each condition, we tested 12 participants, a total of 48 participants for the entire experiment. They are 20- to 30-year-old Japanese native speakers living in Vancouver at the time of the testing, who had spent no more than a combined span of 12 months in North America or any other English-speaking area. The design is summarized in table (12).

(12) Experimental Design

Scope	Plain negation	*wa*-negation
$\forall >$ Neg	$n = 12$	$n = 12$
Neg $> \forall$	$n = 12$	$n = 12$

Participants were tested individually in a small classroom. Each participant was first introduced to the task with 4 practice trials. They were then given 4 test trials and 4 filler trials in a pseudorandom order. In a brief debriefing session at the end of all the trials, they were asked to provide a justification for their answers. This allowed us to check whether the answers of the participants were based on the right reasons and not on irrelevant factors. All scenarios were pre-recorded and were shown to each participant on a portable computer screen. The use of pre-recorded scenarios allowed us to avoid any variation in the enactment of scenarios and to keep the prosody of the test statements constant. The test sentences given to the participants each contained an object QNP with either regular or *wa*-negation, as in (1), repeated here as (13). In the scenario that tests the Neg $> \forall$ reading, Donald eats two oranges out of three, and in the scenario that tests the $\forall >$ Neg reading, Donald eats none of the oranges.

(13) a. Donald-ga orenji subete-o tabe-na-katta.
Donald-NOM orange every-ACC eat-NEG-PST
'Donald did not eat every orange.'

b. Donald-ga orenji subete-o tabe-wa shi-na-katta.
Donald-NOM orange every-ACC eat-TOP do-NEG-PST
'Donald did not eat every orange.'

The purpose of the filler trials was to separately test the participants' comprehension of negation and of QNPs, and to prevent any priming effects. All participants were given two filler sentences containing a subject QNP, as in (14a), and the participants in regular negation conditions were given two filler sentences with *wa*-negation, as in (14b), while those in *wa*-negation conditions were given two filler sentences with regular negation, as in (14c). To introduce variation in the answers, we set up the filler scenarios such that two of the fillers should be true and the other two should be false.

(14) a. Otokonohito subete-ga iwa-o nage-ta.
man every-NOM rock-ACC throw-PST
'Every man threw a rock.'

b. Zou-ga kirikabu-ni nobori-wa shi-na-katta.
elephant-NOM tree-trunk-onto climb-TOP do-NEG-PST
'The elephant did not climb onto the tree trunk.'

c. Zou-ga kirikabu-ni nobor-ana-katta.
elephant-NOM tree-trunk-onto climb-NEG-PST
'The elephant did not climb onto the tree trunk.'

2.2. Results

To obtain quantified results, whenever a participant accepted a statement, that response was scored as one, and the rejection of a statement was scored as zero. The mean percentage acceptance by condition was computed by first converting a participant's score out of four (= # of test trials) to a percentage, then arriving at the arithmetic mean of the twelve (= # of participants per condition) percentage scores.

The overall results from the experiment are summarized in table (15). Our findings are: (i) regardless of negation type, speakers accept the $\forall >$ Neg reading; (ii) speakers accept the Neg $> \forall$ reading with *wa*-negation; (iii) only 54% of the speakers accept the Neg $> \forall$ reading with regular negation.

(15) Mean Percentage Acceptance

Scope	Plain Negation	*wa*-Negation
$\forall >$ Neg	98%	98%
Neg $> \forall$	54%	94%

The results clearly show that the condition testing the Neg $> \forall$ reading with regular negation stands out in comparison to the other conditions. Unlike the other three conditions, the participants in this condition roughly show a 50-50 split in their responses, replicating the disagreement in the literature. The significance of the results in this condition is verified by a one-way ANOVA, comparing average scores across all four conditions. The end result is [$F(3,44) = 9.156$, $p < .0001$], indicating an extremely high degree of statistical significance. Post-hoc analysis using the Tukey HSD test yields a significant ($p < .05$) difference whenever the 'Neg $> \forall$, regular negation' condition is compared against one of the other three conditions. We take these results to indicate that our findings can be generalized out to the entire population of Japanese speakers.

2.3. Discussion and Analysis

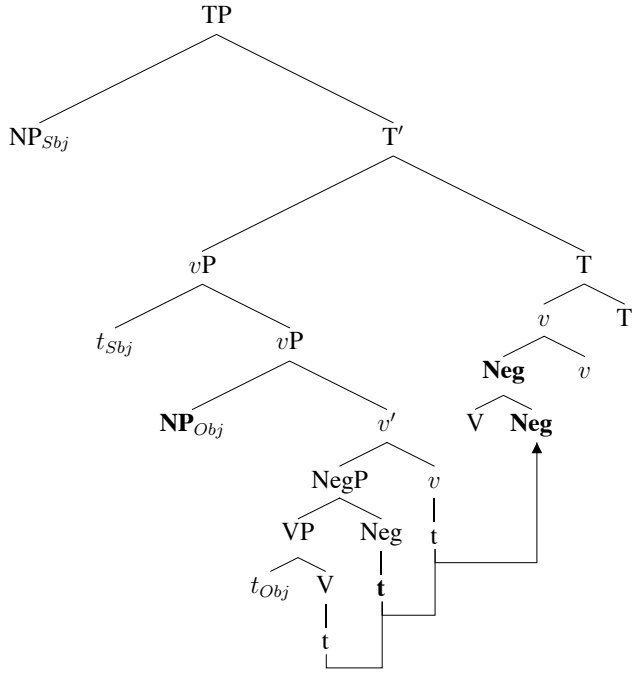
In this section, we consider the two hypotheses in (8) against our findings and argue that Hypothesis 1 is superior.

According to our findings, almost all the speakers accepted the $\forall >$ Neg reading in the '$\forall >$ Neg - regular negation' condition. This suggests that a structure is available in which NegP is hierarchically lower than the object QNP, as in (8a). However, a structure in which NegP is higher than the object QNP, as in (8b), is also consistent with the data. This is because the situation that meets the truth conditions

of $\forall >$ Neg also meets the truth conditions of Neg $> \forall$. For instance, a situation in which Donald eats none of the oranges is also a situation in which Donald eats not all of the oranges. Hence, speakers could be accepting the statements in the '$\forall >$ Neg - regular negation' condition with the Neg $> \forall$ generated by Hypothesis 2. So, the data in this condition remains inconclusive in determining the superiority of the two hypotheses. This kind of problem is identified as 'the entailment problem' by Lidz and Musolino (2002).[3]

In the 'Neg $> \forall$ - regular negation' condition, only half of the speakers accepted the Neg $> \forall$ reading. This fact simply cannot be accounted for with Hypothesis 2, because this hypothesis can only generate the Neg $> \forall$ reading, hence incorrectly predicting 100% acceptance in this condition. With Hypothesis 1 in conjunction with verb raising, the split response in this condition can be accounted for. According to Hypothesis 1, NegP is c-commanded by the object QNP, accounting for the half of the speakers who rejected the Neg $> \forall$ reading. For the other half of the speakers, a structure must be available in which negation is higher than the object QNP. This can be obtained if the verb raises to T^0, picking up negation on its way to T^0, forming a complex head, as in (16). Assuming the Kaynean definition of c-command, as in (17), negation in T^0 is able to c-command out of the complex head, and take scope over the object.

(16)



(17) X c-commands Y iff X and Y are categories and X excludes Y [no segment of X dominates Y] and every category that dominates X dominates Y (Kayne, 1994, p. 16).

[3] A way to avoid the entailment problem and to obtain more conclusive data in this condition would be to use scenarios and test statements with numeral quantifiers. For example, in a scenario where Donald is given four oranges but eats only two of them, *Donald did not eat two oranges* is true under the Two $>$ Neg reading but false under the Neg $>$ Two reading. We are currently in the process of designing a new experiment with numerals.

But our reasoning so far implies that only half of the speakers have verb raising. If all the speakers had verb raising, then all the speakers would incorrectly be predicted to accept the Neg $>$ $\forall$ reading, just as predicted by Hypothesis 2.

The idea that there may be variation concerning verb raising within a single speech community is not new. Han et al. (2003) report a similar TVJT experiment on scope of negation and object QNP in Korean with a similar split in scope judgments. Han et al. argue that this split is a by-product of the head-final clausal structure which obliterates string order evidence for verb raising. Thus, as far as verb raising is concerned, they argue, the learners of Korean do not receive enough evidence to decide the matter, and hence not all speakers acquire the same grammar. We take our results from Japanese, another head-final language, to be a further support of the proposal put forth in Han et al. and conclude that the Neg $>$ $\forall$ reading with regular negation is available only to the speakers that have acquired a verb raising grammar. This proposal is further supported by the fact that the split in scope judgments is not within a speaker but between speakers: that is, a speaker either uniformly accepted Neg $>$ $\forall$ or uniformly rejected Neg $>$ $\forall$, and s/he did not accept or reject Neg $>$ $\forall$ half of the time.[4]

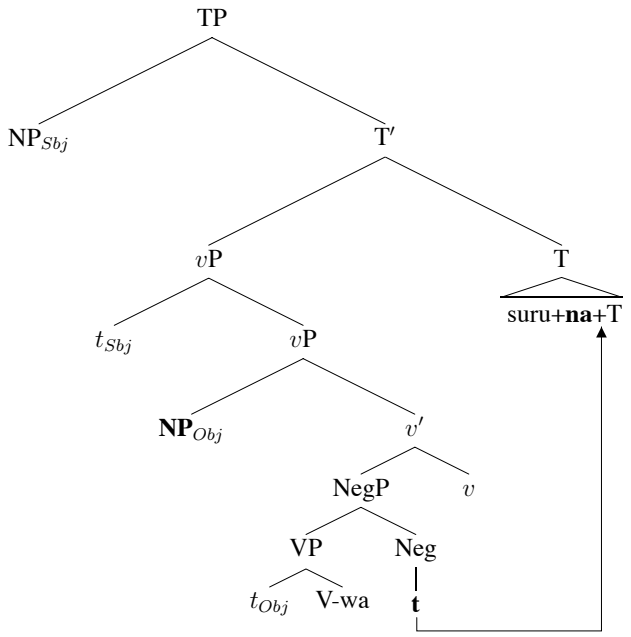
We now need to recast the data in the '$\forall$ $>$ Neg - regular negation' condition in light of the split in verb raising. For the speakers who do not have verb raising, Hypothesis 1 straightforwardly generates the $\forall$ $>$ Neg reading. For the speakers who have verb raising, negation will end up taking scope over the object QNP, generating the Neg $>$ $\forall$ reading. But as discussed earlier, even these speakers will accept the statements given because the scenario that verifies $\forall$ $>$ Neg also verifies Neg $>$ $\forall$. This then accounts for the near 100% acceptance rate in this condition.[5]

Almost all speakers accepted the Neg $>$ $\forall$ reading in the 'Neg $>$ $\forall$ - *wa*-negation' condition. What this means is that a structure is available for all speakers in which negation is higher than the object QNP. How could this be if negation is projected lower in the clause, as we just concluded? First of all, a clause structure containing *wa*-negation which is consistent with Hypothesis 1 is as in (18), where *-wa* on the verb blocks the verb from coming together with the tense inflection, and instead *suru* 'do' is inserted in T^0 to support tense. Further, exploiting the fact that *-na* has an affixal status morphologically, the Neg $>$ $\forall$ reading can be generated if *na* moves and cliticizes onto *suru* in T^0. We assume that *-na* adjoins to T^0 in syntax and then it undergoes a morpho-phonological relinearization in morphology (in the sense of Embick and Noyer 2001 and Fukui and Sakai 2003) obtaining the surface string order *suru*+*na*+TENSE.

[4]Interestingly, the literature on Japanese does not seem to agree on whether Japanese has verb raising, just as there isn't much agreement on scope judgments concerning negation and quantified arguments. For instance, while Otani and Whitman (1991) and Koizumi (2000) argue for verb raising, Hoji (1998) points out a flaw in Otani and Whitman's argument, essentially concluding that their argument is not sufficient to support verb raising, and Fukui and Sakai (2003) refute all the arguments presented by Koizumi and argue for the position that Japanese has no verb raising. See Storoshenko (2004) for a summary of the literature on this issue. A similar state of affairs for Korean is reported and summarized in Han et al. (2003).

[5]If we were to use numerals instead of a universal quantifier in the test sentences, we would predict a split in responses in this condition as well. This prediction remains to be tested.

(18)



In the '$\forall >$ Neg - *wa*-negation' condition, almost all speakers also accepted the $\forall >$ Neg reading. The structure in (18) is consistent with this finding. The 100% acceptance rate is expected because a context that verifies the $\forall >$ Neg reading also verifies the Neg $> \forall$ reading.[6]

3. Conclusion

In this paper, we have shown, through scope judgments obtained from a TVJT experiment, that Japanese speakers seem to uniformly accept the $\forall >$ Neg reading with regular and *wa*-negation, and the Neg $> \forall$ reading with *wa*-negation, but that there is a split in the population when it comes to the Neg $> \forall$ reading with regular negation. We have attributed this split in scope judgments to a split in the availability of verb raising within the population, and argued that all the data can be accounted for if negation is projected lower in the clause structure. With our analysis, we are able to present a unified account of the two types of sentential negation in Japanese, and also provide an explanation for the disagreement in the extant literature on the topic of negation scope as a reflection of speakers' grammars.

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[6] With test sentences containing numerals, we predict a near 0% acceptance rate in this condition.

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Chung-hye Han, Dennis Ryan Storoshenko, Yasuko Sakurai
8888 University Drive
Department of Linguistics
Simon Fraser University
Burnaby, BC V5A1S6, Canada

{chunghye,dstorosh,ysakurai}@sfu.ca

Long-Distance Voicing Agreement: An Evolutionary Perspective

GUNNAR ÓLAFUR HANSSON
University of British Columbia

0. Introduction

Phenomena involving the long-distance assimilation of consonants (e.g., Ineseño /**s**-api-**tʃ**^{h}o-it/ → [**ʃ**apit**ʃ**^{h}olit], Yaka /-**m**í:tuk-i**d**i/ → [-**m**í:tuk-i**n**i]) have come under renewed scrutiny in recent years.[1] Most notably, it has been argued that such phenomena involve not feature spreading but featural *agreement*, and are rooted in the psycholinguistic domain of phonological encoding for speech production (e.g., Walker 2000; Rose and Walker 2000, 2004; Hansson 2001). Some typical diagnostics of consonantal agreement systems are listed in (1):

(1) Salient characteristics of long-distance consonant agreement:
   a. Highly sensitive to (triggered by) *similarity* of potential trigger-target pair.
   b. Often sensitive to the *proximity* of target to trigger in the output string.
   c. Displays certain asymmetries robustly attested in speech errors (direction of assimilation, "palatal bias" effects, etc.).
   d. Very often restricted to morpheme-internal contexts, or to derivational (as opposed to inflectional) domains within the output string.

Nevertheless it remains unclear what it really means to say that such agreement has its roots in the speech planning domain. Is the link genuinely synchronic—i.e., grammar-internal—or merely diachronic ("phonologized speech errors"), or perhaps a combination of both? Does it hold for all agreement systems or just some, and how can we tell? Adopting the perspective of Evolutionary Phonology (Blevins and Garrett 1998, 2004; Blevins 2004a, b, to appear; Garrett and Blevins to appear), with its emphasis on the primacy of a diachronic mode of explanation for synchronic sound patterns, the problem can be approached by posing the following questions: (i) What are the diachronic pathways by which consonant agreement phenomena can and do arise? (ii) Do some, or perhaps all, agreement

[1] I am indebted to several people for helpful comments and feedback on the work presented here, especially Juliette Blevins, Andrew Garrett, Suzanne Gessner, Bruce Hayes, Beth Hume, Larry Hyman, Sharon Inkelas, Sharon Rose and Rachel Walker. All errors remain my own.

systems of a particular type arise by "unnatural" mechanisms—i.e., not through (listener-based) sound change but by analogical processes? (iii) Does a case-by-case examination of the diachronic origins of individual agreement systems shed light on the typological properties of those particular systems? (iv) Does such an examination help sharpen our understanding of consonant agreement, and elucidate its supposed relation to psycholinguistic factors of speech planning?

This paper attempts to address the above questions with respect to one particular subtype of long-distance consonantal assimilation phenomena: *voicing agreement*. Three central claims are made here. First of all, I argue that some of the clearest cases of voicing agreement are likely to be the secondary diachronic result of analogical processes. They may thus have little to do with factors of speech planning, at least as regards their origin or motivation. Secondly, these "unnatural" diachronic scenarios help explain certain anomalous aspects of the systems in question which raise serious difficulties for analyses appealing to factors of speech planning at the synchronic level. Finally, the remaining residue of attested [voice] agreement systems is rather more well-behaved, displaying a range of properties characteristic of the vast majority of agreement phenomena.

1. Unnatural Histories of Voicing Agreement

A closer look at the typology of the (rather few) attested voicing agreement systems reveals that nearly all cases (for surveys see Hansson 2001, Rose and Walker 2004) can be partitioned into the two categories in (2):

(2) Near-exhaustive categories of voicing agreement systems:
   a. Languages which show (synchronically and/or diachronically) extensive *tone-voicing interdependence*—in particular interaction of Low tone and [voiced] obstruents—as well as tone-spreading processes.
   b. Languages which have agreement in at least one *other laryngeal feature* as well, and where distributional evidence suggests that agreement in [voice] is explicitly patterned after agreement in the other feature(s).

It is proposed here that the cases in (2a) arise through analogical reanalysis. Fortuitous patterns of agreement at-a-distance in [voice], which are themselves ultimately an accidental byproduct of L(ow) tone spreading and L-induced voicing, are interpreted at face value: as [voice] agreement in its own right. The proposed explanation for the cases in (2b) is that they are due to analogical extension. An independently existing agreement pattern in some other laryngeal feature, such as [spread glottis] or [constr. glottis], is extended or generalized to encompass the class (or node) of laryngeal features as a whole, including [voice].

1.1. Analogical Reanalysis of Tone-Voicing Interaction

Cross-linguistically, laryngeal features are known to interact strongly with pitch and phonological tone (e.g., Hombert 1978). Phonetically, modal voicing has a f0-

lowering effect; phonologically, [voice] often conditions L or blocks the presence of H (Hyman and Schuh 1974, Bradshaw 1999). Importantly, the tone-voicing correlation is *bidirectional*: L may condition [voice], just as [voice] may induce or facilitate L tone (Poser 1981, Bradshaw 1999).

The clearest case of tone-induced voicing is that of Yabem (Oceanic, Papua New Guinea; see Hansson 2004 for details and references). In this language, a lexical tone contrast (/áwé/ 'outside' vs. /àwè/ 'woman') goes hand in hand with voicing in obstruents, if any are present; obstruents are voiced in low-toned syllables, else voiceless (/**t**í**p**/ 'all at once' vs. /**d**ì**b**/ 'thud'). The dependence of obstruent voicing on tone, combined with a tone spreading process, results in prefixes agreeing in tone *and* voicing with a following root (e.g., /**k**á-**t**áŋ/ 'I weep' vs. /**g**à-**d**èŋ/ 'I move towards' for 1.sg.realis /ka-/).

This state of affairs in Yabem gives the appearance of voicing agreement, though the identity in voicing values is fortuitous as such, being mediated by tone. What is more, the "agreement" even seems to show a similarity restriction (cf. (1a) above) in that the sole fricative /s/ fails to interact with stops (cf. /**s**à**g**ìŋ/ 'house partition', /**d**à-**s**àʔ/ 'we (incl.) put on top of'). However, the apparent similarity restriction simply results from a general devoicing of earlier **z* in the recent history of Yabem, which obliterated [z]~[s] alternations. See Hansson (2004) for a full analysis of Yabem tone-voicing interaction in Optimality Theory.

1.1.1. Voicing Agreement and Tone-Voicing Interaction in Kera

Only one case is attested where voicing agreement results in overt alternations: Kera (East Chadic, Chad; Ebert 1979a, Walker 2000, Hansson 2001, Uffmann 2003, Rose and Walker 2004). With extremely few exceptions, voiced and voiceless pulmonic plosives do not cooccur in this language (unless noted otherwise, all data is cited from Ebert 1979a):

(3) Voicing agreement in Kera words:

a.	**d**è**g**é	'to stomp'	b.	**t**é**k**é	'to pluck'
	dè**b**é	'to flee'		**t**é**p**é	'to gather'
	də̀**b**ə̀r**g**ə́	'hen'		**k**ū**p**úr**k**í	'billy goat'

Alternations in [voice] are most clearly visible in words containing nominal affixes with /k/ (surfacing as [k ~ g]), as in (4):

(4) Affix alternations due to voicing agreement:

a.	/k + sir + kí/	→	**k**ī**s**í**r**í	'black (masc.)'
	/k + dʒàr + káŋ/	→	**g**ə̀**dʒ**à**r**áŋ	'colourful (coll.)'
b.	/k + taːtá + w/	→	**k**ə̄**t**ā**ːt**áw	'cooking pots'
	/k + dʒàːŋà + w/	→	**g**ə̀**dʒ**àːŋáw	'footstools'

Among the general class of obstruents, it appears that neither implosives nor (pulmonic) fricatives participate in the voicing agreement. As illustrated in (5), voiced implosive stops freely cooccur with voiceless and voiced pulmonic stops alike (5a), and voiceless fricatives freely cooccur with voiced stops (5b).

(5) Implosives and fricatives are neutral/immune to voicing agreement:

a.	**ɗ**ĩ**g**í	'to think'	**ɗ**ú**p**í	'to scoop (pl.)'
	ɓál**g**é	'to spoil'	**ɓ**ə́**k**áj	[no gloss]
	gù**ɓ**í	'to shut in'	**tʃ**ér**ɗ**é	'to press'
b.	**f**èr**g**é	'to itch'	(< ***v**èr**g**é)	
	dèf**é**	'to make [sauce]'	(< ***dè**v**é**)	

Both of the limitations in (5) could be attributed to a similarity restriction (Rose and Walker 2004; cf. Hansson 2001). However, there are two reasons why this is less than ideal. For one thing, the apparent failure of fricatives to participate in voicing agreement in (5b) is clearly the secondary result of a general devoicing of voiced fricatives (almost universal for /z/ > /s/, sporadic for /v/ > /f/). The original voicing values can in fact usually be inferred from the tone pattern; once these are "restored," few if any cases remain of voicing *dis*agreement in words mixing plosives with fricatives. In its original form, then, agreement must have targeted all (pulmonic) obstruents. Secondly, to interpret implosives as being consistently dissimilar to pulmonic obstruents creates severe problems with respect to the similarity metric; see section 2 below for detailed discussion.

As it turns out, there is extensive interaction between tone and laryngeal features in Kera, as in many other languages of the Chadic family (Ebert 1979a, b; Pearce 1998/99). More specifically, [voice] in obstruents frequently conditions Low tone. For example, in verbs, a root-initial voiced obstruent forces the following vowel to be L (6a) rather than M or H (6b):

(6) Kera verbs: tone predictable based on consonants (from Pearce 1998/99)

a.	/zald-ú/	zàld-ú	'hit him'	b.	/mirk-ú/	mírk-ú	'greet him'
	/zald-m/	zàld-àm	'hit you (m.)'		/mirk-m/	mīrk-īm	'greet you (m.)'
	/gun-ú/	gùn-ù	'awaken him'				
	/gun-m/	gùn-ùm	'awaken you (m.)'				

The L induced by the voicing of a root-initial obstruent is involved in several processes: (i) L blocks leftward spread of H from a H-toned suffix such as /-ú/; (ii) L spreads to a toneless prefix or suffix vowel (often epenthetic, but not always); (iii) under certain conditions, L spreads to a H-toned suffix, delinking the H (e.g., in /gun-ú/ → [gùn-ù]).

In all cases of affixal [voice] alternations as in (4), e.g., /k-dʒàːŋà-w/ → [**g**ə̀-**dʒ**àːŋá-w], the voicing-induced L of the root-initial syllable spreads to an (epenthetic) prefix vowel. As a result, voicing agreement is seen to reach across a

L vowel. Likewise, when voicing passes from root to suffix (e.g., /-dʒàr-káŋ/ → [-**dʒ**àr-**g**áŋ]), the intervening root vowel is by necessity low-toned, cf. (6a) above.

This appears to be a general distributional pattern in Kera; two agreeing [+voiced] obstruents are *always* separated by a low-toned vowel/rhyme. What is more, the following example suggests that an intervening L is in fact a necessary condition for voicing agreement to take place:

(7) Voicing agreement blocked by intervening H? (from Pearce 1998/99:51)
/k-ágàj/ → **k**ə**g**àj 'hoes' (not ****g**ə**g**àj)

In sum, there is considerable evidence suggesting that (low) tone is implicated in creating the Kera voicing agreement pattern, if not synchronically then at least at some diachronic stage. Whether the two agreeing obstruents are in a single root (e.g., [dèbé]), a root-suffix sequence (e.g., [-dʒàr-gáŋ]), or a prefix-root sequence (e.g., [gə-dʒà:ŋá-w]), the intervening L may in fact be the culprit *directly* responsible for the voicing of one of the obstruents—much like in Yabem above.

1.1.2. Voicing Agreement and Tone in Ngizim

Voicing agreement, by the regressive assimilation in [voice] between pulmonic obstruents, is also attested in another Chadic language, Ngizim (West Chadic, Nigeria; Schuh 1997; see Hansson 2001). Historically, morpheme-internal *T…D sequences were harmonized to D…D (though borrowings have given rise to new, disharmonic T…D sequences). Fricatives participate in the agreement, but just as in Kera, implosives fail to interact with their pulmonic counterparts:

(8) Voicing agreement in Ngizim (data from Schuh 1997):

a.	gâ:zá	'chicken'	<	*k…z	(cf. Hausa /kà:zá:/)
	dəbâ	'woven tray'	<	*t…b	(cf. Hausa /tà:fí:/ 'palm')
	zèdù	'six'	<	*s…d	(cf. Hausa /ʃídà/)
b.	kì:ɗú	'eat (meat)'			(not > **gìɗú)
	fəɗú	'four'			(not > **vəɗú)

There is no obvious connection between tone patterns and the voicing agreement (and the agreement is probably not synchronically active). Nevertheless, there is clear and ample evidence of interaction of low tone with obstruent voicing in Ngizim, both in the diachronic development of tone and in synchronic tonal processes (Schuh 1971, Bradshaw 1999); in all such cases, (voiced) implosives pattern with voiceless obstruents rather than with voiced ones. Given the pervasive connection between L and [voice] in Ngizim phonology (synchronic as well as diachronic), and given the fact that implosives pattern alike in tonal processes and in voicing agreement, it is at least a plausible conjecture that tone may have been implicated in the historical development of voicing agreement.

1.2. Analogical Extension of Other Laryngeal Agreement?

In a small number of cases, agreement in [voice] coexists with agreement in another laryngeal feature, either [spread glottis] or [constricted glottis]; the overall pattern is thus a three-way laryngeal agreement system. As demonstrated in this section, evidence suggests that voicing agreement has a secondary status and likely results from analogical extension or expansion of a previous two-way system to a three-way one. A shared property of these languages is the limitation of laryngeal agreement to *plosives*, excluding fricatives.

1.2.1. Voicing and Aspiration Agreement in Zulu and Ndebele

A general morpheme-internal laryngeal harmony among (non-click) stops holds in Zulu and Ndebele (Bantu, S. Africa/Zimbabwe; Khumalo 1987, Hyman 1999, Hansson 2001). Other things being equal, roots with multiple stops have only T^h…T^h, T…T, or D…D, never disharmonic sequences like *T…T^h or *T^h…D:

(9) Harmonic roots in Zulu (Khumalo 1987):

a.	-**k^h**e**t^h**a	'to choose'	b.	-**p**e**t**a	'to dig up'	c. -**g**u**b**a	'to dig'
	-**p^h**a**t^h**a	'to hold'		-**t**a**p**a	'to collect'		

(10) Agreement enforced in Zulu loanword adaptation (Khumalo 1987):

a.	í-**k^h**ô**t^h**o	'court'	(from English *court* /**k^h**ɔ**t**/)
b.	úm-**b**í**d**i	'conductor'	(from English *beat* /**b**i**t**/)

Aspiration agreement, in Zulu and Ndebele alike, is overridden by a restriction limiting [k^h] to root-initial position (Khumalo 1987, Hyman 1999, Hansson 2001), as shown in (11a).[2] However, when the two stops are homorganic, it is agreement that instead overrides the ban against non-initial [k^h] (11b).

(11) Aspiration agreement and medial [k^h] (Ndebele data from CBOLD[3]):

a.	-**p^h**e**k**a	'cook, brew'	(not **-p^hek^ha)
	-**t^h**i**k**aza	'be disturbed'	(not **-t^hik^haza)
b.	-**k^h**o**k^h**a	'pull, draw out'	
	-**k^h**u**k^h**ula	'sweep away'	

Voicing agreement behaves in the exact same way with respect to non-initial velars. If the trigger is a heterorganic stop (labial or coronal), agreement is thwarted, resulting in medial [k] as in (12a). If the trigger is a homorganic stop (velar), then agreement is enforced, giving rise to medial [g] (12b).

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[2] Strictly speaking, [k^h] does not need to be in absolute root-initial position, as long as it is *the first consonant* within the root (cf. Ndebele /-ak^ha/ 'build', /-ok^ha/ 'roast').

[3] CBOLD = *Comparative Bantu On-Line Dictionary*, lexicographic database accessible at <http://www.ddl.ish-lyon.cnrs.fr/bdd/cbold/>.

(12) Voicing agreement and medial [g] (Ndebele data from CBOLD):

a.	-**d**a**k**wa	'be drunk'	(not **-dagwa)
	-**d**i**k**isa	'palpitate, twitch'	(not **-digisa)
b.	-**g**u**g**a	'wear out'	

The problem is that Zulu/Ndebele does *not* have any prohibition against medial [g] that could account for (12a) vs. (12b). In contexts where agreement is not at stake, non-initial [g] freely occurs (unlike [k^h]), cf. /-fuga/ 'push a cart', /-huga/ 'allure, entice', /-lagisa/ 'send cattle to grazing place', etc. Instead, it seems that the patterning of voicing agreement with respect to targeting of velars (and the role of trigger-target homorganicity) is somehow *modelled after* the patterning of aspiration agreement with respect to the same factors. The latter is simply interacting with independently validated phonotactic restrictions.

These facts suggest that voicing agreement in Zulu and Ndebele arose through the analogical generalization or "promotion" of aspiration agreement to an all-encompassing laryngeal agreement (subsuming [voice]). Although much is yet unclear about the precise mechanism underlying such a development, agreement in [voice] thus appears to be of secondary origin in this case as well.[4]

1.2.2. Voicing and Ejection Agreement in Chaha

Root-internal laryngeal harmony among stops also occurs in Chaha, a Gurage dialect (Semitic, Ethiopia; Rose and Walker 2000, 2004). The features involved are [voice] and [constr. glottis], separating three series of voiced, voiceless, and ejective stops. The agreement, illustrated in (13), is most consistently enforced between stops which are adjacent within the consonantal root (e.g., /**t'ɨk'ɨ**r/ 'hide!') but it is also highly significant between non-root-adjacent stops (e.g., /**t'ɨ**β**ə**k'/ 'be tight!'; see Rose and Walker 2004).[5]

(13) Laryngeal agreement in Chaha roots (from Rose and Walker 2004)

a.	**k'ɨt'ɨ**r	'kill!'	b.	**gɨdɨ**r	'put to sleep!'	c.	**kɨt**f	'hash [meat]!'
	n**ɨt'ɨk'**	'snatch!'		**ə**d(**ɨ**)**g**	'make fall!'		**tɨk**s	'set on fire!'

Comparison with related languages reveals evidence that regressive assimilation has taken place in roots mixing ejectives and voiced stops, as illustrated in (14).

[4] See Hansson (2001) for arguments that coronal agreement in Tahltan (Athapaskan; British Columbia) has undergone a similar expansion from a two-way to a three-way system. Note further that the very origin of the [voiced] stop series as such in Zulu/Ndebele is somewhat unclear. Finally, Larry Hyman (p.c.) suggests that it is at least conceivable that tone has played a role in the development of Zulu/Ndebele voicing agreement as well, as L/[voice] interaction is rampant in these languages.

[5] It should be noted that, due to the usual Semitic OCP-Place restrictions on root consonants, nearly all of the relevant stop combinations are *heterorganic*.

(14) Comparative evidence of regressive assimilation (Rose and Walker 2000):

	Chaha	*Amharic*	
a.	**t'ɨk'**ə**k'**	**dɨk'**ə**k'**	'be crushed/grounded!'
	w**ɨt'ə k'**	w**ɨdə k'**	'snatch!'
b.	**gɨd**a	**k'ɨd**a	'draw liquid!'
	m**ɨdad**	m**ɨt'**a**d**	'griddle!'

Interaction between [voiced] and [constricted glottis] stops might be seen as a restriction against the cooccurrence of stops with conflicting (privative) laryngeal features. Such effects are attested elsewhere, e.g., in 'Peruvian' Aymara (MacEachern 1999, Hansson 2001), where [constr.gl.] stops and [spr.gl.] stops cannot cooccur (*K'…T^h, *T'…K^h, *K^h…T', etc.), though each freely cooccurs with the plain stops which lack laryngeal specifications (i.e., K'…T, T^h…K, etc.).

Comparison with related languages has yet to reveal direct evidence of agreement being actively implemented through assimilation in the case of voiced/plain combinations (D…K, K…D, etc.) or ejective/plain combinations (T'…K, K…T', etc.), though such combinations are virtually nonexistent in the Chaha lexicon. Interestingly, in their database of 855 verb roots, Rose and Walker (2004) find only a single exception to "pure" agreement in [constr.gl.] agreement (of the type K'…T, T'…K, etc.), but numerous exceptions to "pure" agreement in [voice] (of the kind G…T, D…K, etc.). It thus seems that agreement in voicing is less strictly enforced in Chaha than agreement in ejection. Moreover, Rose and King (2003) found that Amharic has a significant cooccurrence restriction on root-adjacent stops differing only in [constr.gl.], but no corresponding restriction on stops differing only in [voice], indicating that any voicing agreement observed in Chaha is a later innovation.

2. Inertness of Implosives and the Similarity Metric

Recall that in the Chadic languages discussed in section 1.1, implosives are inert, consistently failing to trigger voicing agreement, unlike their pulmonic congeners (stops and fricatives). Thus words like Kera /ɗúpí/ 'to scoop (pl.)' or Ngizim /fəɗú/ do not get "repaired" to **[ɗúbí] and **[vəɗú], respectively. The analysis of voicing agreement as similarity-driven correspondence (Walker 2000, Hansson 2001, Rose and Walker 2004) has no recourse but to interpret the lack of interaction in these cases as a *similarity effect*. In other words, the level of similarity which holds between an implosive and a (voiceless) pulmonic obstruent must be below the threshold at which agreement becomes mandatory.

Recent work has suggested that segment-to-segment similarity is best calculated in terms of the set of distinct natural classes arising from the segment inventory of the language in question, and the degree of overlap in the sets of natural classes to which the two segments belong (Frisch 1996, Frisch et al. 2004).

(15) Similarity metric based on distinct natural classes:

$$\text{Similarity} = \frac{\text{Shared natural classes}}{\text{Shared natural classes} + \text{Non-shared natural classes}}$$

Unfortunately, however, the metric in (15)—as well as one based on simple feature-counting—makes incorrect predictions for implosives in Kera and Ngizim (Hansson 2001). In both languages, agreement applies to all pairs of pulmonic obstruents, even those which differ in place of articulation and/or manner. By contrast, a pulmonic-implosive pair is *not* subjected to agreement even when the two segments are identical in all other features. Consequently, if agreement is indeed automatically triggered by a high degree of similarity, we must assume that heterorganic stop-fricative pairs like */t…v/ or */f…d/ (banned due to agreement) are in fact being counted as "more similar" than homorganic stop-stop pairs like /t…ɗ/ or /ɓ…p/! This is incompatible with any reasonable similarity metric, including the natural-class-based one above. Representative figures are shown in (16) for /t…v/ vs. /t…ɗ/ in Ngizim; the similarity of /t/ to /ɗ/ is several times greater than that of /t/ to /v/, and yet the former fails to trigger agreement.

(16) Similarity values given Ngizim segment inventory:[6]

a.	/t…ɗ/:	21/(21+24) = 0.47	(harmony *not* triggered)
b.	/t…v/:	7/(7+57) = 0.11	(harmony triggered)

If, however, voicing agreement in Kera and Ngizim is instead due to analogical reanalysis of tone-voicing interaction effects, then the inertness of implosives is entirely as expected. In Kera, for example, the (voiced) implosives pattern with voiceless obstruents rather than with voiced pulmonic obstruents in their interaction with tone. In verbs, a root-initial implosive or voiceless obstruent forces the following vowel to be H rather than L (17); in nouns the same consonants force the vowel to be either M or H, not L (18):

(17) Kera verb tones and phonation of root-initial C (Ebert 1979a):

a.	/bəŋ-é/	bìŋ-ì	'to open'	b.	/taːk-é/	táːk-é	'to let'
	/gun-é/	gùn-ì	'to wake [s.o.]'		/fel-é/	fél-é	'to find'
	/zel-é/	zèl-è	'to boil'		/ɗəg-é/	ɗíg-í	'to think'
	/var-é/	vèr-è	'to choose'		/ɓal-é/	ɓél-é	'to nail'

[6] The overall number of natural classes depends on the feature system used, and whether any features are defined as privative rather than binary (precluding reference to negative values). The calculations in (16) are based on a somewhat simplistic all-binary system, which generates a rather large number of natural classes, but this does not significantly affect the magnitude of the difference between the values in (16a) and (16b).

(18) Kera noun tones and phonation of root-initial C (Pearce 1998/99):

a.	bə̀gàr	'antelope'	b.	kēlēw	'horn'
	dà:rə̀	'friend'		pə́ŋáj	'mountain'
	gèŋé	'men in bush'		ɓō:rō	'bow and arrows'
	zə̀búl	'soap'		ɗárká	'ant hill'

Given that implosives are not correlated with L tone, the hypothesis that voicing agreement in Chadic results from the analogical reinterpretation of patterns resulting from tone-voicing interaction helps explain why implosives fail to participate in the agreement system. The relative similarity of implosives vis-à-vis pulmonics to a potential target obstruent is simply irrelevant.

3. The Residue: "True" Voicing Agreement?

There remains a very small residue of cases where voicing agreement cannot, it seems, be "explained away" as being due either to the reanalysis of tone-voicing interaction or to the analogical extension of agreement in another laryngeal feature. However, these show important characteristics which are also typical of many other relatively rare types of consonantal agreement. One of these is an extreme sensitivity to trigger-target similarity, with agreement applying only to Cs which are identical in *all* other features (place, manner, etc.); in effect this means that implementation of voicing agreement always results in complete trigger-target identity. Secondly, these are all strictly root-internal cooccurrence restrictions that do not hold across morpheme boundaries.

The best known and perhaps clearest example is Ngbaka (Adamawa-Ubangi, Dem. Rep. of Congo; Thomas 1963, Mester 1988, Walker 2000, Hansson 2001, Rose and Walker 2004), where voicing agreement is parasitic on identity in place of articulation. Homorganic obstruents only cooccur to the extent that they agree in voicing (/pɛpu/ 'vent', /ɓabã/ 'companion'), whereas no such restriction holds for heterorganic obstruents (/duka/ 'shoulder', /kɛbɛ/ 'fast').

In fact, voicing agreement in Ngbaka forms part of a bigger system, where on a scale {T – D – ^{N}D – N} homorganic combinations drawn from adjacent steps on the scale do not mix. Not only are homorganic mixed-voicing sequences prohibited (T vs. D), but so are homorganic mixed-nasality sequences (D vs. ^{N}D and ^{N}D vs. N). Thus while words like /ɓabã/ 'companion', /^{m}ɓè:^{m}bɛ/ 'snail' and /nɑnɛ́/ 'today' are well-formed, homorganic sequences like */b…^{m}b/ or */n…^{n}d/ are ruled out. When the consonants are heterorganic, by contrast, the restriction no longer applies (cf. /báᵑgá/ 'jaw', /màᵑgà/ 'net').

Another case with somewhat similar properties is Hausa (West Chadic, Nigeria; MacEachern 1999, Hansson 2001), where ejectives and implosives are not allowed to cooccur within roots. This might be construed as voicing agreement among segments that already agree in [constricted glottis], and forms part of a larger generalization: in Hausa, two cooccurring [c.g.] segments must in fact be *identical in all features*, including voicing as well as place.

4. Conclusions

It appears that voicing agreement is a heterogeneous category of phenomena from a diachronic-evolutionary perspective, in that most cases have "unnatural" histories involving analogical reanalysis and/or analogical extension. In Kera and Ngizim, agreement is likely an indirect result of extensive interaction and interdependence between tone and laryngeal features, in particular between Low and [voice]. This explains the otherwise-anomalous behaviour of implosives in these voicing agreement systems. In Zulu and Ndebele, voicing agreement is likely secondary, due to an extension from aspiration to all laryngeal features. This may help explain why voicing agreement fails to affect non-initial velars even though non-initial [g] (but not [k^h]) is allowed. Such analogical extension may also have played a part in the development of agreement in Chaha. The small residue of remaining cases shows characteristics which are highly reminiscent of more common cooccurrence restrictions such as OCP-Place (see Frisch et al. 2004 and references cited there). Perhaps these, then, are the only examples of voicing agreement where psycholinguistic factors of speech planning are truly implicated.

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Dept. of Linguistics, Univ. of British Columbia
Buchanan E270, 1866 Main Mall
Vancouver, B.C. V6T 1Z1
Canada

ghansson@interchange.ubc.ca

History in Support of Synchrony*

ALICE C. HARRIS
SUNY Stony Brook

0. Introduction

In a recent paper I argued that diachronic linguistics can explain certain typological phenomena that are otherwise problematic; in the present paper I want to discuss two other ways the study of historical data can contribute to synchronic linguistics. In §1 I argue that consideration of a prior stage of a language offers the kind of insight also provided by the examination of closely related languages. In §2 I show that diachronic data offer a way of testing hypotheses and claims.

1. Person Agreement in Old Georgian

Generative grammar has gained insight into the way language operates by examining in depth minimal differences between dialects or closely related European languages. Of course, other approaches have also made good use of related dialects. For example, it is well known that it was in part the comparison of the Swiss dialect of Kerenz with other forms of German that led to the recognition of the regularity of sound change (Osthoff and Brugman 1878:viii-ix). In this section I argue that it is possible to gain similar insights by studying older stages of a language from a synchronic point of view.

Person and number agreement in the Georgian verb has been one of two testing grounds for new morphological theories for more than twenty years. At least eight analyses of these paradigms have appeared in the literature in that time; here I discuss only two of these—those of Anderson (1982, 1984, 1986, 1992) and Halle and Marantz (1993). Georgian, along with Potawatomi, seems to have been chosen as representing a complex system, yet the agreement of Old Georgian is significantly more complex and thus would better test theories. Here I discuss only the agreement prefixes, not the considerably more complex suffixes. I want to make two points here: (i) Both Anderson's and Halle and Marantz's approaches make the correct

* The research reported here was supported in part by the National Science Foundation under grant BCS 0215523; gathering and analysis of data were supported by earlier grants, especially the American Council of Learned Societies' exchange with the Academy of Science of the USSR (administered by the International Research and Exchanges Board, 1981, 1989). I am grateful to each of these organizations.

predictions for most of the interaction found among agreement prefixes. (ii) Residual interaction is a challenge to both.

As is well know, Anderson's approach treats the markers of agreement as processes (rules) applied to bases, groups competing rules in blocks, and makes use of extrinsic ordering as necessary. Halle and Marantz's analysis treats the markers as objects (morphemes) added to bases, and is otherwise modeled after Anderson's treatment. The disjunctive ordering and form of both analyses are summarized in (1).

(1)	Anderson (1986:7)	Halle and Marantz (1993:119)
	a. /X/ → /gv + X/	a. [+1], DAT, [+pl] ↔ /gv-/
	b. /X/ → /m + X/	b. [+1], DAT ↔ /m-/
	c. /X/ → /g + X/	c. [+2], DAT ↔ /g-/
	d. /X/ → /v + X/	d. [+1] ↔ /v-/

To simplify, I have omitted the portion of Anderson's rules that specifies that rule (1a) is conditioned by a first person plural object, (1b) by a first person singular object, rule (1c) by a second person object, and rule (1d) by a first person subject. We may overlook the fact that Halle and Marantz's rules, as written, will work only in one subset of Georgian tense-aspect-mood categories (traditionally called "Series I"). Both analyses prefer ordering by Panini's Principle (or "The Elsewhere Condition"), but both accept extrinsic ordering. The disjunctive ordering represented in (1) for both analyses can account for the "competition" among these prefixes in the Modern Georgian dialect that they examine.

Agreement in Old Georgian was considerably more complex, even when we limit our study to the prefixal markers of this type. First, while Modern Georgian has only the first person subject marker *v*-, introduced by rules (1d), Old Georgian had in addition a second person subject prefix, with the allomorphs *s*-, *h*-, *x*-, and Ø. Second, while the dialect of Modern Georgian considered by these authors has agreement prefixes only for first and second persons, Old Georgian had a third person object prefix, with the same allomorphs as the second person subject marker.[1] Third, although syntactic rules prevent the cooccurrence of markers of direct and indirect objects in Modern Georgian (Harris 1981:48-52), these syntactic rules did not apply in Old Georgian. Consequently there was "slot competition" between markers of direct and indirect objects in Old Georgian that does not occur in Modern Georgian. Either version of the disjunctive rules of (1) will account for most of this increased competition, if we assume that the rules that introduce second person subject prefixes (1′f) and third person object prefixes (1′d) are ordered as in (1′). I assume further that the basic form of these additional markers is *h*-, that phonological rules provide the correct final forms,[2] and that other parts of the rules will assure that

[1] In Old Georgian, the third person object marker is conditioned by indirect objects in Series I and II, but by direct objects only in Series I. I have selected examples below from Series I when the direct object prefix is at issue.

[2] Old Georgian texts are of three types regarding these allomorphs. One set of texts, termed *xanmet'i*, uses only the form *x*- for both prefixes; a second set, termed *haemet'i*, uses only the form *h*- for both.

these are conditioned by nominals with appropriate features.

(1′) Adaptation of

Anderson (1986:7)	Halle and Marantz (1993:119)
a. /X/ → /gu + X/	a. [+1], DAT, [+pl] ↔ /gu-/
b. /X/ → /m + X/	b. [+1], DAT ↔ /m-/
c. /X/ → /g + X/	c. [+2], DAT ↔ /g-/
d. /X/ → /h + X/	d. [+3], DAT ↔ /h-/
e. /X/ → /v + X/	e. [+1] ↔ /v-/
f. /X/ → /h + X/	f. [+2] ↔ /h-/

In Modern Georgian the first person plural object prefix is phonetically [gw] (transliterated <gv>); in Old Georgian the same sounds were usually written <gu> (transliterated). In Old Georgian a first person plural object could be marked with either *gu-* or *m-*, but we will overlook the small problem this causes in the application of the rules in (1′).

One generalization represented by the disjunctive ordering in (1) and (1′) is that, when both a subject prefix and an object prefix are conditioned, it is the object prefix that shows up. This is illustrated by (2) and (3) with direct objects. Agreement prefixes are in bold and are glossed with 'S' for subject markers, 'O' for object markers, and a number for first, second, or third person. Arguments are represented at the right margin of the page, in the order *subject, direct object, indirect object (where applicable)*, with bold type indicating the argument or arguments marked by agreement prefixes. For example, in (2) the subject is first person, the direct object second; the latter is marked by a prefix in bold, glossed 'O2'.

(2) me **g**ici šen (Ist. Kr. II, 29, 8; Imnaišvili 1971:320) 1-**2**
I O2-know you
'I know you.'

(3) vitarmed ara **m**ici me (Luke 22:34; Imnaišvili 1971:320) 2-**1**
because NEG O1-know me
'because you do not know me'

The generalization holds also when the first or second person is the indirect object, as shown in (4)–(7).

(4) p'uri čueni samaradisoj mo**m**ec čuen dγejs (Mt 6:11) 2-3-**1**
bread our everyday O1-give us today
'Give us today our daily bread.'

The third set of texts, the *sannarevi*, has *h-* before labial, velar, and uvular consonants, *s-* before alveolars and alveopalatals, and Ø before vowels.

(5) p'uri čueni tanaarsobisaj mo**m**ec čuen dγiti dγed (Lk 11:3) 2-3-**1**
bread our essential O1-give us day-to-day
'Give us each day our essential bread.'

(6) čuen mas sesxsa mi**g**agebt (Piz XI, 23, Abulaʒe 1973:214b) 1-3-**2**
us the loan O2-give
'we give you the loan'

(7) aramca mi**g**ecit igi šen (John 18:30) 1-3-**2**
NEG O2-give him you
'We would not have delivered him up to you.'

Anderson (1982, 1984, 1986, 1992) and Halle and Marantz (1993) observe this "slot competition" and this is the primary fact that motivates their arranging the agreement rules in "blocks" of competing rules.

The second generalization represented by the disjunctive ordering is that, when there are both direct and indirect objects, first person objects take precedence over second person, and second over third, without regard to grammatical relations. Neither Anderson (1982, 1984, 1986, 1992) nor Halle and Marantz (1993) describe this interaction, because in Modern Georgian it is preempted by the syntax, as noted above. The correctness of the generalization is shown below.

(8) γmertman mo**gu**cna qelta tkuenta 3-**1**-2
god O1-give hands y'all's
'God delivered us into your (PL) hands.'

(9) mo**gu**cna tkuen γmertman... qelta čuenta 3-2-**1**
O1-give y'all god hands our
'God delivered you (PL) into our hands.'
(Ag. ʒeg. I, 167, 28 and 25; Imnaišvili 1971:319)

These show that first person objects win the slot competition over second, regardless of whether the first person is direct object, as in (8), or indirect, as in (9).

(10) mcnebasa axalsa mi**g**cem tkuen (J 13:34) 1-3-**2**
commandment new O2-give you
'A new commandment I give unto you.'

(11) mi**g**cemden k'rebulsa (Mt 10: 17 AB, Imnaišvili 1986:354) 3-**2**-3
O2-give council
'they will give you to [their] council'

These show that second person (*g*-) wins over third (*h*-), whether the second person is the direct or indirect object, illustrated in (10) and (11), respectively.

(12) sik'udilsa araj mi**m**ca me (Plk't' 156: 18, Abulaʒe 1973:253a) 3-**1**-3
death NEG O1-give me
'He did not give me to death.'

(13) igi mi**m**cems me (Mk 14:20AB) 3-3-**1**
he O1-give me
'He will give me [to them].'

These examples show that first person (*m*-) takes priority over third (*h*-), as would be expected by transitivity.

In all of the above, there is competition for a single slot. We can conclude, with Anderson and Halle and Marantz, that all of these rules occur in a single block, in order to account for the competition among them, as indicated in (1′).

The problem comes with the third person object (*h*-), for this cooccurs with the first person subject (*v*-), as illustrated in (14)–(17).

(14) ara mi**vs**cnet asulni čuenni ersa ucxosa **1**-3-**3**
NEG S1-O3-give daughters our people foreign
'We have not given our daughters to foreign people.'
(O Neem. 10: 30, *apud* Abulaʒe 1973:253a)

(15) anu ara mi**vs**cet? (Mk 12:14) **1**-3-**3**
or NEG S1-O3-give
'or should we not give it [to Caesar]?'

(16) xolo magas ver **vh**q'op (Iona 140, 29; Imnaišvili 1971:276) **1-3**
but that NEG S1-O3-do
'but that I cannot do'

(17) mo**vh**guare igi moc'apeta šenta (Mt. 17:16AB) **1**-3-**3**
S1-O3-bring him disciples your
'I brought him to your disciples'

(Although I have indicated to the right that the verb agrees with the first person subject and the third person indirect object, in fact we cannot determine whether it is the direct or indirect object that the verb agrees with here, since both are conditioned, and the markers are identical.) Given that the first person subject is together with other rules in a single block in (10), we would expect the third person object prefix, *h*-, to cooccur with all of them, but it does not, as shown below. (12) and (13) show that *h*- and its allomorphs do not cooccur with *m*-, the marker of the first person singular subject. In (12) we get *mi**m**ca*, not **mi**ms**ca*, and in (13) *mi**m**cems*, not **mi**ms**cems*; this shows that *m*- does not cooccur with *h*- (or the *s*- that would be expected before *c* of the root). (10)–(11) and (18) show that the second person object prefix, *g*-, also does not cooccur with *h*-.

(18) mi**g**cem šen sik'imasa sazep'urosa čemsa 1-3-**2**
O2-give you ? own my
'I give you my own (possession?).'
(Ip'. Rom.-k'urtx. 64:1, *apud* Abulaʒe 1973:253a)

In (18) we find *migcem*, not **mi**g**s**cem*; this shows that the second person object prefix, *g-*, does not cooccur with *h-* or its allomorphs. (19a) and (20) illustrate that *h-*, the marker of the third person object, does not usually occur twice when both direct and indirect objects are in the third person, but (19b) and (21) show that this may occur in some instances.[3]

(19) a. moiγo p'uri,... gant'exa da mi**hs**cemda mat (Lk 24:30A) 3-**3**-**3**
take-he bread break-he and O3-O3-give-he them
'He took break,... broke it, and gave it to them.'

b. moiγo p'uri,... gant'exa da mi**s**cemda (Lk 24:30B) 3-3-**3**
take-he bread break-he and O3-O3-give-he
'He took break,... broke it, and gave it to them.'

(20) mi**hs**cemda (Mk 8: 6 *haemet=i, apud* Molitor 1952:113) 3-**3**-**3**
O3-O3-give-he
'he gave it to them'

(21) ras ʒuris-sakmesa še**s**c'amebt k'acsa magas (John 18:29) 2-3-**3**
what charge O3-witness man this
'What accusation do you (PL) bring against this man?'

(21) above and (22) below also show that the third person object marker, *h-*, does not cooccur with the second person subject marker, also *h-*.

(22) rameto ara **h**xedav p'irsa k'acisasa (Mk 12:14A) 2-**3**
for NEG O3-look face man-GEN
'for you do not look at the face of a man'

(I have glossed the *h-* here as 'O3' on the grounds that elsewhere the object prefix takes precedence over the subject, but in reality we cannot determine whether this is O3 or S2.)

Thus, occurrence of all the agreement prefixes of Old Georgian can be correctly described in terms of rule blocks, as proposed by Anderson (1982, 1984, 1986, 1992) and Halle and Marantz (1993), except that of the third person object marker *h-*. The prefix *h-* cooccurs (obligatorily, when triggered) with the first person subject prefix,

[3] For the most part, this occurrence of two third person object prefixes is limited to the *xanmet'i* and *haemet'i* texts, but the text illustrated in (19b) is not in either of these categories.

v-, but not with other prefixes that otherwise appear to be in the same block with *v*-. The object prefix itself is an occasional exception to the last generalization.

These data show clearly that the rule block approach, while it makes many correct predictions, is not sufficient to account for the full variety found in natural languages.

2. Gender and Declension Class

Although gender and declension class are often treated as related categories in grammars, Aronoff (1994) claims that they are distinct and independent. This makes the specific prediction that from a historical point of view these categories are free to develop independently. If his claim is correct, we should expect to find languages that develop gender without declension classes and ones that develop declension classes without gender, and we should find languages that lose gender without losing declension classes and ones that lose declension classes without losing gender. On the basis of familiar Indo-European languages, this seems unlikely. Those, like English, which have lost gender, have also lost declension classes; languages such as Latin, Spanish, German, Russian, and others have kept both gender and declension classes. In this section I describe a language—Svan—that has developed declension classes without developing gender, and another—Udi—that has lost gender without losing declension classes.

2.1. What are Gender and Declension Classes?

As Aronoff (1994) points out, whether a language has grammatical gender can only be determined by looking at elements with which nouns occur, such as adjectives, determiners, and verbs. "A language will have gender if and only if we find in that language (1) some form of agreement with nouns that (2) involves a distinction among noun classes..." (Aronoff 1994:66).

In contrast, whether a language has declension classes can only be determined by examining the declension of a variety of nouns. "An inflection class is a set of lexemes which share a paradigm and whose word forms are alike in respect of the realization of the morphosyntactic properties in every cell" (Carstairs-McCarthy 1998:323).[4] In a language with declension classes, the declension of some nouns is different from that of other nouns in ways that cannot be predicted on the basis of phonology.

The issue addressed here arises because in some familiar languages, such as Spanish and Latin, it appears that declension class is determined by gender. If declension class and gender are independent variables, as claimed by Aronoff, the two are free to change independently of one another.

2.2. Udi: Loss of Gender Without Loss of Declension Classes

Udi is a member of the North East Caucasian language family; it is a highly

[4] Aronoff's definition is similar: "An **inflectional class** is a set of lexemes whose members each select the same set of inflectional realizations" (1994:64).

divergent member of the Lezgian subgroup. Proto-Lezgian (PL) had four genders (Alekseev 1985), and indeed this is probably true of Proto-Northeast-Caucasian (PNEC), although in this case the number of genders is not entirely clear. Gender I in PL contained most nouns designating male humans, gender II most nouns designating female humans, and genders III and IV most nouns designating non-humans; the semantic distinction between the last two may have been animal vs. non-animal.

Alekseev's (1985:89-95) reconstruction of the gender markers includes both a strong and a weak set of markers of gender in PL; a modified version is presented in (23).

(23)		Strong	Weak
	I	**r*	**w*
	II	**r*	**r*
	III	**b*	**v*
	IV	**d* [5]	**w*

Alekseev argues that the weak set are an innovation of PL, but others do not accept a distinction between strong and weak markers. Schulze (to appear) reconstructs a single set in the singular, and another set for the plural.

(24)		Singular	Plural
	I	**w*	**b*
	II	**r/y*	**b*
	III	**b*	**d*
	IV	**d*	**d* (Schulze 1992, to appear)

The important point for our purposes is that PL, the language from which Udi descends, possessed gender. There is also specific fossilized evidence of gender III in a number of Udi verbs (Jeiranišvili 1956). In general, in PL and PNEC, gender markers did not occur on nouns, but a handful of nouns preserve a fossilized gender marker, including Udi *viči* 'brother', which preserves the gender I marker **w/v* (cf. *xun-či* 'sister').

(25) illustrates gender agreement in Archi, where 'II' glosses gender II in the singular, and 'NE' is a numeral ending.[6] (26) illustrates gender agreement in Rutul.[7]

(25)	ya-r	zon	L'annu-r	d-is	q'°Ie-r-u	dol:zu-r	došdur
	this-II	me.ABSL	loving-II	II-my	two-II-NE	elder-II	sisters(II)

'these two elder sisters of mine who love me' (Kibrik 1994:342)

[5] I have changed Alekseev's **p:* to **b* and his **t:* to **d* since all of the languages that preserve the relevant category have *b* and *d* and none have *p:*, *p*, or *p'* in gender III or *t:*, *t*, or *t'* in gender IV. The NEC languages outside the Lezgian group also have *b* and *d*, not *p:* and *t:*, as gender markers.

[6] [L] here represents a aspirated non-ejective lateral affricate (Kibrik 1994:300-301).

[7] [x̂] here represents a voiceless dorso-uvular (unrounded) fricative.

(26) ha riš hɨx̂dɨ r-iʔi (Alekseev 1994:238)
this girl(II) good II-is
'This girl is good.'

Udi has lost gender agreement in the verb, gender agreement in the adjective, and with these, gender as a grammatical category (Jeiranišvili 1971, Pančviʒe 1974, Schulze 1982, Harris 2002).

Turning to declension classes, we find the following major declension types in NEC languages today.

Table 1. Paradigm Structures Found in NEC Schemas

	Schema A	Schema B	Schema C	Schema D	Schema E	Schema F
Absl	ROOT	ROOT	ROOT	ROOT	ROOT	ROOT
Erg	ROOT-X	ROOT-W-X	ROOT-W	ROOT-W-X	ROOT	ROOT-X
Gen	ROOT-Y	ROOT-W-Y	ROOT-W-Y	ROOT-W	ROOT-Y	ROOT-X
Dat	ROOT-Z	ROOT-W-Z	ROOT-W-Z	ROOT-W-Z	ROOT-Z	ROOT-Z

Among these six schemas, B, C, and D all are instances of the so-called "dual base" declension, since all use one base for the absolutive and a different base for all other cases. NEC languages have an exuberant variety of locative cases, not included in Table 1, and they too are based on the second, "oblique" stem. At least one of the dual-base schemas is found in every member of the NEC family (Harris 2003). In schema C, the ergative case is the base for all others, while in D the genitive case fills this role. In schema B, all oblique cases (that is, all cases other than the absolutive) have the oblique stem formant plus an additional suffix. Schemas A, E, and F lack an oblique stem. Every NEC language has at least two of these schemas, apart from three of the Lezgian languages; even these three have different declensions.[8] Schemas A, B, and C are all widespread in NEC languages.

(27) illustrates some of the variety in noun declensions in Tabassaran (Dyubek dialect, data from Magometov 1965:97-98, 104, 112-113.)

(27)						
	Absolutive	š:aw 'nail'	rug 'earth'	xvar 'mare'	maš 'face'	tepe 'heap'
	Ergative	š:aw-di	rug-z̲i	xvar-u	maš-nu	tepe-j
	Genitive	š:aw-di-n	rug-z̲i-n	xvar-a-n	maš-na-n	tepe-n
	Dative	š:aw-di-s	rug-z̲i-z	xvar-a-z	maš-na-z	tepe-s

[8] In Lezgi, variation in declesion is manifested largely in differences of formants of the oblique stem and plural markers (Haspelmath 1993:71-80). In Aghul, declension classes are manifested in the variety of formants of the oblique stem, including *-di*, *ji (-j)*, *-ni*, *-na*, *-la*, *-ra*, *-i*, *-u*, and *-a* (Magometov 1970:72). Khinalug seems to show no declension classes in the singular; plural markers are determined by semantics and by the phonological structure of the stem, but not in a way that would be predicted by ordinary phonological operations (Kibrik 1994:374-375; see also Kibrik et al. 1972: 50). It might, therefore, be argued on the basis of the plurals that Khinalug still has declension classes.

Differences among declension classes in Indo-European languages are usually based on differences in the case-number suffixes. In NEC languages this is less frequently the locus of declension differences; in many NEC languages there is little difference between the case suffixes, and sometimes the number suffixes, from one declension class to another. The differences among the different paradigm structures or schemas in Table 1 are one of the loci of differences among declension classes in many NEC languages. A third locus of declension class differences may be differences among the formants of the oblique stem. Magometov notes that the following oblique stem formants are found in Tabassaran: *-i*, *-di*, *-ri*, *-li*, *-ni*, *-u*, *-ru*, *-nu*, *-ji* (1965:99). Thus, in NEC languages, declension classes may vary according to (i) paradigm structure, as in Table 1, (ii) oblique formant, (iii) formant of number, or (iv) formant of case.

In some Lezgian languages, there is some correlation between declension class and gender. For example, In Tsakhur, nouns of genders I and II have an ergative case in *-e*, while those of genders III and IV have an ergative in *-n* or -V*n* (Schulze 1997: 30). In Archi, different genders usually take different oblique markers (Mikailov 1967:44-47). In some NEC languages, gender markers appear to be part of declension. Consider the noun 'dog' in Kryz.

(28) Absl xwar 'dog'
Erg xwar-ə-r
Gen xwar-ə-ĵ
Dat xwar-ə-s (Topuria 1960:442)

(< ĵ > is used here to represent a voiced alveopalatal affricate.) While *xwar-ə-ĵ* is the genitive 'dog's', with a different possessed noun we get *xwar-ə-d*, where *- ĵ* and *-d* are gender markers (Topuria 1960:442). Thus we cannot absolutely rule out the possibility of some correlation between gender and declension in PL, but the sheer variety of correlations found in the daughter languages makes this unlikely.

While other NEC languages, as described in the literature, have two or three of the schemas shown in Table 1, Udi has five, shown in Table 2. The paradigm structures in this table represent the major declension classes in Udi. Four oblique formants are used, *-en* (reduced to *-n*), *-in, -e*, and *-j*, but the last three have restricted distribution. There is variation in markers of number, which are not illustrated in the data presented here; nouns may form the plural with *-ux* (*-uγ* when followed by another suffix), *-rux* (*-ruγ*), *-rxox* (*-rx*), or *-mux* (*-muγ*). There is quite a bit of variation among markers of the genitive and dative cases. The genitive uses the markers *-i*, *-j*, *-aj*, *-ej*, *-in*, *-un*. The dative may be *-ax*, *-ex*, *-ix*, *-ux*. (The *x* may optionally be omitted, but this is not part of declension variation.) Thus, Udi declension classes exhibit variation in all of the four dimensions according to which noun declension varies in NEC languages. Additional variation is illustrated in Appendix A.

Table 2. Declensions of Common Noun, Singular in Udi (data from Jeiranišvili 1971:53-62, Sixaruliʒe 1987).

	Declension A	Declension B	Declension C	Declension D	Declension E
Nom (Absl)	šumak' 'hen'	me 'knife'	muz 'language'	t'ajna 'millet'	pul 'eye'
Erg	šumak'-en	me-n-en	muz-en	t'ajn-in-en	p-in
Gen	šumak'-un	me-n-ej	muz-n-aj	t'ajn-in	p-in
Dat	šumak'-ax	me-n-ax	muz-n-ux	t'ajn-in-ax	p-ex
Allat	šumak'-ač'	me-n-ač'	muz-n-uč'	t'ajn-in-ač'	p-eč'
Super	šumak'-al	me-n-al	muz-n-ul	t'ajn-in-al	p-el

While Proto-Lezgian had both gender and declension class, Udi has lost the former but not the latter. This provides diachronic evidence that gender and declension class are independent variables in language.

2.3. Svan: Addition of Declension Class Without Addition of Gender

Common Kartvelian (CK) had neither declension class (Mač'avariani 1970, 1985, Schmidt 1976, Harris 1985:65-92) nor gender. None of the daughter languages has gender, and there is no reason to believe that this category was ever found in the Kartvelian languages.[9] Among the daughter languages none except Svan has declension classes, and these can be shown to be secondary in Svan (Šaraʒeniʒe 1955, Mač'avariani 1960, 1985, Kaldani 1974, Harris 1985:69-72, 78-79). In §2.3.1, I show that there is no gender in Kartvelian, and in §2.3.2 that there are no declension classes. In §2.3.3, I describe the development of declension in Svan.

2.3.1. Agreement in Common Kartvelian

Given that gender can only be identified by looking at agreement of other elements with nouns, we should look at agreement in Kartvelian languages; (29) illustrates agreement in Old Georgian, and the other languages have somewhat reduced versions of this.

(29) da movid-es mona-ni igi mamasaxlis-isa-ni (Mt 13:27)
and come-3PL servant-PL.NOM the.NOM.SG householder-GEN-PL.NOM
'And the servants of [the] householder came.'

Here the verb agrees in person and number with its subject, 'the servants of the householder'; the article *igi* in this instance agrees in case but not number with the

[9] Čikobava (1942) assumes that an ancestor of CK had gender on the basis of his more general assumption that Kartvelian is related to the North East Caucasian and North West Caucasian language families. The latter assumption is unfounded, and no convincing evidence has ever been presented to support it. The assumption that an ancestor of CK had gender is also unfounded.

head noun *monani* 'servants'; and the possessor, 'householder', agrees in case and number (*-ni* 'PL.NOM') with its head, *monani.* In general, modifiers agree with head nouns in terms of case and number, while verbs agree with subjects, direct objects, and indirect objects in person, number, and grammatical role, as shown above in §1. There is no grammatical gender in Georgian or its sister languages.

2.3.2. Declension in Common Kartvelian

Old Georgian nouns were declined in the singular as shown in (30) (all data from Imnaišvili 1957:27, 42, 86, 87, 116, 117).

(30) **Old Georgian**

Absl	gul	kmar	ʒma	ʒe	c'q'aro	ru
Nom	gul-i	kmar-i	ʒma-j	ʒe-j	c'q'aro-j	ru-j
Erg	gul-man	kmar-man	ʒma-man	ʒe-man	c'q'aro-man	ru-man
Dat	gul-sa	kmar-sa	ʒma-sa	ʒe-sa	c'q'aro-sa	ru-sa
Gen	gul-isa	kmr-isa	ʒm-isa	ʒ-isa	c'q'aro-jsa	ru-jsa
Inst	gul-ita	kmr-ita	ʒm-ita	ʒ-ita	c'q'aro-jta	ru-jta
Adv	gul-ad	kmr-ad	ʒm-ad	ʒe-d	c'q'aro-d	ru-d
	'heart'	'husband'	'brother'	'son'	'spring'	'creek'

The nouns in (30) accurately represent the variety of declension of common nouns in Old Georgian; there are few differences. The second noun, *kmar* 'husband', undergoes syncope (alternation of *kmar* ~ *kmr*), and nouns that undergo this process must be marked in the lexicon. All other differences are completely phonologically determined: nominative case *-i* becomes non-syllabic after a vowel; *i* in the genitive and instrumental case markers becomes non-syllabic after back rounded vowels, etc. Declension in the plural and the collective, though not illustrated here, is equally uniform. These predictable differences do not constitute different declensions, and Old Georgian has no declension classes.

Laz declension is illustrated in (31) (all data from Čikobava 1936:44-48; see also Kutscher et al. 1995). The paradigms in (31) omit two innovative cases, which would add nothing to our discussion. There is essentially no variation in Laz declension; neither stems nor affixes change. Closely related Mingrelian is similar.

(31) **Laz**

Nom	k'oči 'man'	bucxa 'nail'	k'učxe 'foot'	orʒo 'chair'	k'at'u 'cat'
Erg	k'oči-k	bucxa-k	k'učxe-k	orʒo-k	k'at'u-k
Dat	k'oči-s	bucxa-s	k'učxe-s	orʒo-s	k'at'u-s
Gen	k'oči-ši	bucxa-ši	k'učxe-ši	orʒo-ši	k'at'u-ši
Inst	k'oči-te	bucxa-te	k'učxe-te	orʒo-te	k'at'u-te

Declension in CK was essentially similar to that in Old Georgian and did not involve declension classes (Harris 1991:23-28). Three opinions of the reconstruction of the declension of common nouns are presented in (32); none involves declension classes.

(32) Reconstructed CK Noun Declension[10]

Nom	*Ø	*i	*i/y, Ø
Erg	*d/*n	*ad, *d, *n	*ad/d, *n(a)
Dat	*s	*s	*s
Gen	*is$_1$	*es$_1$, *is$_1$ (*s$_1$)	*es$_1$/is$_1$
Inst	*(i)s$_1$t		
Adv	*d		
	(Harris 1985:90)	(Mač'avariani 1970)	(Mač'avariani 1985)

I am convinced by the arguments in Mač'avariani (1985) that CK had only four cases.

2.3.3. Svan Innovations

Šaraʒeniʒe (1955) identifies five declensions; (33) provides the singulars, slightly modified according to the findings of Mač'avariani (1985).[11]

(33)

	Declen I	Declen II	Declen III	Declen IV	Declen V
Nom	txwim	čäž	ala	māre	ara
Erg	txwim-d	čäž-w-em	amnēm	mārad/mārēm	arēm/arāmd/arāmnēm
Dat	txwim-s	čäž-w	amis/ amas/alas	māra	arām
Gen	txwim-iš	čäž-w-(e)m-iš	amīš/amša	mārēm-iš	arēmiš
Inst	txwim-šw	čäž-w-š	amnoš	māroš	arāmšw
Adv	txwim-d	čäž-w-d	amnär(d)	mārad	arāmd
	'head'	'horse'	'this (one)'	'man'	'eight'

Declension I is inherited directly from CK noun declension, and declension III from CK pronoun declension. Cognate to Svan declension III are the pronoun declensions illustrated in (34).

(34)

	Old Georgian		**Laz**
	Proximate	Remote	Proximate
Nom	ese 'this (one)'	igi 'that (one)'	aya 'this (one)'
Erg	aman	man	amuk
Dat	amas	mas	amus
Gen	amis	misa	amuši

Because Šaraʒeniʒe's declension III is limited to pronouns, it would not be considered a declension class by some morphologists. We can, at the very least, say that it is not a noun declension class, and we are thus left with four declension classes in Svan, only one of these directly inherited.

[10] The sound [*s$_1$] follows the reconstruction in Gamq'reliʒe and Mač'avariani (1965); this sound had the reflex [s] in Georgian and [š] in the other languages.

[11] Šaraʒeniʒe (1955) lists subtypes, and Gudjedjiani and Palmaitis (1985) also expand this, but for our purposes, Šaraʒeniʒe's major types are sufficient.

The declension type seen most clearly in declension II (but also found in declensions IV and V) is the "dual base" type found also in Northeast Caucasian languages. Historically, Svan has been in contact with several languages of this family.

Mač'avariani (1960) was the first to explain the origin of Svan dual base declensions. Though Svan was affected by contact with NEC languages that have this unusual declension type (also found however in many Uralic languages), Svan developed these through its own internal diachronic processes. In Pre-Svan, possibly even as far back as CK, definite articles followed nouns. This is the order attested in Old Georgian, where definite articles were frequent. The definite article in Svan was historically the demonstrative 'this', illustrated in declension III of (33). It has long been known from many unrelated languages that definite articles often originate in this way, and this has been described in detail by Greenberg (1978) and elsewhere; the same sources indicate that the article in turn frequently is reanalyzed as case marking or as gender (noun class) marking. On this basis we can assume the origin indicated in (35) (cf. (33) above).

(35)	Nom	māre	<	*māre	<	*māra	i…	<	*māra	i…	'the man'
	Erg	mārēm	<	*mārāman	<	*māra	aman	<	*māra-n	aman	
	Dat	māram	<	*mārāmas	<	*māra	amas	<	*māra-s	amas	
	Gen	mārēm-iš	<	*mārāmīš	<	*māra	amīš	<	*māra-iš	amīš	

While the attested forms in (35) generally represent the Upper Bal dialect, the dative is from the Lent'ex dialect instead (cf. UB *māra*). It is likely that the nominative form of the demonstrative contained *i*, but the form cannot be reconstructed with confidence. In the nominative and genitive, *i* conditioned umlaut to *ä*, then to *e*. It is assumed here that paradigm leveling accounts for the *e* (*ē*) in the ergative. Mač'avariani (1960, 1985) has pointed out that the form *amas* probably represents the more direct reflex of the CK dative pronoun form, while *alas* (in (33)) is probably restructured on the basis of the nominative, *ala.* The instrumental and adverbial forms have probably developed more recently, out of the ergative (Mač'avariani 1985). Among the attested forms of the genitive of 'this', *amīš* probably most directly reflects the CK form (cf. the Old Georgian genitive in (30)). Thus, Mač'avariani (1960) has shown how Svan declension IV developed, and Harris (1985:69-79) related this to known universals. It is likely that declensions II and V originated in a similar way. (For other points of view, see P'almait'i 1979 and Šaraʒeniʒe 1983.)

2.3.4. Summary

Thus, Svan has innovated the use of declension classes. The fact that these appear entirely independently of gender adds confirmation to the claim that gender and declension class are independent characteristics.

3. Conclusions

I have argued here that we can learn more about natural language by looking at complex systems than we learn from simpler ones, and I have observed that in some instances older attested languages provide the greater complexity needed. In particular, Georgian verb prefixes, which have been used to support several different morphological theories, are more complex in Old Georgian than in the modern language. While the approach of blocks of rules, as outlined both in Anderson (1992) and in Halle and Marantz (1993), makes a number of correct predictions for Old Georgian, it cannot easily accommodate the more complex facts of Old Georgian.

I have also shown that in some instances a theoretical claim can be tested diachronically. The claim that gender and declension class are independent of one another (Aronoff 1994 and elsewhere) is confirmed by the demonstration that gender but not declension class has been lost historically in Udi, and that declension class but not gender has developed historically in Svan.

Appendix: Major Sub-types of Udi Declension (Common Noun, Singular) (Jeiranišvili 1971:53-62, Sixaruliʒe 1987)

Table 3. Sub-types of Declension A, Singular

	A1	A2	A3	A4	A5	A6	A7	A8
N	šumak’ ‘hen’	äyz ‘village’	k’ạvạn ‘meadow’	γar ‘boy’	čur ‘cow’	nana ‘mother’	viči ‘brother’	xạ ‘dog’
E	šumak’-en	äyz-en	k’ạvạn-en	γar-en	čur-en	nana-n	viče-n	xẹ-j-n
G	šumak’-un	äyz-un	k’ạvạn-un	γar-i	čur-ej	nana-(j)	viče-j	xẹ-j
D	šumak’-ax	äyz-ix	k’ạvạn-ex	γar-ax	čur-ax	nana-(x)	viče-x	xạ
A	šumak’-ač’	äyz-ič’	k’ạvạn-eč’	γar-ač’	čur-ač’	nana-č’	viče-č’	xạ-č’
S	šumak’-al	äyz-il	k’ạvạn-el	γar-al	čur-al	nana-l	viče-l	xạ-l

Table 4. Sub-types of Declension B, Singular

	Declension B1	Declension B2	Declension B3	Declension B4	Declension B5
Nom (Absl)	me ‘knife’	haso ‘cloud’	ga ‘place’	č:o ‘face’	c’i ‘name’
Erg	me-n-en	haso-n-en	ga-n-en[12]	č:o-e-n	c’i-j-en
Gen	me-n-ej	haso-n-un	ga-n-ej	č:o-e-j	c’i-j-ej
Dat	me-n-ax	haso-n-ax	ga-n-ux	č:o-e-x	c’i-j-ex
Allat	me-n-ač’	haso-n-ač’	ga-n-uč’	č:o-e-č’	c’i-j-eč’
Super	me-n-al	haso-n-al	ga-n-ul	č:o-e-l	c’i-j-al

Many phonological variants of Declension C exist, as the oblique formant *-n-* assimilates to preceding alveolars—*r*, *l*, *d*, *t’*, *t*.

[12] The noun *ga* ‘place’ has a second declension, with the oblique formant *-l-* instead of *-n-*.

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Department of Linguistics
SUNY Stony Brook
Stony Brook, NY 11794-4576

alice.harris@stonybrook.edu

Conceptual Manipulation and Semantic Distinctions in Mandarin Verb Complements: The Contrast between *shàng* and *dào*[*]

HUI-CHEN SABRINA HSIAO
University at Buffalo, The State University of New York

0. Introduction

This study investigates the lexicalization of spatial and aspectual components incorporated in Mandarin verb complements (VCs hereafter) *shàng* 'up' and *dào* 'arrive'. The verb complement in Mandarin is well-known as the second verbal element in VV construction. Traditionally, V-*shàng* and V-*dào* are categorized as 'directional complements' and 'phase complements' respectively (Chao 1968; Li and Thompson 1981). Both VCs s*hàng* and *dào,* originally functioning as a main verb (Gao 1995), are similar to the counterpart 'up/on/above/over' and 'arrive/ reach' in English; they have various usages, such as in verb phrases, and prepositional phrases, for example. Although there is no doubt that s*hàng* and *dào* are poly-functional, it seems that there is no agreement on to what extent particular uses are related to one another. Most of the previous studies focus on the spatial meanings lexicalized in noun phrases and postpositions; they provide explanations based on a metaphorical approach or cultural values. However, such accounts cannot entirely explain the main function of the post-verbal complements s*hàng* and *dào* in VV construction.

In this paper, I explore the subtle distinctions between the satellites *shàng* and *dào*, and provide an explanatory account for their seemingly diverse functions from a cognitive approach. Moreover, this paper aims to offer another perspective on the conceptual properties of spatial and aspectual notions embodied in these two verb complements, and verify evidence that Mandarin treats five framing events as a single conceptual entity.

The organization of this paper is as follows. A brief literature review and the theoretical framework are presented in section 1. In section 2, the data involved the verb complements *shàng* and *dào* are introduced. In section 3, based on Talmy's (2000) framework and framing event types, I discuss several examples

[*] I would like to thank Leonard Talmy for valuable discussions of this material. I also thank Jean-Pierre Koenig for comments and suggestions. And thanks as well go to Liancheng Chief for helpful discussions. All errors remain my own responsibility.

and account for how aspectual and spatial concepts are explicitly expressed in *shàng* and *dào* regarding different framing event types. Section 4 shows a summary of findings and conclusion.

1. Previous Studies

The VCs s*hàng* and *dào* function both as verbs or post-verbal complements; they are two of the most common VCs based on a corpus[1] search. In previous studies, a set of lexical rules are postulated by Thompson (1973) to explain the VV derivation in Mandarin. However, lexical rules have too many limitations, and they fail to capture subtle distinctions. Teng (1977) generalizes the functions of several verb complements by claiming that s*hàng* and *dào* both have the semantic property of "contact," but differ in which of the 'movement' feature of the verb [+/–movement] is involved. However, this account does not explain the possibility that the same verb occurs with different verb complements. It also fails to explain the aspectual functions among verb complements. In addition, Poteet (1987) does not attempt to account for the phenomena discussed above and only focuses on the characterization of *dào*. Most studies (cf. Smith 1990; Yong 1997; Kang 2001) agree that Mandarin verb complements denote a new state resulting from the action (V_1). Other approaches, such as collocation patterns of the two elements (McDonald 1994) or a metaphorical approach (Xing 2000), do not exemplify how the intertwined ranges of functions are conceptually incorporated in verb complements.

Therefore, a detailed semantic analysis of *shàng* and *dào* is proposed in section 3. Different from the previous analysis, I adopt Talmy's (2000) cognitive approach (lexicalization patterns) and discuss the semantic components embodied in each verb complement in this paper. Based on Talmy's (2000) claim, languages seem to divide into a two-category typology on the basis of the characteristic pattern where the conceptual structure of the macro-event is mapped onto the syntactic structure. Typology is composed of whether the core schema[2] is expressed by the main verb or by the satellite.[3] In general, Mandarin is an example of a satellite-framed language (Talmy 2000), while Spanish is a verb-framed language. Therefore, if this assumption that the concepts are "encapsulated" into the satellite V_2 is valid, the next question is what are the essentially underlying conceptual manipulations incorporated in *shàng* and *dào*, since there are numerous VCs in Mandarin.

2. The Data

In Mandarin, a simple verb is often used with a perfective marker *le* or a verb

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[1] Sinica Corpus 3.0 http://www.sinica.edu.tw/ftms-bin/kiwi.sh

[2] The core schema of the framing event is composed of either the association function alone or the association together with the ground entity (Talmy 2000).

[3] The term 'satellite' refers to a surface element in which a connected set of semantic categories that appear lexicalized in a closed-class type (Talmy 2000).

complement in a sentence. The following examples (1-6) are the primary focus of the present paper.

	Simple V		V-*shàng* 'up'	V-*dào* 'arrive'
(1)	a. piāo	'float'	b. piāo-*shàng*	c. piāo-*dào*
(2)	a. zhuī	'chase'	b. zhuī *shàng*	c. zhuī *dào*
(3)	a. zhuàng	'bump'	b. zhuàng-*shàng*	c. zhuàng-*dào*
(4)	a. huā	'spend'	b. huā-*shàng*	c. * huā-*dào*
(5)	a. mǎi	'buy'	b. * mǎi-*shàng*	c. mǎi-*dào*
(6)	a. péi	'compensate'	b. péi-*shàng*	c. * péi-*dào*

A closer examination of the data indicates that the semantics and functions of the VCs, *shàng* and *dào*, cannot be illuminated by simply combining the two components (V_1-V_2) together. Scrutinizing the data above, we found that *shàng* and *dào* do not all behave the same way with respect to functioning as a post-verbal complement. Several remarkable similarities and dissimilarities are observed. First, both VCs *shàng* and *dào* can occur in the same environments, as shown in (1-3). Second, it seems that they are in complementary distribution with each other, as illustrated in (4) and (5). Third, previous accounts cannot explain their non-spatial (aspectual) uses, shown in (4) and (6). One question remaining to be addressed is how to predict their diverse occurrences. In particular, what are the overlapping functions they both have, and what are the distinctive functions and conceptual representations exhibited by each?

3. A Finer Look: Contrast between V-*shàng* and V-*dào* Constructions

The goal of this section is to capture the subtle distinctions between *shàng* and *dào* by means of concrete comparison. In the view of this paper, my discussion is primarily focused on V-*shàng* and V-*dào* constructions so that a fine-grained elaboration would clarify these two VCs.

My preliminary proposal is as follows: a) *shàng* and *dào* can occur in the same contexts if the spatial notion, such as path or spatial relation between the Figure and the Ground,[4] is more saliently construed by the speaker than the aspectual notion; b) the crucial distinction between *shàng* and *dào* is aspectual, that is, *shàng* encodes a telic notion and the inchoative/inception of the resultant state, whereas *dào* merely signals telicity; c) in realization framing events,[5] *dào* functions as a fulfillment satellite, whereas *shàng* is a confirmation satellite as well as a fulfillment satellite, depending on the first verb. These arguments will be elaborated in the following section.

[4] The Figure is the salient moving or stationary object in a Motion event whose path or site is the relevant issue. The Ground is the reference object with respect to which the Figure's path/site is characterized.

[5] An event of realization is an encompassive category for a pair of related types, fulfillment and confirmation.

3.1. Contexts Where Both *shàng and dào* Can Occur

Example (7) illustrates a situation where both satellites *shàng and dào* behave alike in a Motion event. The Motion event consists of a transition by the Figure with reference to the Ground. Basically, the Motion event involves the Figure object changing its position in space in relation to the Ground; the spatial relation between the Figure and Ground is also specified. What these two examples, (7a) and (7b), have in common is that they both express the end (telic) point of an event.

(7) a. Qiqiu piao-*shàng* waitaikong (qu) le
balloon float-up outer space (go) ASP
'The balloon floated/is floating up to outer space.'

b. Qiqiu piao-*dào* waitaikong (qu) le
balloon float-*arrive* outer space (go) ASP
'The balloon floated/has floated up to outer space.'

The Figure in (7) refers to *qiqiu* 'balloon', whereas the primary reference object (i.e. the Ground) is unspecified. Nevertheless, we can locate the movement of the Figure on the basis of the earth-based reference. The support relation of the co-event is particularized as *Manner* to the framing event,[6] and the core schema is WITH-THE-MANNER-OF. As shown in (7a), the aspectual (telic) information as well as the path notion (i.e. the movement of the Figure) is implicated by the use of *shàng*. That is, the notion of the path is more saliently expressed than the aspectual component in such a motion event with the use of the satellite *shàng*. By contrast, if the VC *dào* is used in (7b), the path notion is not as saliently conveyed as the aspectual notion (telic). The other way to explicate the subtlety is that the employment of *dào* draws one's attention not only to the ending (telic) of the floating, but also to the final site where the Figure *qiqiu* 'balloon' is finally located.

However, it is worthwhile to remark that the function of *shàng* is not limited to specifying the notion of the path only. The satellite *shàng* also specifies the spatial relation between the Figure and Ground in addition to the path notion. Another framing event, an event of coactivity, is given in (8).

(8) a. Xiaohua zhui gongche
Xiaohua chase bus
'Xiaohua tries to chase after the bus.'

b. Xiaohua zhui-le gongche
Xiaohua chase-PERF bus
'Xiaohua chased after the bus.'

[6] The framing event serves to schematize a conceptual domain, and it is composed of four components: a Figure, and an activating process, an association function, and a Ground.

c. Xiaohua zhui-*shàng* (le) gongche le
Xiaohua chase-*up* PERF bus ASP
'Xiaohua caught up with/was running over to the bus.'

d. Xiaohua zhui-*dào* (le) gongche le
Xiaohua chase-*arrive* PERF bus ASP
'Xiaohua caught up with the bus.'

The use of the satellite *shàng* denotes the spatial relation between the Figure and Ground, and such an event is interpreted as being in a coactivity relation rather than the notion of path. Coactivity is also known as Activity Correlating. It means the first subject performing an activity is associated with the second subject whose activity is correlated with the first. Examples of this can be seen in (8). In example (8), *chasing bus*, the Figure is *Xiaohua* and the Ground is *gongche* 'bus'. The meaning of the simple verb *zhui* 'chase' in (8a) does not convey the realization of the action of chasing. Moreover, the addition of the perfective marker *le* leads to a perfective or past tense reading. Besides using *le*, Mandarin native speakers often use a variety of VCs such as *shàng* and *dào*, as exemplified in (8c) and (8d). Both *shàng* and *dào* denote the notion of telicity in (8c) and (8d), but only *shàng* signifies the temporal concept of *instantaneous change* (i.e. the inception of another change of state resulting from the V_1).

More importantly, in addition to denoting the telicity, *shàng* in (8c) also specifies the spatial configuration between the Figure and the Ground (i.e. Xiaohua and the moving bus – a reference object). Two possible conceptions are often associated with the use of the satellite *shàng*. First, it can be the case that the event of the Figure and the Ground has an inchoative aspectual reading – a correlative view is emphasized. Second, it is also possible to construe a situation where the agent *Xiaohua* (the Figure) is jumping onto the bus (the Ground) if the satellite *shàng* is used. For the VC *dào*, only the aspectual (telic) notion is incorporated; there is no spatial concept associated with *dào*.

The last example of the spatial use of VCs in a motion event involves the semantic notion of *contact* (cf. Teng 1977).

(9) a. Zhangsan zhuang le anquandao
Zhangsan bump PERF median
'Zhangsan bumped into the median.'

b. Zhangsan zhuang-*shàng* le anquandao
Zhangsan bump-*up* PERF median
'Zhangsan drove over/bumped into the median.'

c. Zhangsan zhuang-*dào* le anquandao
Zhangsan bump-*arrive* PERF median
'Zhangsan bumped into the median.'

Regarding the examples shown in (9), (9b) and (9c) are more commonly used than (9a) by native speakers. Example (9a) only describes a past/perfective event that just happened with the use of perfective *le*. Compared with (9c), the VC *dào* is used to specifically emphasize the confirmation of the action V_1 as well as the telic concept. Apparently, it seems that the example (9) is compatible with Teng's (1977) claim that both *shàng* and *dào* contains the semantic component 'contact'. However, there is no need to explain the function of *dào* by using the notion of spatial contact. On the contrary, when the satellite *shàng* is used in (9b), this sentence just explicitly designates the spatial configuration between the Figure (the unspecified car that Zhangsan drove) and Ground (*anquandao* 'median'). This example provides additional evidence for confirming that the satellite *shàng* is a poly-functional VC.

3.2. Aspect: Complementary Distribution

The satellites *shàng* and *dào* do not all behave alike with respect to the notion of aspect. In example (10), satellites *shàng* and *dào* both function as an event of temporal contouring (Aspect). If there is no VC used but a perfective marker *le* is used in (10a), the only meaning expressed by the verb *hua* 'spend' is the perfective or the past meaning of spending. However, if the VC *shàng* is used, not only the completion of the action is evoked, but the **inception** plus the **duration** of V_1 *hua* 'spend' is semantically signified. The focus is from starting, remaining, and intensifying the duration of the V_1; in particular, the duration is longer than the speaker's expectation (presupposition). As we observe in (10b), the addition of *shàng* not only denotes an inception of another new state, but it also implies the **duration** of the V_1. However, this is in contrast to the satellite *dào*, which cannot be used in (10c) since the aspect marker *dào* only denotes the telic notion of the event.

(10) a. Zhangsan hua-(le) ershi-ge xiaoshi xie qimo-baogao
Zhangsan spend-PERF twenty-CL median write final-report
'It took/has taken Zhangsan twenty hours to write the final paper.'

b. Zhangsan hua-*shàng* ershi-ge xiaoshi xie qimo-baogao
Zhangsan spend-*up* twenty-CL median write final-report
'It took/has taken Zhangsan twenty hours to write the final paper.'

c. *Zhangsan hua-*dào* ershi-ge xiaoshi xie qimo-baogao
Zhangsan spend-*arrive* twenty-CL median write final-report

In a nutshell, the VCs *shàng* and *dào* are incorporated with different aspectual components. The VC *dào* signals a telic notion, whereas *shàng* specifies a telic plus an inception notion, yielding a certain degree of duration. This explains why the example (10c) is ungrammatical if the aspectual marker *dào*, denoting the duration of the event, is used. The contrast between *shàng* and *dào* can be

expanded to reveal their fundamental aspectual complementarity in state change or realization framing events later.

3.3. Realization: Confirmation vs. Fulfillment Satellites

In an event of realization, I demonstrate that *shàng* and *dào* function differently in terms of fulfillment or confirmation. The satellite *shàng* functions as either a fulfillment or a confirmation satellite, whereas *dào* mainly functions as a fulfillment satellite. Additionally, the different roles of the satellite *shàng* depend on the use of the first verb. As illustrated in (11), the referent of the transitive verb *guan* 'close' consists of an Agent's intended activity of closing and the Agent's further intention that this activity will lead to fulfilling the action – closing the door.

(11) **Moot-fulfillment verb:** action + goal (i.e. *guan* 'close')
Fulfillment satellite*:* *shàng* 'up' (with fulfillment of the goal)

a. Chumen shi, jide yao ba men guan le
Go out time remember want BA door close ASP
'Be sure to close the door when you are going out.'

b. Chumen shi, jide yao ba men guan-*shàng*
Go out time remember want BA door close-*up*
'Be sure to close the door when you are going out.'

c. *Chumen shi, jide yao ba men guan-*dào*
Go out time remember want BA door close-*arrive*

Basically, the meanings of (11a) and (11b) are the same and the use of the satellite *shàng* 'up' just further fulfills the goal of the action V_1 *guan* 'close'. It is plausible to argue that the additional use of the satellite *shàng* conceptually leads to the beginning of the resultant state change. That is to say, without a satellite in (11a), this verb is moot regarding the outcome, and the sentence just expresses an action of "closing the door". The intended result expressed by the verb *guan* 'close' is originally **potential**, but the addition of the satellite *shàng* 'up' indicates that the inception of this state change has **actually** been fulfilled in (11b). Therefore, this type of event can also be regarded as a kind of state change, from potential action to actual realization. On the other hand, the VC *dào* in (11c) is not allowed in this construction because the aspectual notion of *dào* does not indicate the inception of the resultant state change.

Let's look further at the other examples given in (12). First, one remarkable thing to note is the similar meaning illustrated in both (12a) and (12c), but with additional implication signified by the use of *dào* in (12c).

(12) **Moot-fulfillment verb**: action + goal (i.e. *mai* 'buy')
Fulfillment satellite*: dào* 'arrive' (with fulfillment of the goal)

a. Zhangsan mai-le zhe-zhang changpian
Zhangsan buy-PERF this-CL record
'Zhangsan bought this record.'

b. *Zhangsan mai-*shàng* (le) zhe-zhang changpian
Zhangsan buy-*up* PERF this-CL record

c. Zhangsan mai-*dào* (le) zhe-zhang changpian
Zhangsan buy-*arrive* PERF this-CL record
'Zhangsan bought this record (implication: through an effort).'

Likewise, the single verb *mai* 'buy' in (12a) is a moot-fulfillment verb, and the outcome is indeterminate without employing any verb complements. With the fulfillment satellite *dào* used in (12c), the implication of the sentence is that one made a lot of effort in order to buy the record. This reading is quite different from (12a), in that there is no such implication involved in the use of the perfective marker *le.* That is, in (12c), *dào* not only denotes the completion of the action of buying, but also implies that the effort (i.e. looking, searching, and finally buying) that one had devoted has finally been realized. Second, unlike the previous example (11), the satellite *shàng* is not allowed in (12b) instead. Notice that if the aspectual notion (telicity) denoted by the verb complement is saliently construed and if there is no spatial relation such as the notion of path involved, the use of the satellite *shàng* is ungrammatical. In contrast with the satellite *shàng*, the VC *dào* is preferred in (12c) to purely denote the fulfillment of the buying action as well as telicity.

On the other hand, in addition to functioning as a fulfillment satellite, *shàng* also functions as a confirmation satellite, as shown in (13).

(13) **Attained-fulfillment verb**: action + goal + fulfillment of that goal
Pleonastic satellite: fulfillment of the goal (confirmation of implicature)

a. Zhangsan haishi pei-le shiyi tai-bi
Zhangsan still compensate for-PERF ten-billion Taiwan-unit
'Zhangsan still suffered a loss of ten billion Taiwan dollars.'

b. Zhangsan haishi pei-*shàng* shiyi tai-bi
Zhangsan still compensate for-*up* ten-billion Taiwan-unit
'Zhangsan still suffered a loss of ten billion Taiwan dollars.'
(p.s. The amount of money is higher than the ordinary people's expectation)

c. *Zhangsan haishi pei-*dào* shiyi tai-bi
Zhangsan still compensate for-*arrive* ten-billion Taiwan-unit

In Mandarin, *pei* 'compensate' is an attained-fulfillment verb, and the use of *pei* 'compensate' indicates the actual fulfillment of the intention rather than just an implicature of the fulfillment of the further intention or a moot outcome. The fulfillment of the intention is essentially embodied by the verb itself. The pleonastic satellite *shàng* is just used to further denote the resultant state, implying the confirmation of that implicature of V_1. Thus, this use of *shàng* involves a certain degree of the inception of another state. We can say that the satellite *shàng* is responsible for the reading about the speaker's surprise feeling toward the amount of money being compensated for. As seen in (13b), the amount of money for the compensation is higher than the ordinary people's assumption. In general, the VC *shàng* does implicitly express such a notion – the mental space. As discussed above, *dào* does not indicate the beginning of another event or change of state. The reason for the satellite *dào* being incompatible in (13c) is because the satellite *dào* does not function as a confirmation satellite.

4. Conclusion

In this paper, it has been shown that the VCs, *shàng* 'up' and *dào* 'arrive' in Mandarin mainly differ in three aspects. First, if the spatial notion is more saliently construed than the aspectual notion by the speaker, *shàng* vs. *dào* can occur in the same environment with regard to being VCs. However, the use of *shàng* further specifies the spatial configuration between the Figure and Ground (i.e. path, surface contact, or spatial relation between the Figure and Ground), whereas *dào* only denotes the aspectual notion. Second, with respect to the notion of aspect, *dào* only denotes a telic notion, whereas *shàng* denotes a telic plus an inception of resultant state from the first verb. Third, in a framing event of realization, *dào* primarily functions as a fulfillment satellite, whereas *shàng* is a confirmation satellite as well as a fulfillment satellite, dependent on the first verb.

In summary, I have addressed the issue of the nature of the differences between VCs *shàng* and *dào* in Mandarin. Furthermore, I have also proposed an adequate account for some of these differences from a cognitive perspective. My analysis regularizes the seemingly diverse functions of two VCs, *shàng* and *dào*, occurring in similar syntactic environments, and also captures their subtle semantic distinctions. It reveals that neither postulating lexical rules nor collocation groups will clarify the nuances between the VCs *shàng* and *dào*. On the other hand, this account also serves to justify that there is no single distinct function exhibited by Mandarin VCs. Instead, the meanings and functions of VCs in Mandarin are comprised of a complex of conceptual categories, and each differs by a certain degree of salient manifestation of spatial or aspectual notions.

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Hui-Chen Sabrina Hsiao
609 Baldy Hall
University at Buffalo, The State University of New York
Buffalo, NY 14261
hhsiao2@buffalo.edu

Effect of Tonal Neutralization Rules on Native Speech Perception*

TSAN HUANG
University at Buffalo (SUNY) & The Ohio State University

0. Introduction

Many researchers discussed the interplay of phonology and speech perception (e.g. Hume and Johnson 2001), especially how perception helps to shape synchronic phonology and conditions historical sound change. In the other direction, despite claims for a universal map of inherent or positional perceptual salience in speech sounds (e.g. Steriade 2001), speech perception also appears to depend on listeners' linguistic experience. First of all, the native inventory of contrastive sounds may have an impact on speech perception. For instance, Japanese listeners, whose language has only one liquid sound, perceive the /r-l/ distinction differently from American English speakers (Miyawaki et al. 1975). Hume et al. (1999) found that while consonant-vowel transition seems to provide more place information for consonant place identification than stop burst for both American English and Korean listeners, the difference between the two kinds of stimuli is greater for Korean listeners. Hume *et al.* suggest that this is because the Korean listeners with a three-way stop consonant contrast, which is cued in part by the duration of aspiration, may be paying more attention to the CV transition between the burst and the vowel onset than do the English listeners, who have a two-way stop contrast. Second, the phonotactics of a language may have an effect on speech perception. Pitt (1998) found that phonotactic constraints biased native listeners' identification toward permissible sound sequences in English when perceiving continua whose two ends consist of a voicing or place contrast. Third, phonological rules operating in the listener's native language influence his/her perception as well. Fox (1992) found that English listeners fared poorly in identifying or discriminating vowels in the neutralizing context of /hVr(d)/. Fox suggests that knowledge of the phonological rule that neutralizes vowel contrast in this context may have affected listeners' ability to make perceptual decisions about vowel quality.

* This work was supported by Grant No. 5 R01 DC04421 to Keith Johnson from the National Institute on Deafness and Other Communication Disorders, and an Alumni Grant for Graduate Research to Tsan Huang from the Ohio State University in Spring 2003.

Past studies have shown that tonology may influence tone perception in a similar way. Gandour (1983, 1984) and Lee, Vakoch and Wurm (1996) showed that differences in lexical tone inventories may play a role in tone perception. In Gandour's (1983) study using synthesized f0 stimuli, speakers of Mandarin, Cantonese, Taiwanese, Thai, and English made dissimilarity judgments on tonal pairs. Results show that the tones were rated significantly differently by tone versus nontone language speakers, by Thai versus Chinese (Mandarin and Taiwanese) speakers, and by Cantonese versus Mandarin and Taiwanese speakers. Lee et al. (1996) used naturally recorded stimuli of Cantonese and Mandarin tones on word and nonword syllables. It was found that Cantonese and Mandarin listeners were better at discriminating tones in their own dialect and that the tone language speaking listeners did better than the English group.

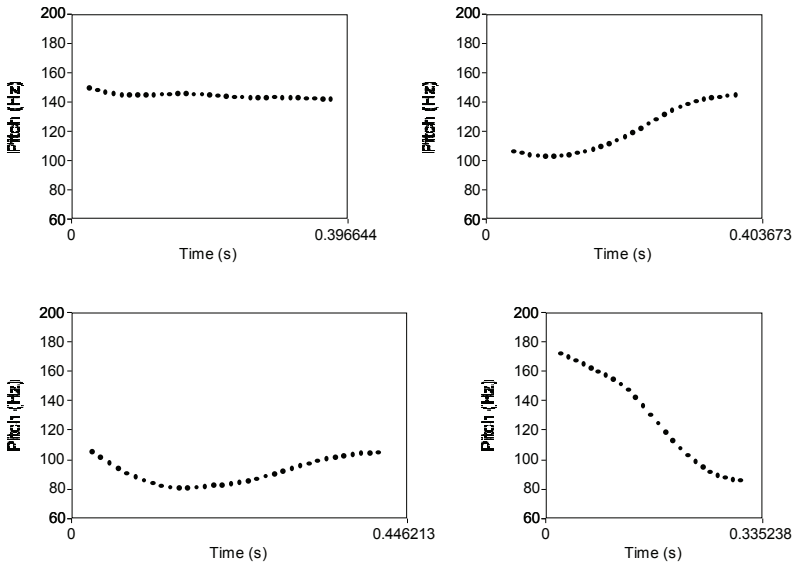
Gandour (1981, 1983) suggests that tone sandhi rules may also influence tonal perception. Using INDSCAL (Carroll and Chang 1970), Gandour (1981) analyzed confusion data from native listener identification of naturally produced Cantonese tones. He found that the high falling tone was placed midway between the level and the contour tones in the perceptual tone space. He argues that this is due to the fact that this tone has a high level allotone in Cantonese. Although the allotone was not present in the stimuli, allophony still interfered with listeners' perception. The effect of the same allophonic alternation showed up in Gandour's (1983) study, where Cantonese listeners perceived a /44/ (high level) contour to be similar to a /53/ (high falling). In the same experiment, Mandarin listeners perceived the /44/ contour to be similar to /35/ (rising), which, as Gandour points out, is due to the existence of the allophonic rule that turns a rising tone to a high level in Mandarin (Chao 1965; see also §1 below). In Huang (2001; see also Huang 2004), I have argued that the Mandarin T214 sandhi rule increases the confusability between T214 and T35 in native tone perception. The main findings of that study will be recapitulated in §2.

In the present study, we re-tested the phonology and perception interplay in the domain of lexical tone perception in Standard Beijing Mandarin and further investigated at what level(s) such influences were present. The data were compared with those of Huang (2001). The theoretical implications of these empirical data for speech perception models will also be discussed.

1. Background: Tones and Tone Sandhis in Standard Mandarin

Standard Mandarin has four lexical tones. Chao (1965) describes them as high level [55], mid-rising [35], low falling-rising [214], and high falling [51]. The numbers in the square brackets indicate the idealized pitch values of these tones on a five-level scale. I shall refer to them as T55, T35, T214 and T51, respectively. (Figure 1 shows the f0 traces of these tones.) There are also the so-called neutral-toned syllables in Mandarin, which are not specified for tone underlyingly.

Figure 1 F0 traces of T55 (upper left panel), T35 (upper right), T214 (lower left), and T51 (lower right), produced in monosyllables by a male Beijing speaker. Lengths of the X-axes reflect the relative durations.



Underlying full tones may be modified under the influence of their tonal environment. In the third tone sandhi, T214 becomes T35 when immediately followed by another T214 (Chao 1965, Duanmu 2000):

(1) The T214 Sandhi Rule
/T214.T214/ → [T35.T214][1]

Since an underlying /T35.T214/ sequence is also realized as [T35.T214], the paradigmatic contrast between T35 and T214 is lost before a following T214, creating many homophonous surface pairs. For example, /*hao*^{214}.*mi*^{214}/ 'good rice' is not distinguishable from /*hao*^{35}.*mi*^{214}/ 'millimeter', since both surface as [*hao*^{35}.*mi*^{214}]. The neutralization of T214 and T35 is complete perceptually (Wang and Li 1967, Peng 1996).

In the second tone sandhi rule, T35 becomes T55 when following a T55 or T35 and preceding a full-toned syllable (Chao 1965). This rule is optional and is not taught to second language learners.

(2) The T35 Sandhi Rule
/T55.T35.T*x*/ → [T55.T55.T*x*], or
/T35.T35.T*x*/ → [T35.T55.T*x*],

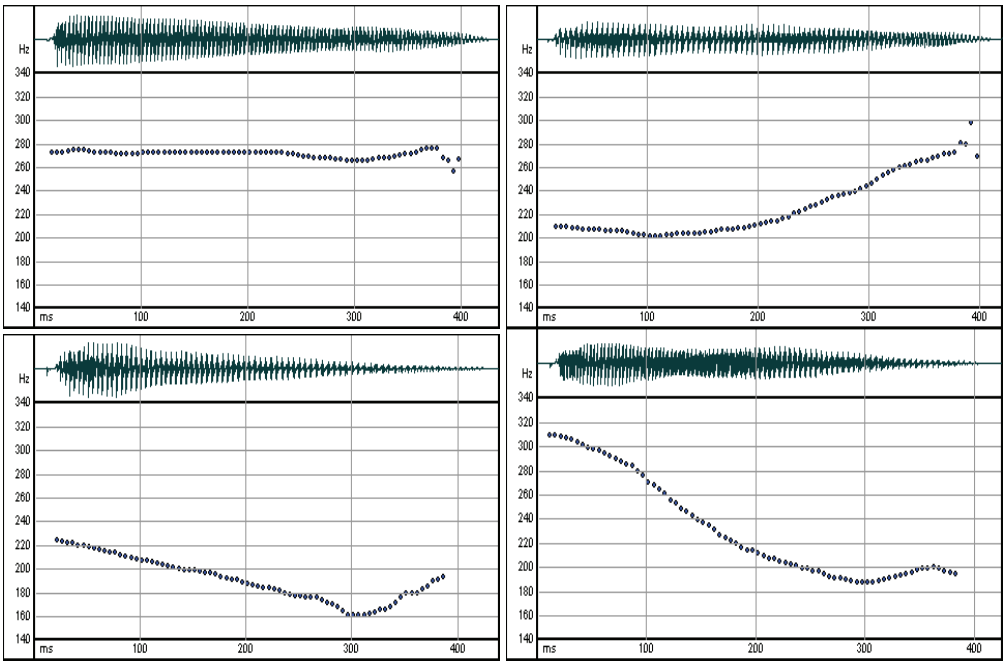
[1] I shall use a period [.] between two syllables produced as a sequence/word, and a hyphen [-] between an ordered pair of monosyllables. A notation with a slash [/] between two monosyllables, as in T55/T35, covers both T55-T35 and T35-T55. Tones may appear as raised diacritics in words, as in /*hao*^{214}.*mi*^{214}/ 'good rice'.

where T*x* is any non-neutral tone. /*cong*^{55}.*you*^{35}.*bing*^{214}/ → [*cong*^{55}.*you*^{55}.*bing*^{214}] '(Chinese) onion pancakes' is a familiar example (Chao 1965:36). This rule also leads to paradigmatic neutralization: the contrast between T55 and T35 is lost.

2. Summary of Huang (2001)

Huang's (2001) study tested the hypothesis that native phonology may influence speech perception, using natural speech tokens of Mandarin tones and Chinese- and English-speaking listeners. The stimuli used in that experiment were the first syllables cut from recorded disyllabic nonsense sequences and had the same segmental shape /ba/ with varying tones (Figure 2). An AX discrimination task was used. While each stimulus pair was played (at a 300ms inter-stimulus interval, or ISI), listeners made simple "same"/"different" judgments.

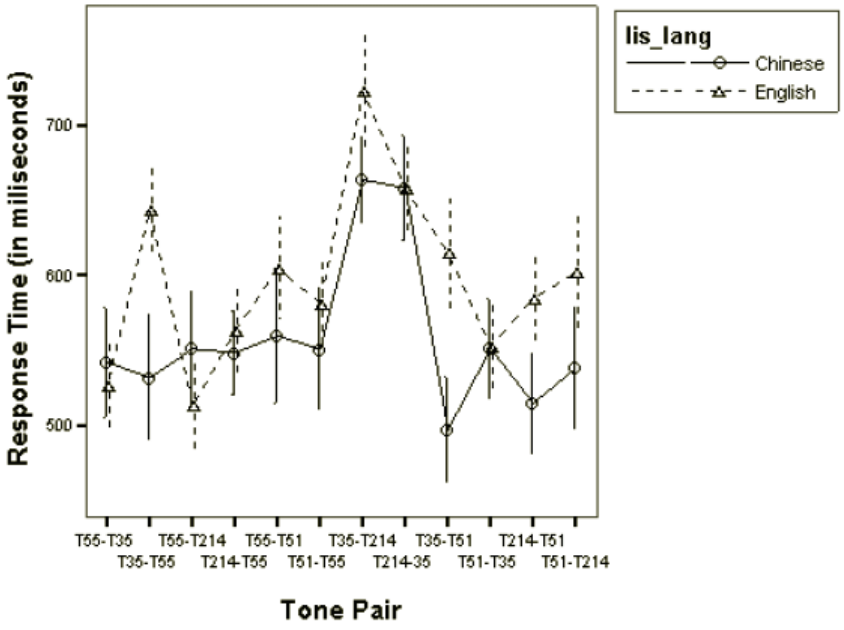
Figure 2 F0 traces of the stimulus tones used in Huang (2001). Upper left: T55; Upper right: T35; Lower left: T21(4) – final rise cut off in non-final position; Lower right: T51.



Both the judgment accuracy and reaction time (RT) were recorded. The results showed that T35 and T214 – i.e., the two tones involved in the T214 sandhi – were perceptually more confusable (attracting more mistakes and inducing longer RTs) than any other tone pairs for both listener groups. As error rates were very low for both listener groups (overall 4.5% for the Chinese listeners and 5.25% for the AE listeners), there was no statistically significant difference among the tone pairs.

A repeated measures analysis of variance (ANOVA) was performed on the RT data for the correct "different" responses, with tone pair (i.e., T55/T35, T55/T214, T55/T51, T35/T214, T35/T51, and T214/T51) as the within-subject variable (12 levels), and listener language (i.e., Chinese and English) as the between-subject variable (2 levels). No significant difference was found between language groups, [$F(1, 21) = .76$, $p = .393$]. But there was a significant effect with tone pair types, sig.[$F(7.487, 157.221) = 13.382$, $p < .001$, partial $\eta^2 = .389$]. The interaction of language and tone pair was also significant, sig.[$F(7.487, 157.221) = 3.295$, $p = .002$, partial $\eta^2 = .136$].

Figure 3 RT plot (in milliseconds) for the correct "different" tone pair responses. Error bars show one standard error.



Pairwise comparison for each language group showed that T35/T214 were the most confusable for the Chinese listeners and were significantly different from all other pairs ($p < .05$), while T35-T51 was the least confusable and significantly different from all other pairs except for T35-T55 and T214-T55. While T35/T214 were also the most confusable for the AE group, T214-T35 was not significantly different from T35-55, T35-T51, or T51-T214. They also found three tone pairs to be the least confusable, namely T55-T35, T55-T214, and T51-T35, which did not stand out in the Chinese listeners' data at all (see Figure 3).

Pairs T35-T55 and T35-T51 are quite different for the two listener groups. As seen in the ANOVA report above, these were among the least confusable for the Chinese listeners but the more confusable for the AE listeners. A T-test on the RT data shows that these between-group differences are significant: $t = -2.136$, $p = .045$, and $\eta^2 = 0.178$ for T35-T55, and $t = -2.254$, $p = .035$, and $\eta^2 = 0.195$ for

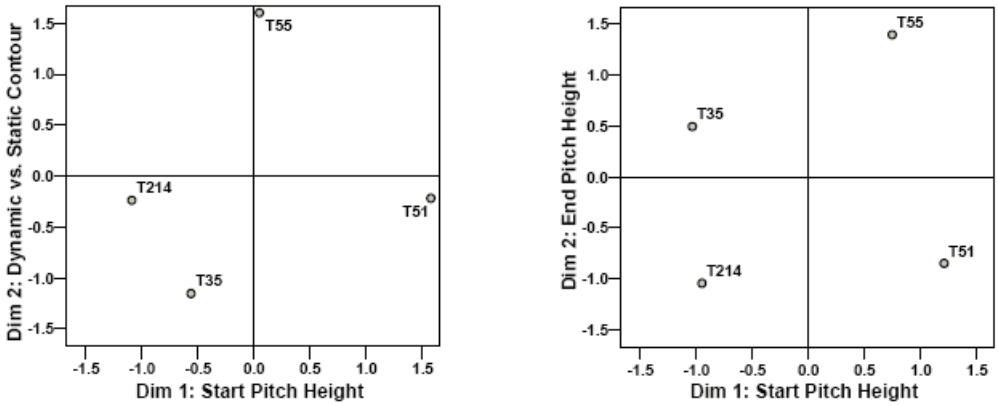
T35-T51. What is special about these pairs is that the pitch offset of the first tone (T35 in both cases) and the pitch onset of the second tone (T55 or T51) are very similar in height. This seems to affect the AE listeners' perception, but not the Chinese listeners', whose RT curve is fairly flat, except for T35-T214 and T214-T35, while that for the AE listeners has more obvious maxima and minima, some of which are attributable to this factor (e.g. T35-T55, T55-T51 and T51-T214). It is likely that the AE listeners, with no lexical tone categories in their lexicon, were more sensitive to the pitch onsets and offsets and used them as phonetic cues to discriminate the tones (Wang 1976, Stagray and Downs 1993). The more similar these points are, the more confusable the tones are for the AE listeners, as in the case of T35-T55 and T35-T51. On the other hand, the Chinese listeners may have perceived the f0 contour on a monosyllable as an indivisible unit and thus ignored such phonetic details of the contour to a certain extent.

Obviously, these different processing strategies were not always to the advantage of either group of listeners: for T55-T35 and T55-T214, the AE listeners used the phonetic cues more efficiently and scored shorter RTs. But the Chinese listeners made good use of contour information in pairs T35-T55 and T35-T51. This difference in strategies is actually a very telling one, because it suggests that the long RTs for the T35/T214 pairs may have resulted from different factors for the two groups. That is, T35 and T214 were confusable for the Chinese listeners not because of the phonetic similarity between the tones that affected the AE listeners, but because of the tone sandhi in their native phonology which neutralizes the contrast between these two tones in one environment.

The RTs for T35/T214 are much longer relative to the other tone pairs in the Chinese listeners' data, while the inter-pair RT differences for the AE listeners are less pronounced. This is best visualized using INSCAL (Carroll and Chang 1970). The analysis also brought out the two most important tonal characteristics (labeled along the two dimensions in Figure 4) in each listener group's perception. Notice that the AE listeners paid attention to both f0 onsets and offsets, while the Chinese listeners seemed to rely on f0 onsets only.

As the perceptual distance d was computed with the reciprocal function $d = 1/RT$ (Shepard 1978), the distance between T35 and T214 is noticeably much shorter in the Chinese space. Recall that the within-group pairwise comparisons also showed that for the Chinese listeners, T35/T214 were significantly different from all other tone pairs. This seemingly surprising pattern can be explained if, as Peng (1996) found, some surface [T35] syllables may be linked to both /T35/ and /T214/ morphemes (perhaps as part of a compound) in the Chinese listeners' lexicon. It is worth noting that with such a complex mental representation of the tonal category (or rather categories) of certain morphemes and a one-to-many mapping of surface tone to underlying tone categories, the boundary between the T35 and T214 categories may be blurred and the confusion between these tones may exist beyond just the sandhi environment, which is why there is not much difference between the RTs for T35-T214 and T214-T35 for the Chinese listeners.

Figure 4 The Chinese (left panel; stress = 0.189, RSQ = 0.89) and English (right panel; stress = 0.169, RSQ = 0.91) listeners' perceptual spaces of the four tones as revealed by the INSCAL analysis.



3. The Present Study: A Speeded AX Task

Fox (1984) found that faster response led to decreased language effects. In particular, he showed that a response latency shorter than 500 ms blocks the lexical effect on perception. We decided to investigate whether a speeded task would reduce the sandhi effect on tone perception as shown in Huang (2001).

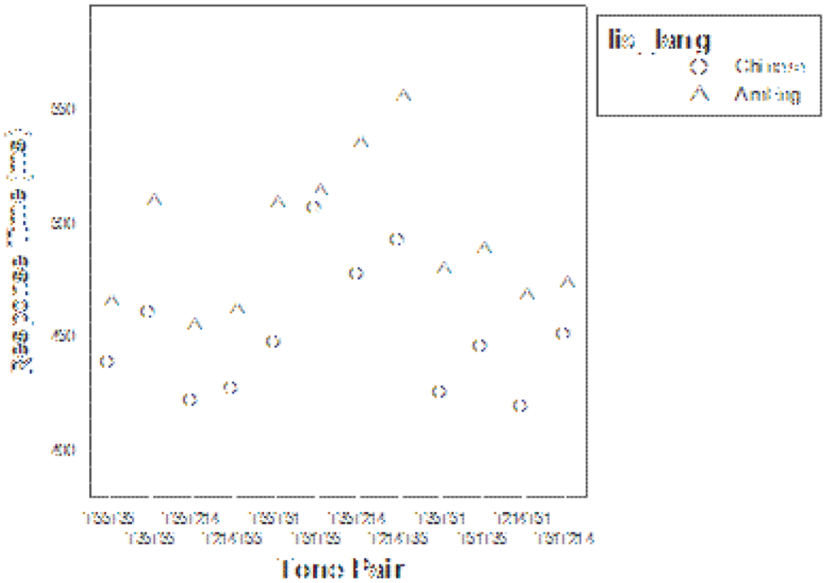
3.1. Procedures

A group of 24 high school students from Beijing and a control group of 20 native AE-speaking undergraduate college students from Columbus, Ohio participated in the present study. The task was the same as that used in Huang (2001), except that they were asked to respond within 500ms. (They could check their performance on the computer screen in front of them. As can be seen in Figure 5 below, they did very well, having most RT values below or around 500ms.) The inter-stimulus interval was also shortened to 100ms. The stimuli were recorded as monosyllables and had the segmental makeup of /ba/. (The f0 traces shown in Figure 1 were from this recording.) As in the previous study, error rates and RT were recorded.

3.2. Results and Analyses

Since the stimuli were played at a comfortable volume with no background noise, the error rates were very low, 5.13% and 5.88% overall for the Chinese and the AE listeners, respectively. The pairs that attracted the most errors were T35/T214 (9.35%) and T55/T51 (7.61%) for the Chinese listeners, and T55/T51 (8.75%) and T35/T214 (7.5%) for the AE listeners. Figure 5 shows the group RT plots.

Figure 5 RT (in milliseconds) for the correct "different" tone pair responses. Error bars show one standard error.



In comparison with the RT plots in Figure 3, we may notice that the AE listeners had very similar curves for both datasets, except that here T55/T51 have longer RTs and that T51-T35 is at a maximum. These seem explainable in terms of the differences in the stimuli used in the two studies: the differences in the f0 offsets of the first stimulus (T55 or T51) and the onset of the second (T55, T51 or T35) in these pairs are smaller in the present study. The curves for the Chinese listeners' datasets are also very similar, except that the points for T35-T55 and T51-T55 are now at maxima. The explanation of matching f0 offset and onset cannot be invoked for the Chinese listeners, because the f0 offset of T35 was also similar to the onset of T55 in the 2001 stimuli. In addition, unlike the AE listeners, the Chinese listeners have a shorter RT for T55-T51 than T51-T55 here. One possible explanation for the RT disparity for T35-T55 in the two studies is that: We have a group of Beijing listeners in the present study, who may have the T35 sandhi in their speech. As for T51-T55, recall that the stimuli used in this study were recorded as monosyllables. When played at a 100ms ISI, they might have been heard as two consecutive syllables in normal speech. As a result, the Beijing listeners might have undone the downstep effect of T51 (Xu 1997) and effectively "raised" the onset of the following T55. As the Chinese listeners tend to rely on the onset pitch to predict the whole tonal contour, T55 might have been mistaken as T51 when it was played after a T51.

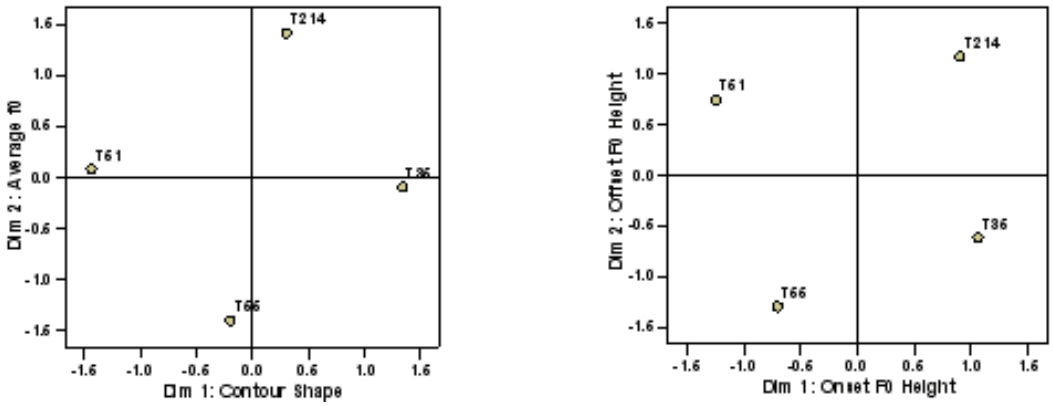
A repeated measures ANOVA on the RT data of correct "different" responses found no significant between-subject effect, $F(1, 41) = 2.48$, $p = .123$. The within-subject factor of tone pair had a significant effect, sig.[$F(9.396, 385.225) = 21.455$, $p < .001$, partial $\eta^2 = .344$]. There was also a significant effect with the interaction

of language and tone pair, sig.[F(9.396, 385.225) = 2.136, p = .024, partial η^2 = .05]. Results from paired comparisons using independent samples T test were rather unremarkable, with only T35-T55 and T35-T214 showing some marginal between-group differences.

Separate ANOVA analyses on the RT data for each group revealed that tone pair types had a significant effect for both groups (p < .001). The AE listeners found T214-T35, T35-T214 and T35-T55 the most confusable, while T55/T51 fell in the middle of the confusability rank. For the Chinese listeners, T51-T55 was the most confusable, followed by T214-T35, T35-T55 and T35-T214.

Group INSCAL spaces are shown in Figure 6. As in the earlier study, the AE listeners' tone space has very clearly defined dimensions. The effects of the T214 and T35 sandhi rule and the possible downstepping effect of T51 on T55 are not visible in the Chinese listeners' space, precisely because all of them might be at work. If the sandhi effects did not go away completely even in this simple AX task with a short 100ms ISI and a response time constraint, it is evidence for the contention that language-specificity exists in early levels of speech processing.

Figure 6 INSCAL spaces for the Chinese (left panel; RSQ = .918, stress = .157) and the AE listeners (right panel; RSQ = .918, stress = .164).



4. General Discussion

As is evident from the experimental data reported above, linguistic experience can lead to language-specific patterns in speech perception, which should be accounted for in any model of speech perception. For Steriade (2001), the universal perceptual salience map of speech sounds does not change for speakers of a particular language. Rather, language-specific patterns arise from different constraint rankings. However, leaving language-specificity to different constraint rankings does not offer an adequate theoretical explanation for the phenomenon, as rankings derived from empirical data only describe the patterns but do not

reveal the driving mechanisms. Some other force(s) must be working along with the perceptual map in determining language-specific patterns.

Guenther and colleagues (Guenther and Gjaja 1996, Guenther et al. 1999, Guenther and Bohland 2002) propose that the language-specificity in speech perception has a neurophysiological basis. In their neural model of an auditory cortical map, the formation of the map is determined by stimulus input and type of training. In particular, Guenther et al. (1999) found that categorical training in psychophysical experiments using nonspeech-like bandpass-filtered acoustic noise in different frequency ranges led to smaller cortical representation of – hence, decreased sensitivity to – stimuli in the training range, while discrimination training led to larger cortical representation – hence, increased sensitivity – in the training range. Functional magnetic resonance imaging (fMRI) studies by Guenther and Bohland (2002) provided further supporting evidence for this assertion. If an auditory warping similar to what Guenther et al.'s model describes existed, it would certainly serve the linguistic purpose well, as the warping directs neural activities to distinguishing between-category differences while ignoring irrelevant within-category differences. But the model as it stands now cannot account for the different degrees of language-specific effects as seen in the two studies discussed above.

In Johnson's (2004) lexical distance model, the universal perceptual distances assumed for speech sounds need not be altered by linguistic experience to account for language-specific effects, which simply emerge from the lexicon, as incoming signals are compared directly against phonetically detailed forms stored there. The model computes overall perceptual distance (d) from two sources, namely inherent auditory similarities between two stimuli (d_a), and aggregated average difference in lexical activations by the two stimuli (d_l, computed as the difference in the amounts of activation of the lexicon caused by these stimuli, with a constant k gating the influence of this lexical distance on perception under different experimental conditions); or $d = d_a + k \times d_l$. It is claimed that the model has the ability to distinguish discrimination performance from categorization performance, the former of which can be found in a minimal uncertainty task such as the speeded AX task reported here (no lexical access, perceptual distance computed almost exclusively from auditory distance) and the latter of which in tasks involving higher memory load such as AXB identification (lexical forms consulted). Johnson's (2004) fricative perception data from a rating task and a speeded AX discrimination task by Dutch and AE listeners support this claim.

Neither the neural model nor the lexical distance model explicitly discusses the issue of how neutralization rules may affect discrimination of two contrastive sounds (or tones) that are neutralized in a certain environment. Within Guenther et al.'s model, we may imagine a "noisy" training condition under which stimuli categorized into an abstract representation of A may sometimes have to be also categorized as B. This double-identity status may weaken the contrast between the relevant categories. Within Johnson's lexical distance model, because of the cross-representation of two sounds (e.g. T35 and T214 in Mandarin), a T35 or

T214 input may activate lexical items containing either a /T35/ or /T214/ form in the lexicon. Consequently, the lexical distance between /T35/ and /T214/ is predicted to be smaller than if there is no such neutralization rule. Both models need further refining to account for the data reported here.

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Tsan Huang
609 Baldy Hall
SUNY/Buffalo
Buffalo, NY 14260

thuang3@buffalo.edu

Deconstructing Markedness: A Predictability-Based Approach*

ELIZABETH HUME
Ohio State University

0. Introduction

Since first proposed as a linguistic term by Trubetzkoy (1939), the notion of markedness has come to occupy a position of considerable importance in phonology and other areas of linguistics. However, since Trubetzkoy's time, markedness has acquired a much broader meaning. The term "unmarked" is generally synonymous with, for example, simpler, more common, easier to produce, acquired earlier, etc. It is no longer limited to relations between elements on a language-specific basis, as Trubetzkoy assumed. Rather, markedness has come to refer to the universals of language (e.g., Jakobson 1963, 1990; Greenberg 1966), determined by Universal Grammar (Chomsky and Halle 1968, Kean 1975, and many others following them). Further, it has grown from a simple classificatory term to a predictive scientific concept (e.g., Kiparsky 1985, Calabrese 1995, Rice 1996, de Lacy 2002).

There are many serious problems with the notion of markedness, as I outline in section 1. The result, I suggest, is that markedness is not predictive and hence, not a scientific concept. The root of the problem is this: due to the vagueness of the concept, markedness, it is unclear what markedness diagnostics, e.g. neutralization, simplicity, deletion, are actually diagnosing. What we are lacking is a clear understanding of the basis of markedness.

I argue that it is *predictability*; that is, traditional markedness diagnostics are actually providing evidence for a linguistic element's predictability within a system. An element with greater predictability patterns as less marked than a corresponding, less predictable, one. Predictability is determined by a complex of fac-

* Special thanks to Mary Beckman, Chris Brew, Nick Clements, Hope Dawson, Kathleen Currie Hall, Keith Johnson, Hyunsook Kang, Grant McGuire, Jeff Mielke, Anton Rytting, and the OSU Phonetics/Phonology group (aka Phonies) for their most valuable input. My thanks also to audience members at the MOT Workshop in Phonology (2004) and BLS, in particular, Juliette Blevins, Marie-Hélène Côté, Heather Goad, Bruce Hayes, Larry Hyman, John Ohala, Sharon Peperkamp, and Glyne Piggott. I, of course, am responsible for the views expressed in this paper as well as for any errors.

tors, some language-specific and some universal, as discussed below. This paper focuses primarily on the contribution of one language-specific factor: language experience. As I hope to show, this approach is superior to traditional views of markedness for a number of reasons: first, it correctly predicts observed language patterns both at the language-specific and universal level; second, it correctly reflects the probabilistic nature of markedness; and finally, it is quantifiable, thus moving us closer to a predictive, scientific theory of sound patterns.

1. Problems with the Traditional Approach to Markedness

Developing a predictive and unified theory of markedness has not been a trivial undertaking. In fact, a wide range of diagnostics have been proposed (see Rice 1999 for discussion) including: phonetic instability, articulatory simplicity, perceptual salience, neutralization, epenthesis, assimilation, segment deletion, distribution, structural complexity, language acquisition, sound change, creole genesis, cross-language frequency, and implicational relations. Yet, much of the criteria assumed to provide evidence for markedness has been brought into question for the reason that sound patterns contradicting markedness claims are commonly observed at the level of the individual language, e.g., assimilation (Hume and Tserdanelis 2002, Hume 2003), passive neutralization (Hume 2003), underspecification and default values (Steriade 1995; Clements 1988, 1993; Mohanan 1993; Calabrese 1995), neutralization (Odden, p.c.), epenthesis (Vaux 2002; also, see below), cross-language phoneme frequency (Battistella 1990, Rice 1999), implicational relations (Rice 1999), creole genesis (Thomason 1993), child language acquisition (e.g., Menn 1983, Beckman et al. 2003), sound change (e.g., Lass 1975, Ladefoged 1984).

Consider assimilation, for example. When comparing members of a feature class in assimilation, it is commonly assumed that "the unmarked pole of an opposition is lost or obscured, with the marked pole remaining…In assimilation, the marked features within a class are active…the unmarked features, on the other hand, are passive, or inert…overridden by other features" (Rice 1999:4). Put another way, marked features resist modification while unmarked features are subject to change. Problematic for this view of markedness is the observation that virtually any place of articulation can pattern as unmarked in some language (Hume and Tserdanelis 2002, Hume 2003).

Developing a predictive theory of markedness has also proven difficult due to apparent inconsistencies and contradictions among the diagnostics themselves. Consider, for example, perceptual salience, a term commonly used to refer to the number and quality of the acoustic/auditory cues in the speech signal that a listener may use to identify a given sound or sound sequence. A sound with weak phonetic cues, and hence low salience, is more likely to undergo phonological processes such as assimilation, reduction and deletion, than sounds with better cues. In cases such as this, the member of the opposition with *low* salience is considered unmarked. On the other hand, sounds and sequences with good cues and

thus higher salience are also considered unmarked. The CV syllable is a prototypical example, widely considered to be the universally unmarked syllable type. Perceptual salience is thus used in apparently contradictory ways to refer to the same markedness value: an unmarked element can have low salience or it can have high salience.

Another example illustrating seemingly contradictory predictions of the diagnostics involves epenthesis and deletion. The epenthetic vowel or consonant is generally taken to correspond to the unmarked segment of a language. Deletion of one member of a class of sounds also denotes unmarked status. What this means is that an unmarked sound is not only more apt to delete, it is also more apt to be inserted. To put another way, the unmarked segment is both the most preferred and the least preferred segment in the language.

Due to problems such as these, an objective definition of what would validate or falsify markedness is lacking. Is markedness falsified if the evidence from different criteria conflict? If not, how do we determine the markedness status of an element? For example, a sound that is perceptually salient may be relatively simple from a production perspective. Does this make it marked in a system or unmarked? Given the lack of an objective statement of what markedness is, the concept tends to be used as is convenient; patterns that support a particular view of markedness are used as evidence for that view while those that do not, tend to be labeled "irregular," "exceptional," or "irrelevant."

Following Menn (1983), it is clear that markedness does not explain anything; it is something that needs to be explained. As I argue below, the concept predictability is able to do just this.

2. Predictability

Markedness is best considered a probabilistic notion with predictability positively correlated with unmarkedness. As I show below, observed markedness patterns follow from this approach in a straightforward manner. In short, an element that is predictable within a system is less crucial to successful communication than one that is less predictable. Consequently, a predictable element is a more likely candidate for reduction, deletion, change, etc. Recall that these are all traditional diagnostics for unmarkedness. Interestingly, a more predictable element is also more likely to be the epenthetic segment, another diagnostic of unmarkedness, since language users are biased towards predictable elements (see below). Thus, by taking into account the predictability of a segment in a language system, we are able to predict both its instability and a speaker/hearer's bias towards it. Further, unlike traditional approaches to markedness, cross-linguistic variability is not only accounted for, it is predicted, as I briefly discuss below.

There are several factors that come into play in determining the predictability of a given linguistic element. As I lay out in greater detail in Hume (2004b,c), these include perceptual salience, articulatory simplicity, functional load, social factors (e.g., prestige value), and the speaker/hearer's experience with the usage

of linguistic elements, e.g. sounds, words. All are crucial in determining how predictable an element will be in a language system. It is the influence of language experience that I focus on in this paper. Cross-linguistic variability and hence, language-specific markedness patterns result from the contribution of the system-dependent factors: functional load, social factors, and experience.

3. Experience

Experience is important because it is correlated with *expectation*. As described by Feather (1982), expectation, like other cognitive concepts, recognizes "the individual's capacity to process information so that it becomes organized and set within a context of meaning. These organized residues of experience then become important filters for future information processing, serving as benchmarks, criteria, or reference frames against which new information can be tested. They also guide the form that behavior takes." Formally, expectation is the probability (P) of *x* given *y*.

(1) EXPECTATION: $P(x|y)$

The more experience that one has with some element, the greater is the expectation that that element will occur. Experience is thus also correlated with *predictability*.

The impact of experience on language learning, language change, language processing, and language production is well-established (see, among others, Zipf 1932; Bybee, e.g. 1985, 2001; Jurafsky et al. 2001; Frisch 1996; Frisch et al. 2000; Luce 1986; Lindblom 1990; Pierrehumbert 1994; Pitt and McQueen 1998; Raymond, Dautricourt, and Hume to appear; Saffran, Aslin, and Newport 1996; Saffran, Newport, and Aslin 1996; Vitevitch and Luce 1999; Dell et al. 2000; Makashay 2001). In language acquisition, for example, experience with the ambient language shapes an infant's expectations regarding language, revealed as a preference for aspects of his/her native language (Aslin et al. 1981; Best et al. 1988; Jusczyk 1997; Polka and Werker 1997; Werker et al. 1981; Werker and Tees 1984). Psycholinguistic research in speech and word processing also shows that the ability to process speech is facilitated by a listener's familiarity with various dimensions of the native language's phonological system including: the language's sounds (Pitt and Samuel 1990), phonotactics (Hallé et al. 1998, Massaro and Cohen 1983, Pitt 1998, Pitt and McQueen 1998), patterns of contrast (Lahiri and Marslen-Wilson 1991, Otake et al. 1996, Dupoux et al. 1997, Harnsberger 2001, Hume and Johnson 2003), and syllable structure (Cutler and Norris 1988, Pallier et al. 1993, Pitt et al. 1998, Treiman and Danis 1988). For example, listeners are biased to parse consonant clusters that are phonotactically impermissible into permissible sequences (Hallé et al. 1998, Massaro and Cohen 1983, Pitt 1998). Pitt (1998) found that an epenthetic schwa was more likely to be perceived between the consonants of phonotactically illegal consonant clusters

(e.g., [tlæ] → [təlæ]) than legal clusters (e.g., [træ] → [təræ]). It is also uncontroversial that how words are processed is influenced by factors such as their frequency of occurrence and the predictability of sequences of sounds in the word (e.g., Savin 1963, Luce 1986, Luce and Pisoni 1998, Pitt and McQueen 1998, Vitevitch and Luce 1999, Frisch et al. 2000). For example, the higher the frequency of the word, the greater the likelihood is that the listener will identify the word correctly (Luce 1986). As I discuss below, experience also plays a role in synchronic phonological patterns.

Language experience and predictability are useful concepts when it comes to understanding markedness since, as it turns out, most of the traditional diagnostics fit into one of two categories: (a) they provide evidence for the result of predictability, or (b) they contribute to one's experience with a particular element and, as a result, influence what is predictable within the system of an individual speaker/hearer or the language more generally. I illustrate these two points just below.

4. Diagnostics that Feed Experience

Consider first traditional markedness diagnostics that contribute to one's experience with a linguistic element. As shown in Figure 1 these include distribution, neutralization, articulatory simplicity, perceptual salience, and structural simplicity. Each of these diagnostics provides evidence of a speaker/hearer's experience with some element of his/her language, and thus the degree of predictability of the element in question.

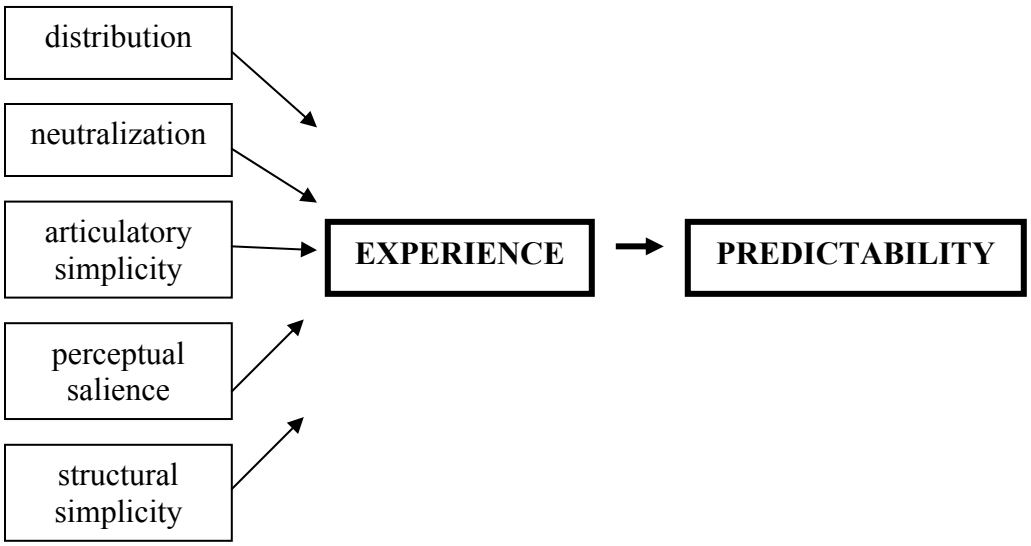

Figure 1. Traditional markedness diagnostics that feed experience with a particular linguistic element

Distribution has long been considered a diagnostic of markedness: the element with the wider distribution is deemed unmarked. Linking distribution to an element's predictability is straightforward: given two elements *x* and *y*, if *x* has a wider distribution than *y*, chances are that the language user will have more experience with *x* than with *y*. Thus, the probability of *x* occurring is greater than the probability of *y* occurring. This is nicely illustrated in Mielke's (2003) cross-linguistic study of the perception of /h/ by native listeners of Turkish, Arabic, English, and French, calculated as a function of the sensitivity measure *d′*. A higher *d′* value indicates that the listener is more sensitive to the presence of /h/; that is, /h/ is more easily identified. All subjects listened to identical stimuli produced by a male Turkish speaker. The results, shown in Figure 2, reveal that Turkish and Arabic listeners have a high degree of sensitivity to /h/, and are able to detect it in most contexts. English and French listeners, on the other hand, had much lower sensitivity to /h/. Interestingly, these findings correctly reflect the listener's experience with the sound. In Turkish and Arabic, /h/ is widespread, occurring in most contexts. In English, on the other hand, /h/ has a restricted distribution, occurring only in prevocalic position. /h/ does not occur in the French system at all. In sum, listeners with the greatest experience with /h/ are best able to detect the sound's presence. The observation that there is no significant difference between Turkish and Arabic, and between English and French, may reflect ceiling and floor effects, respectively.

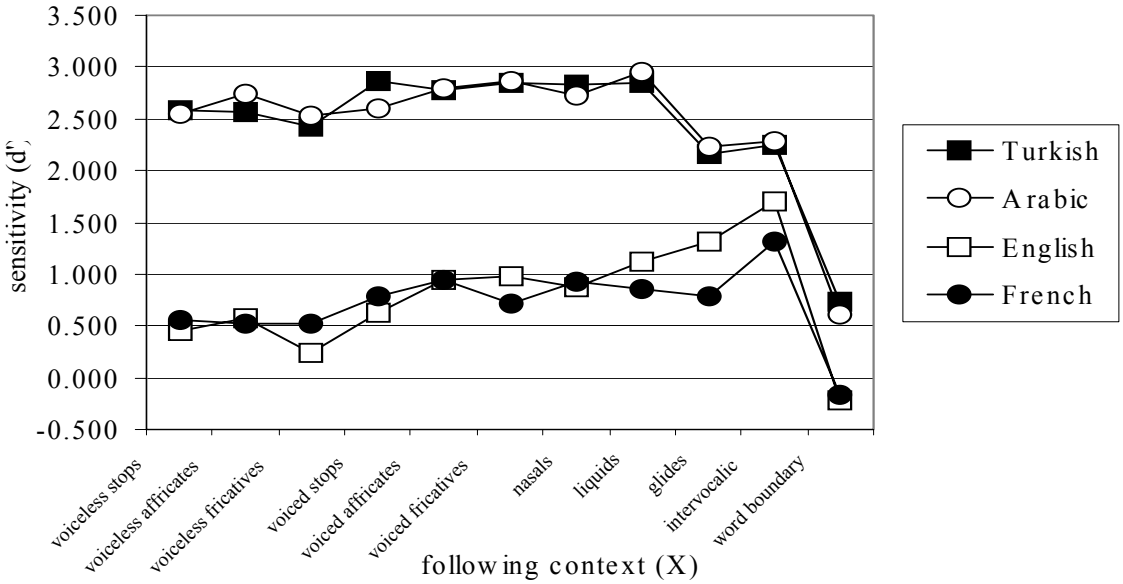

Figure 2. Sensitivity (*d′*) to [h] before another sound or word boundary (VhX) (Mielke 2001, 2003)

Since first proposed by Trubetzkoy (1939), neutralization has also been widely acknowledged as a markedness diagnostic. Neutralization involves the loss of contrast among elements in some context. For example, in languages with final devoicing such as German, Polish, and Russian, the contrast between voiced and voiceless consonants is arguably neutralized in word-final or coda position; only one member of the opposition survives and this member is considered unmarked. Like distribution, neutralization influences predictability. If only one member, *x*, of an opposition, *x*-*y*, occurs in a particular context, the language user only has experience with *x* in that context. It is therefore this member that is most probable and thus, predicted.

Phonetic criteria such as articulatory simplicity and perceptual salience are also equated with unmarkedness. As noted further above, high perceptual salience has been proposed as an explanation for the pervasive presence of, e.g., CV syllables in languages, or clusters with [s] as opposed to other fricatives. The reason is because sound sequences with richer cues tend to be more stable in a language and consequently, typically occur in more words than those with weaker cues (Makashay 2001). Thus, all else being equal, speakers/hearers will generally have more experience with sounds/sequences with higher salience. As a result, high salience can also provide evidence for the predictability of an element.

A similar conclusion can be drawn with respect to articulatory simplicity: consonants produced with less complex articulations tend to occur more frequently in a language than those with more complex articulations. As a result, speakers/hearers will have more experience with these sounds and their predictability will be higher. Of course, articulatorily complex segments do occur in languages and can be frequent. For example, the [ðV] sequence has a high token frequency in English, occurring word-initially in many common function words, e.g. *though*, *this*, *the*, *that*. In this context, therefore, the speaker/hearer has considerable experience with the sequence and it is accordingly highly predictable.

This is precisely what we expect given that language experience, and hence predictability, is dependent upon two factors: (a) the elements that are in a language system's inventory, and (b) the extent to which these elements are used. Thus, even articulatorily complex sounds or sequences with low salience can be predictable within a system provided that they are used a great deal. The reason why articulatorily simple sounds and perceptually salient sequences are typically unmarked is then simply because, due to their inherent phonetic nature, they tend to occur more frequently in systems and, as a result, are used more.

The same point can be made with respect to structural complexity. Language users are generally more familiar with simpler structures since they tend to be used more. Polish syllable structure, for example, contains word-initial onsets of up to four consonants. An examination of their frequency reveals that two-consonant clusters occur in 88% of words, three-consonant clusters occur in 10% of words, and four-consonant clusters are limited to only 2% of words (Bethin

1992). Two-consonant clusters are thus the most predictable clusters in the language.

To summarize, the traditional markedness diagnostics noted above provide evidence for a speaker/hearer's experience with some element of his/her language. As we have seen, some elements are more apt to occur in a language system than others due to their inherent phonetic nature. However, presence within a system is not sufficient to determine the predictability (unmarkedness) of an element; we must also take into account the extent to which the elements are used.

5. Predictability Effects

In this section I consider another group of well-known markedness diagnostics and show how they follow from the proposed model. They differ from the set above in that they provide evidence for the *effects* of predictability. These diagnostics can be further divided into two sets, as shown in Figure 3. One illustrates the *instability of the predictable* and includes diagnostics such as reduction, deletion, and assimilation. The other set exemplifies the *bias towards the predictable* as evidenced in processes like epenthesis, metathesis, and dissimilation.

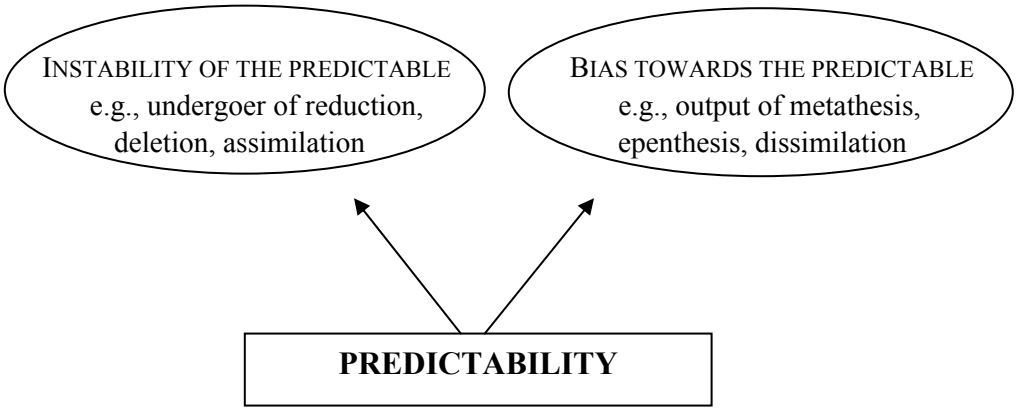

Figure 3. Observed effects of predictability

5.1. Instability

Instability of the predictable incorporates the observation that elements that are predictable within a system are more likely to undergo change, such as reduction, deletion, and assimilation. The reason for this is because predictability reduces an element's surprise value in the system and hence, the amount of information that it contains (Zipf 1932, Shannon 1949, Applebaum 1996). As a result, the greater the predictability of an element, the less information content it has and, I argue, the more expendable it is. The most expected, i.e. unmarked, category is thus the one with the least information content. The view of information content as a quantifiable alternative to markedness is developed more fully in Hume (2004b,c). I

offer some illustrations below but refer the reader to the works just noted for more detailed discussion.

It is widely assumed that the phonologically unmarked segment in a system is the segment which is least stable phonetically. That is, it is most likely to undergo processes such as reduction, deletion, assimilation, etc. According to this view, the alveolar coronal stop can be considered the unmarked consonant type in English. Support for this proposal comes, for example, from data from the Buckeye Speech Corpus of over 100,000 words of conversational speech (Pitt et al. 2005), which shows that 17% of all word variants involve *t*/*d* changes, the most of any consonant type. Similarly, in Sri Lankan Portuguese Creole, labial *m* can be considered unmarked since it is the least stable nasal in the language (nasals include labial, coronal, dorsal) (Hume and Tserdanelis 2002). The word-final labial nasal optionally deletes; dorsal and coronal nasals do not. The labial nasal also undergoes place assimilation to a following consonant; the coronal nasal does not.

The observed instability of *t*/*d* in English and *m* in Sri Lankan Portuguese Creole finds a straightforward explanation when we take into account their predictability within each language. In Sri Lankan Portuguese Creole, users have more experience with *m* than with other nasals. The labial nasal is twice as frequent as its nearest competitor *n* (Hume and Tserdanelis 2002). Interestingly, the velar nasal occurs in only a few words in word-final position and like the highly frequent labial, it undergoes assimilation. The fact that one of the words in which it occurs is the highly frequent indefinite article is perhaps not surprising. I suspect that the high token frequency of the velar nasal led to its instability and thus resulted in its patterning with the labial nasal rather than with the coronal. With respect to English, it is clear that users have more experience with *t*/*d* than with any other consonant in the language. In the Buckeye corpus, 40% of all transcribed words have *t* or *d*, the highest by far of any consonant. Further, some very frequent words contain *t*/*d*, including the three most frequent words in the corpus: *and*, *to*, *that*. In addition, it is well-established that higher rates of *t*/*d* reduction in English correlate with factors such as higher lexical frequency (Bybee 2001, Jurafsky et al. 2001, Patterson and Connine 2001) and predictability from the following word (Raymond, Dautricourt, and Hume to appear).

5.2. Bias

A speaker/hearer is also biased towards the predictable. Since predictability is a function of experience, this means that patterns that are more familiar to the language user will have a greater chance of being produced and perceived. A listener is especially biased towards the more frequent pattern in a system when information specifying a sound or sound sequence is indeterminate (Pitt and McQueen 1998).

In metathesis, for example, Hume (2004a) shows that the knowledge of the sound patterns of one's language influences how the speech signal is processed and thus, the order in which a sequence of sounds is parsed. To be specific, the

order inferred from the signal, and thus the output of metathesis, is the order that occurs most frequently in the language. In this view, the reason that improved perceptual salience is characteristic of many cases of metathesis becomes an artifact of the nature of sequences subject to the process and of those that influence speech processing. Sequences with poorer cues are more likely to undergo metathesis, while those with good cues tend to be more frequent in a system and thus have a greater impact on how the speech signal is parsed (Hume 2004a:227).

With respect to epenthesis, recall from the discussion of Pitt (1998) above that a vowel is often perceived between the consonants of phonotactically illegal consonant clusters in English (e.g., [tlæ] is perceived as [təlæ]). It should not be surprising that the vowel in question is schwa, the most frequent vowel in the language.

This approach to epenthesis departs from the common view that the epenthetic segment is the consonant or vowel with the weakest phonetic cues, i.e., the least salient segment. Support for the low-salience approach comes from the observation that in many languages schwa or [i] is the epenthetic vowel, and the coronal stop [t] or glottal stop is the epenthetic consonant. In the approach taken here, however, I argue that while the phonetic nature of a sound is an important contributing factor (along with functional load, social prestige, and experience), it is more generally a segment's predictability in a given context that is crucial in determining whether it will be perceived as the epenthetic vowel.

Epenthesis in French illustrates the mismatch between epenthesis and phonetic salience and thus provides support for the predictability approach. While the epenthetic vowel in French is commonly referred to as schwa it is in fact the mid front *rounded* vowel, [ø] (Adda-Decker et al. 1999). This is of particular interest since it is commonly assumed that roundness is marked in front vowels (e.g., Chomsky and Halle 1968). Yet, it is the front rounded vowel [ø] that is the epenthetic vowel rather than the arguably simpler and less salient [ɛ], also a sound in the French inventory. Not surprisingly, [ø] is also commonly deleted, e.g., [pøti] ~ [pti] *petit* 'small'.

The explanation for [ø]'s behavior is not that it is the least phonetically salient vowel in the language, but that it is predictable, a consequence (in part) of its high frequency. For example, it occurs in many highly frequent function words, e.g., *je* 'I', *le* 'the (masc.)', *me*/*te*/*se* '1st/2nd/3rd pers. pronoun'. Further evidence comes from corpus-based studies (Adda-Decker et al. 1999). The BREF corpus of read speech contains 66,500 sentences from 120 speakers. In the corresponding word lexicon, 37% of the words contain optional schwas, as in *petit* 'small'. The count of all schwas would actually be higher since this does not include those schwas that are not in the appropriate phonological context for deletion, e.g., *vendredi* 'Friday'. Similarly, in a 38,000 word subset of the MASK corpus of spontaneous speech (409 speakers), of the 2,000 entries in the word list 35% have schwa. Thus, both token and type frequency point to [ø] as a highly frequent vowel in the language.

The bias towards the predictable can also be observed in patterns of language acquisition. For example, Quiché-learning children master /tʃ/ at an earlier age than English-learning children. The explanation for this difference can be related to the observation that the sound occurs in many words that children are exposed to in Quiché whereas it is relatively infrequent, compared to the other plosives, in English (Pye et al. 1987). That is, Quiché-learning infants have more experience with the sound than do English-learning children.

Substitution errors provide further evidence. Results from a study of Japanese-learning children 2-5 years old show that they made more than twice as many "backing" errors for /t/ (i.e., /t/ pronounced as /k/) as they made "fronting" errors for /k/ (/k/ pronounced as /t/) (Yoneyama et al. 2003). This runs counter to the claim that back consonants like /k/ are universally marked and likely to be replaced by front consonants like /t/. However, the patterns are straightforwardly predicted by the observation that /k/ occurs more frequently than /t/ in Japanese (adult lexicon and words that a Japanese child is most apt to hear) (Yoneyama et al. 2003; Beckman et al. 2003). As Beckman et al. point out, the higher frequency of /k/ in Japanese also correctly predicts the earlier acquisition of /k/ reported for Japanese and the larger number of errors for /t/. In English, on the other hand, /t/ occurs more frequently than /k/.

Patterns of language development in creole genesis also support the predictability model. Thomason (1993) shows that the properties of pidgins/creoles depend on the properties of the source languages. Those that are common to both varieties, i.e., familiar to the users, are more likely to be preserved, regardless of how phonetically complex they might be. Chinook Jargon (a pidgin), for example, contains a stable phonemic inventory which includes glottalized, labialized, and uvular (vs. velar) stops.

6. Problems with Markedness Revisited and Explained

At the beginning of this paper I noted a number of problems with the traditional approach to markedness. In this section, I return to these problems and show how the proposed model accounts for the patterns in a straightforward manner.

One problem concerned the observation that given standard assumptions, markedness only predicts the patterns that are supposed to be universal; it does not provide predictions regarding language-specific markedness patterns. Yet, many of the criteria assumed to provide evidence for markedness have been brought into question precisely because patterns contradicting markedness are commonly observed at the level of the individual language. In the present account, both language-specific and language-universal patterns are expected. Briefly put, language-universal patterns result from the phonetic factors due to the shared physiological make-up of humans. To the extent that languages differ in terms of the elements that make up their systems and how they are used, expectations of language users and predictability of the elements will differ. We thus correctly predict cross-linguistic variability in observed language patterns.

A further problem with the traditional approach to markedness has to do with apparent inconsistencies and contradictions among the diagnostics. Recall that an unmarked sound can have either low or high salience. Also, an unmarked sound is not only more apt to delete, it is also more apt to be inserted.

The solution to the problem lies in understanding that the diagnostics are actually providing evidence for the predictability of an element. Recall that some traditional diagnostics feed experience and thus increase an element's predictability, while others provide evidence for the effects of predictability. Thus, an element with good cues (e.g., CV syllable) is more likely to be predictable than one with poor cues simply because the former tends to occur more frequently in language systems. All else being equal (e.g., quality of phonetic cues), a more predictable element is also more apt to delete than a less predictable one (instability). Similarly, a predictable sound is more likely to be epenthesized than a less predictable one (bias). Within the current approach, there is no contradiction; all observations fall out of the single metric, predictability.

7. Conclusion

In this paper I have argued that predictability is at the basis of markedness. Unmarked elements are those that have a high degree of predictability within a system (or a given context). While I have focused on only one of the factors crucial to determining the predictability of a linguistic element, the promise of this approach to explaining markedness patterns should be evident.

First, a single metric, predictability, provides an explanation for both the *instability* of an element and the speaker/hearer's *bias* towards that same element. In both cases, the element in question has high predictability. Markedness, on the other hand, is a descriptive label; it doesn't explain anything.

Second, the predictability of an element is dependent upon both universal properties and the language system in which the element occurs. Thus, both universal and language-specific patterns are predicted. Given standard assumptions, markedness only predicts the patterns that are supposed to be universal; it has nothing to say about language-specific markedness patterns.

Third, predictability is quantifiable, thus moving us closer to a scientifically rigorous theory of the observations (see Hume 2004b,c). Markedness is not.

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Dept. of Linguistics
Ohio State University
222 Oxley Hall
Columbus, OH 43202

ehume@ling.osu.edu

On Case Markers Occurring in Japanese Temporal Expressions*

SHIN-YA IWASAKI
Osaka University

0. Introduction

In this paper, we discuss three Japanese case markers, *–ni*, *–wa*, and *–niwa*, occurring in temporal expressions within the framework of Cognitive Grammar. In particular, we investigate how *–niwa* is related to verb, tense, and aspect.

Japanese temporal adverbials are shown in (1) and (2), for example.[1] (1a) shows that the speaker read a book at the specific time, 'five'. In (1b), the speaker also read a book at five and in this case *5 zi* 'five o'clock' is topicalized. In (1c), it is implied that there is a time which is contrasted with another time, for example, 'At five, I read a book and at six I played the guitar.' *–wa* in (1b) can also have a contrastive interpretation. Interestingly, *–niwa* shows the meaning of limitation when it is used with verbs of initiation or termination as in (2).

(1) a. 5 zi-*ni* hon-o yon-da.
5 time-DAT book-ACC read-PAST
'I read a book at five.'
b. 5 zi-*wa* hon-o yon-da.
5 time-TOP book-ACC read-PAST
'At five, I read a book.'
c. 5 zi-*niwa* hon-o yon-da.
5 time-DAT-TOP book-ACC read-PAST
'At five, I read a book.'

* I would like to thank Seisaku Kawakami and Yukio Oba for their comments and encouragement. I am also grateful to Paul A. S. Harvey for his stylistic corrections. All remaining errors are, of course, my own.

[1] Abbreviations used in this paper are: DAT = Dative marker, TOP = Topic marker, ACC = Accusative marker, NOM = Nominative marker, PAST = Past tense marker, ASP = Aspectual marker. *–niwa* is glossed DATIVE-TOPIC. Although one considers that *–ni* is a postposition when it attaches to a temporal expression, we assume that it is a case marker in this paper, for expository convenience. See Kumashiro (1994).

(2) 5 zi-*niwa* kaigi-ga owaru.
5 time-DAT-TOP meeting-NOM finish
'The meeting will close by five o'clock (at the latest).'

In this paper, we argue that the Japanese case markers *–ni*, *–wa*, and *–niwa* occurring in temporal expressions are all captured by the cognitive notions of a setting and a reference-point construction, which are introduced by Langacker (1987). In particular, it is claimed that the two meanings of *–niwa* are motivated by these notions and the difference between them is captured by inheritance relations; one inherits each meaning from *–ni* and *–wa*; the other partially inherits each meaning and also has the meaning of limitation.

In section 1, we offer an overview of the basic data of Japanese temporal expressions which are case-marked by *–ni*, *–wa*, and *–niwa*. In section 2, we introduce the theoretical framework of this paper. In section 3, we analyze case markers in Japanese by using the cognitive notions of a setting and a reference-point construction. Finally, section 4 presents concluding remarks.

1. Data

From many Japanese case markers, we focus on *–niwa*, which attaches to temporal adverbials. Before concentrating on it, let us look at some data of Japanese temporal adverbials.

First, Japanese temporal adverbials may select case markers in two ways, as shown in (3):

(3) a. haru-*ni* sakura-ga saku.
spring-DAT cherry.blossom-NOM bloom.
'Cherry blossoms bloom in spring.'
b. haru-*wa* sakura-ga saku.
spring-TOP cherry.blossom-NOM bloom.
'In spring, cherry blossoms bloom.'

The temporal adverbials in (3) can also stand alone without case markers:

(4) haru sakura-ga saku.
spring cherry.blossom-NOM bloom.
'In spring, cherry blossoms bloom.'

We have a slight difference in meaning among these three examples. *–ni* has a function of specifying time, while when a temporal adverbial is not case-marked, time is not specified but "established," as pointed out by Masuoka (1995). *–wa* marks a topic, as it attaches to many words or phrases.

Second, the so-called deictic words are not marked by *–ni,* as in (5a-c):

(5) a. kyoo (*–*ni*) gako-e iku.
today school-to go
'I go to school today.'
b. asita (*–*ni*) gako-e iku.
tomorrow school-to go
'I go to school tomorrow.'
c. kinoo (*–*ni*) gako-e it-ta.
yesterday school-to go-PAST
'I went to school yesterday.'

These deictic words are categorized as adverbs, while others are categorized as nouns or adverbs.

Let us now turn to –*niwa* that is attached to temporal adverbials. As we see in (6), we find that there are two types of –*niwa* in Japanese:

(6) a. asita (*–*ni*) kaigi-ga aru.
tomorrow meeting-NOM is
'I have a meeting tomorrow.'
b. ?asita-*niwa* kaigi-ga aru.
tomorrow-DAT-TOP meeting-NOM is
c. asita-*niwa* kaigi-ga owaru.
tomorrow-DAT-TOP meeting-NOM finish
'The meeting will close by tomorrow.'

As we see in (6a), the deictic word 'tomorrow' is not marked by –*ni*. The example (6b) shows that –*niwa* consists of –*ni* and –*wa* because the deictic word does not co-occur with –*ni*. On the other hand, in the example (6c), –*niwa* does co-occur with 'tomorrow'. This indicates that –*niwa* does not consist of the composition of –*ni* and –*wa*. We argue that the latter forms a construction in the sense of Goldberg (1995).

Although –*niwa* is analyzed as a complex word by Nakamura (2001), it is not clear how –*ni* and –*wa* are related to –*niwa*. We would like to focus on the relation between them.

2. Theoretical Assumptions

Our analysis is based on the tenets of Cognitive Grammar proposed by Langacker (1987, 1991, 1999). In Cognitive Grammar, language comprises semantic structures, phonological structures, and symbolic structures between the two. In this theory, conceptualization is captured in terms of the canonical event model, which is shown in Figure 1.

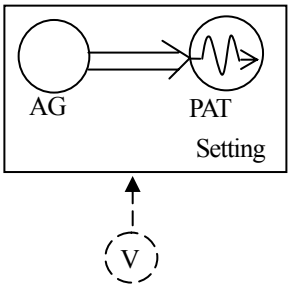

Figure 1. Canonical Event Model

This model assumes an event occurring within a setting and a viewer (V) observing it from an external vantage point. A setting indicates a "global, inclusive region within which an event unfolds or a situation obtains" (Langacker 1991:553). Based on this model, we propose that the Japanese *–ni* which attaches to temporal adverbials indicates a setting (cf. Kumashiro 2002).

We also assume that the Japanese topic marker *–wa* invokes a reference-point construction, as suggested by Langacker (1999) or Kumashiro and Langacker (2003). This is sketched in Figure 2:

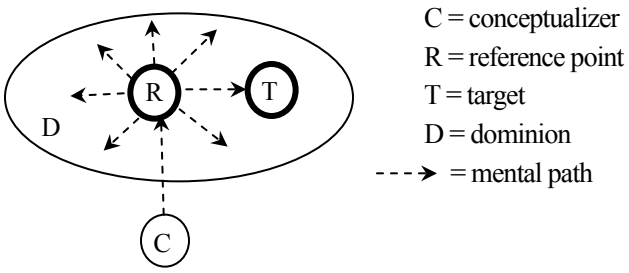

Figure 2. Reference-point relationship (Kumashiro and Langacker 2003: 10)

Figure 2 illustrates reference-point relationship. In this figure, a conceptualizer C accesses a target via a reference point R in the dominion D.

In section 3, we will claim that one of two meanings expressed by *–niwa* is captured in terms of Construction Grammar (Goldberg 1995). According to this approach, a distinct construction is defined as in (7):

(7) C is a CONSTRUCTION iff_{def} C is a form-meaning pair $<F_i, S_i>$ such that some aspect of F_i or some aspect of S_i is not strictly predictable from C's component parts or from other previously established constructions.

We assume that the Cognitive Grammar approach to constructions is parallel to that of Construction Grammar.

3. Proposal

3.1. Schemas of Case Markers

First, we propose that the Japanese *–ni* occurring with temporal adverbials designates a setting, which is illustrated in Figure 3:

(8) a. 5 zi-*ni* hon-o yon-da. (= (1a))
b. haru-*ni* sakura-ga saku. (= (3a))
(9) a. 5 zi-*wa* hon-o yon-da. (= (1b))
b. haru-*wa* sakura-ga saku. (= (3b))

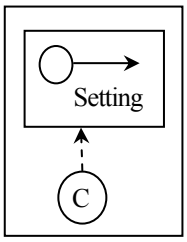

Figure 3. *–ni*

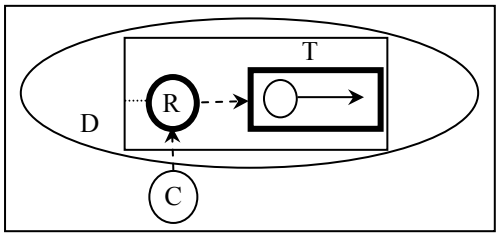

Figure 4. *–wa*

Figure 3 is based on a simplified canonical event model. The inner box indicates a setting. The Japanese topic marker *–wa* invokes a reference-point construction, as we mentioned in section 2. This is shown in Figure 4 on the basis of Figure 2. Since we are concerned with temporal adverbials, the dominion of the reference point corresponds to a setting, although they differ in their levels.

Second, we call the *–niwa*s in (10a) and (10b) *–niwa*$_1$ and *–niwa*$_2$, respectively, for convenience:

(10) a. 5 zi-*niwa*$_1$ hon-o yon-da. (= (1c))
b. 5 zi-*niwa*$_2$ kaigi-ga owaru. (= (2))

–niwa$_1$ indicates the contrastive interpretation, whereas *–niwa*$_2$ indicates the limitative interpretation. In (10a), *5 zi* 'five o'clock' indicates a setting and it is topicalized by *–wa*. This is predicted from the composition of *–ni* and *–wa*, which is sketched in Figure 5:

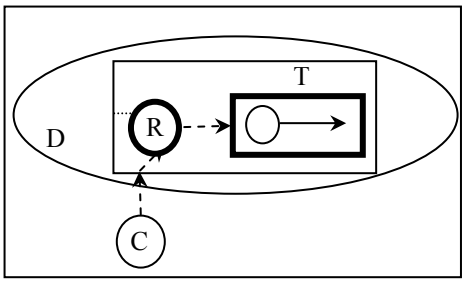

Figure 5. *–niwa*$_1$

Figure 5 shows the meaning of *–niwa*$_1$ and the dotted line indicates a correspondence relation.

In (10b), on the other hand, *5 zi* 'five o'clock' indicates the limitation of the continuation of the meeting. This meaning is not predicted from the composition of *–ni* and *–wa*. The meaning of *–niwa*$_2$ is sketched in Figure 6:

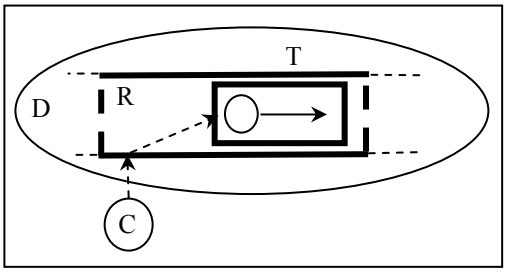

Figure 6. *–niwa*$_2$

In Figure 6, the left and right sides of the box which stands for a setting are expressed by dashed lines. This means that an event does not occur in the time that is indicated by a setting, although it shows the boundary of the occurring event. They are profiled because *–niwa* itself invokes a reference point, not *–wa*. We claim that *–niwa*$_2$ partially inherits the meanings of a setting and a reference-point relationship and creates the meaning of limitation on its own. We consider that the emergence of this meaning is related to the concept of scale which temporal adverbials evoke. Thin broken lines show a temporal scale and the setting is located in this scale.

We integrate the figures that we propose above and look at the relation among them in Figure 7:

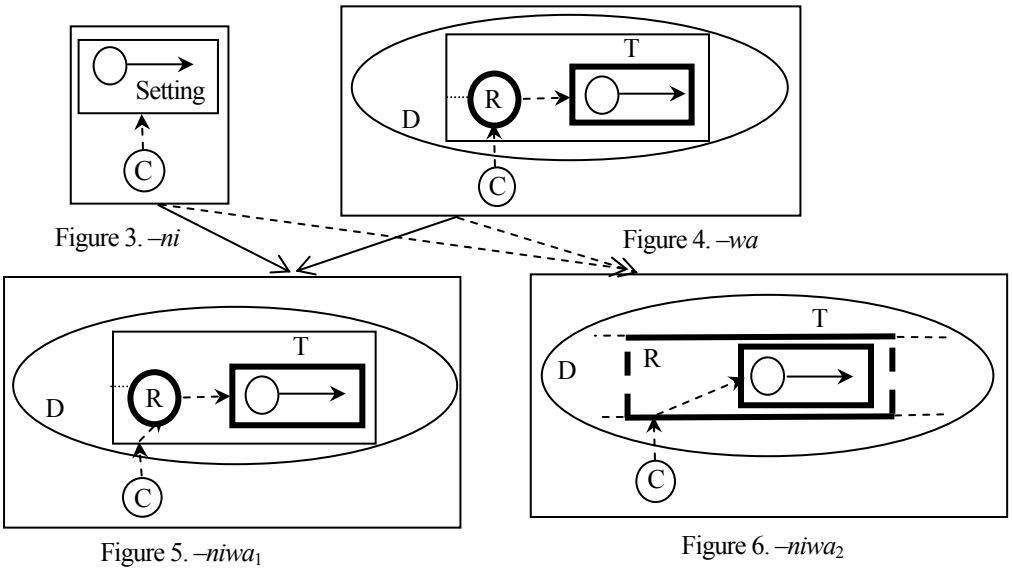

Figure 7.

As we mentioned above, *–niwa*$_1$ inherits from *–ni* its function, a setting, and inherits from *–wa* its function *–wa*, a reference point. On the other hand, *–niwa*$_2$ inherits these features from them partially, which is indicated by the dashed arrow in Figure 7. It creates the meaning of limitation when it occurs with the expression that invokes a scale.

By assuming a setting and a reference-point construction, we can capture the idiosyncrasies of *–niwa*. The setting indicates the two characteristics of *–niwa*, temporal duration and locating an event. *–wa* induces a process to the target as a reference point.

3.2. The Relation between *–niwa* and Other Elements

As we saw in Figure 6, we may predict that *–niwa*$_2$ is compatible with the verbs which have the termination in their components of time because of its limitative meaning. Those verbs are classified as accomplishment or achievement in Vendler's (1957) terms. Although it is controversial whether Vendler's classification is applicable to Japanese verbs (cf. Kindaichi (1950), Okuda (1984)), we shall tentatively apply it to them because we focus on the relation between *–niwa* and aspect.

According to Vendler's classification, accomplishment refers to a situation that is durative and has the termination of the action. Achievement refers to a situation that is punctual and instantaneous. They are represented by (11):

(11) a. Taro-ga ie-o tateru.
Taro-NOM house-ACC build
'Taro builds a house.'
b. kono nuno-ga kawaku.
this cloth-NOM dry
'This cloth dries.'

(11a) and (11b) include the transitive accomplishment predicate and the intransitive achievement predicate, respectively. In (11a), *ie-o tateru* 'build a house' indicates the activity and the termination of building a house. In (11b), *kawaku* 'dry' is punctual and has only the termination. When these sentences have temporal adverbials that are marked by *–niwa*, they have two interpretations, that is, the contrastive and the limitative interpretation:

(12) a. 5 gatu-niwa Taro-ga ie-o tateru.
5 month-DAT-TOP Taro-NOM house-ACC build
'In May Taro builds a house.' (or 'By May Taro builds a house.')[2]
b. 5 zi-niwa kono nuno-ga kawaku.
5 time-DAT-TOP this cloth-NOM dry
'By five this cloth dries.' or 'At five this cloth dries.'

[2] The English translation that is parenthesized indicates the less preferred interpretation.

(12a) and (12b) have the contrastive interpretation as default. Also, since they both have the termination of an event, they have the limitative interpretation. The difference between the two is that in (12b) it is easier to get the limitative interpretation than in (12a) because they have only the termination, not activity. This stems from the characteristic of *–niwa*$_2$. That is, the concept of limitation is compatible with termination.

Let us now turn to the verbs that do not have the termination or initiation. We predict that temporal adverbials with *–niwa* do not have the limitative interpretation when they occur with stative and activity predicates, in Vendler's terms. In Japanese stative predicates are represented by *aru* and *iru* 'exist' because they cannot occur with *–teiru*, which is a Japanese progressive marker. Activity predicates are represented by *aruku* 'walk' or *hasiru* 'run' as in (13):

(13) a. 5 zi-niwa Taro-ga hasiru.
5 time-DAT-TOP Taro-NOM run
'At five Taro runs.'
b. 5 zi-niwa Ken-ga aruku.
5 time-DAT-TOP Ken-NOM walk
'At five Taro walks.'

It is difficult to have the limitative interpretation in (13). When we add to the verb the aspectual suffix *–dasu*, which means the initiation of action, it is possible to get the limitative interpretation, although it is still not preferred.

(14) a. 5 zi-niwa Taro-ga hasiri-dasu.
5 time-DAT-TOP Taro-NOM run-put.out
'At five Taro starts running.'
b. 5 zi-niwa Ken-ga aruki-dasu.
5 time-DAT-TOP Ken-NOM walk-put.out
'At five Taro starts walking.'

–niwa in (15), which includes the stative predicate, does not have the limitative interpretation.

(15) 5 zi-niwa kaigi-ga aru.
5 time-DAT-TOP meeting-NOM exist
'At five there is a meeting.'

Thus, we can say that if predicates have the termination or initiation of action, *–niwa* can have the limitative interpretation.

The limitative interpretation is also affected by tense and aspect. Langacker divides English verbs into two classes in terms of the perfective and imperfective distinction. In

his terminology, only perfectives occur in the progressive construction, whereas only imperfectives occur in the simple present tense. If we apply this classification to Japanese verbs, we must pay attention to the characteristic of the progressive form *–teiru* in Japanese because it has another reading, as shown in (16):

(16) kono nuno-ga kawai-teiru.
this cloth-NOM dry-ASP
'This cloth is dry.'

–teiru in (16) has the resultative interpretation, not progressive. We assume that if the predicate cannot occur with *–teiru*, it is classified as stative and if the predicate with *–teiru* has the resultative interpretation, it is classified as the achievement predicate, in Vendler's terms. Since *aru* and *iru* 'exist' cannot occur with *–teiru*, they are stative.[3]

Let us now consider the temporal adverbials that occur with non-past tense and the *–teiru* form:

(17) a. 5 zi-niwa Taro-ga hasit-teiru.
5 time-DAT-TOP Taro-NOM run-ASP
'At five Taro is running.'
b. 5 gatu-niwa Taro-ga ie-o tate-teiru.
5 month-DAT-TOP Taro-NOM house-ACC build-ASP
'In May Taro will be building a house.'
(or 'By May Taro will have built a house.')
c. 5 zi-niwa kono nuno-ga kawai-teiru.
5 time-DAT-TOP this cloth-NOM dry-ASP
'By five this cloth will have been dried.' or 'At five this cloth is dry.'

When the activity and accomplishment predicates occur with non-past tense and the *–teiru* form, the contrastive interpretation is preferred. On the other hand, when the achievement predicate occurs with them, it is easier to get the limitative interpretation. In other words, the *–teiru*s in (17a) and (17b) show the progressive meaning and *–niwa* refers to an event time, whereas the one in (17c) shows the resultative meaning and *–niwa* refers to a reference time. This characteristic of *–niwa* is motivated by the reference-point construction of *–wa*.

Next, consider the relation between a temporal adverbial and simple past tense:

(18) a. 5 zi-niwa Taro-ga hasit-ta.
5 time-DAT-TOP Taro-NOM run-PAST
'At five Taro ran.'

[3] Although the distinction between progressive and resultative interpretations can be seen in the distinction between the transitive and intransitive verb, it does not affect our discussion.

b. 5 gatu-niwa Taro-ga ie-o tate-ta.
5 month-DAT-TOP Taro-NOM house-ACC build-PAST
'In May Taro built a house.'
c. 5 zi-niwa kono nuno-ga kawai-ta.
5 time-DAT-TOP this cloth-NOM dry-PAST
'At five this cloth dried.'

All the examples have the contrastive reading in *–niwa*. In other words, *–niwa* refers to an event time. We consider that this is because the past-tense marker requires an event time because of its function of locating an event in the past.

Finally, let us look at the relation between a temporal adverbial and past tense with the *–teiru* form:

(19) a. 5 zi-niwa Taro-ga hasit-tei-ta.
5 time-DAT-TOP Taro-NOM run-ASP-PAST
'At five Taro was running.'
b. 5 gatu-niwa Taro-ga ie-o tate-tei-ta.
5 month-DAT-TOP Taro-NOM house-ACC build-ASP-PAST
'In May Taro was building a house.'
(or 'By May Taro had been built a house.')
c. 5 zi-niwa kono nuno-ga kawai-tei-ta.
5 time-DAT-TOP this-cloth-NOM dry-ASP-PAST
'By five this cloth was dry.' or 'At five this cloth was dry.'

Here we have the same result as in (17), which has non-past tense with the *–teiru* form. That is, the *–niwa*s in (19a) and (19b) indicate the contrastive interpretation, whereas the one in (19c) can have the limitative interpretation.

The data that we have seen above are summarized in Table 1:

	Activity	Accomplishment	Achievement
Non-past simple tense	contrastive	contrastive (/limitative)	limitative /contrastive
Non-past tense with *–teiru* form	contrastive	contrastive (/limitative)	limitative /contrastive
Simple past tense	contrastive	contrastive	contrastive
Past tense with *–teiru* form	contrastive	contrastive (/limitative)	limitative /contrastive

Table 1.

This result is motivated by the notions of a setting and a reference-point construction. First let us consider why we do not have the limitative reading when the activity verb is used. We argue that this is because the setting indicated by *–ni* locates the event and the reference point indicated by *–wa* accesses the target. Since the activity verb shows the continuation of successive phases in time, it is not compatible with the limitative interpretation. Second, when the accomplishment verb is used with the non-past tense

and the *–teiru* form, we can have the two interpretations. Since the accomplishment verb includes the terminal point in time, this is compatible with the meaning of limitation, although we still have the contrastive interpretation. Third, as found in the fact that the accomplishment verb expresses the progressive meaning with the *–teiru* form, it includes activity. Therefore, the contrastive interpretation is preferred when it occurs with the *–teiru* form. Fourth, the reason why the limitative interpretation is induced when it is used with the achievement verb is that since the achievement verb shows a single moment of time, it has a clear terminal point. Hence it is compatible with the limitative meaning. When it occurs with the *–teiru* form, it prototypically expresses the limitation, because of the meaning of perfect of *–teiru*. Since a past event needs to be located in the specific time, *–niwa* refers to an event time. Hence the contrastive interpretation is preferred when the verb is used with past tense. Moreover, the contrastive interpretation is at the discourse level, which is motivated by the inheritance of a reference-point construction from *–wa* in Figure 7. The limitative interpretation is at the sentence level, which is motivated by the partial inheritance of the setting.[4]

4. Conclusion

In this paper we argued that *–ni*, *–wa*, and *–niwa* occurring in temporal expressions are captured by a setting and a reference-point construction. In particular, we claimed that *–niwa*$_1$ inherits each meaning from *–ni* and *–wa*; while *–niwa*$_2$ partially inherits each meaning from both of them.

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[4] We have seen how *–niwa* is related to the predicate, tense, and aspect. Although we classify predicates into four classes, their boundaries are not clear. Since *–niwa* coerces the limitative interpretation, the predicates tend to have temporal duration, even though they are punctual. If we omit the subject, which can be contrasted with other subjects, we can have the limitative interpretation, even though the activity predicate is used:

(i) 5 zi-niwa hasiru.
5 time-DAT-TOP run
'At five I run.' (or 'By five I start running.')

Although the verbs can be classified into the four classes, we also notice that the predicate cannot be classified only in terms of temporal duration. As seen in (ii), the predicate *kiru* 'dress' is construed as an activity or achievement:

(ii) a. Ken-ga ima tonari-no heya-de fuku-o ki-teiru.
Ken-NOM now next-GEN room-in clothe-ACC dress-ASP
'Ken is putting on his clothes in the next room now.'
b. Ken-ga kyoo akai fuku-o ki-teiru.
Ken-NOM today red clothe-ACC dress-ASP
'Ken wears red clothes today.'

–teiru in (21a) has the progressive interpretation, while (21b) has the resultative interpretation. Although we need to analyze it from the other perspective, we do not discuss the classification of the predicates any further here. Rather we claim that *–niwa* indicates the domain of an event and does not fix its time, as shown in Figure 6. It motivates the observations that it refers to the initiation or termination and to a reference time, not to an event time, and when the past tense is used, it can refer to an event time.

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Department of English Linguistics
Osaka University, Japan

shinyaiwasaki@hotmail.com

The Interaction of Duration and Pitch in Japanese Long Vowels*

TOMOKO KOZASA
University of Hawai'i at Mānoa

0. Introduction

This paper investigates the relationship between two phonetic properties – duration and pitch – and two phonologically significant features – vowel length and pitch-accent. Vowel length and pitch-accent are phonologically distinctive in standard Japanese[1], and these two phonological characteristics are difficult for non-native speakers of Japanese to master. I conducted two production experiments to examine the way native speakers use phonetic signals to produce long vowels correctly in standard Japanese. The first experiment involved accented vowels and the second one involved unaccented vowels.

The results show that speakers employ duration and pitch unconsciously. When both signals are available, speakers use both of them; but when pitch is not available, they highlight the durational contrast between long and short vowels. These facts might shed some light on the phonetic reality of the Japanese mora.

1. Background

Japanese vowel length is distinctive; that is, the length of a vowel may change the meaning of a word. For example, the Japanese word *tori* with a short vowel means 'bird', but the word *toori* with a long vowel means 'street'. There are many such minimal pairs in Japanese. Likewise, pitch-accent is distinctive. The existence and location of pitch-accent may change the meaning of a word, just as the location of stress may change the meaning of a word in English; e.g., the noun *object* has stress on the first syllable and the verb *object* has stress on the second

* This study is partly supported by a scholarship from the Center for Japanese Studies and a grant from the Department of Linguistics Endowment Fund at University of Hawai'i at Mānoa. I am deeply indebted to Ben Bergen, Patricia Donegan, Yasuko Ito, Michiko Nakamura, and Amy Schafer for their suggestions and comments on the design of experiments and analyses of the data. I also want to thank Kenneth Rehg and Ryo Stanwood for their comments on previous versions of this paper. All mistakes are of course mine.

[1] The subject of this paper is "standard Japanese", the dialect of Japanese spoken in Tokyo and its environs, Japan. I refer to it simply as "Japanese". I also use the term "Japanese" to refer to the Japanese language in general.

syllable. Pitch-accent in standard Japanese is realized as a high pitch (H) and a following low pitch (L). When the pitch contour is changed, the meaning of the word may change as shown in (1); an unaccented word does not have this HL pitch sequence as in (2) below.

(1) Accented words in standard Japanese

hana-ga	'girl's name + NOM[2]'	*hana-ga*	'flower + NOM'
H L L		L H L	

(2) Unaccented word in standard Japanese

hana-ga	'nose + NOM'
L H H	

When a long vowel is accented, only the first mora in the vowel carries a H pitch; consequently, the HL pitch contour must occur within the long vowel (McCawley 1968:133-134) as illustrated in (3). However, when a long vowel is unaccented, the pitch contour in the vowel must be either HH or LH followed by a H pitch as shown in (4).

(3) Words with an accented long vowel in standard Japanese

kooshi	'lecturer'	*rooba*	'elderly lady'
HL L		HL L	

(4) Words with an unaccented long vowel in standard Japanese

kooshi	'Confucius'	*kooshi*	'lattice'
HH H		LH H[3]	

Note that accented long vowels carry two distinctive phonological features (vowel length and pitch-accent), but unaccented long vowels only carry one (vowel length). The phonological vowel length distinction can be captured as the duration of an acoustic signal. The acoustic realization of pitch-accent is a relative pitch movement, and it is measured by the change in the fundamental frequency (F0) value. This paper also investigates the way in which these two acoustic signals interact with one another when speakers produce phonological vowel length distinctions and pitch-accent.

[2] NOM = nominative case marker

[3] The long vowel in the word *kooshi* 'lattice' has the pitch contour LH; however, McCawley (1968) states that in a widespread variety of standard Japanese, "an unaccented initial syllable of the form CVV or CVn is pronounced entirely on a high pitch" (p.133).

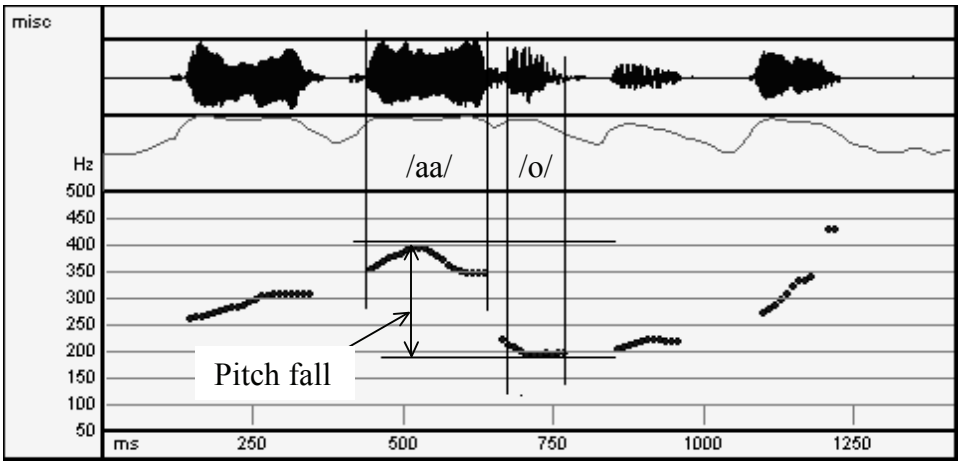
2. Configuration of Experiments

I conducted two production experiments. Experiment 1 involved accented vowels and Experiment 2 involved unaccented vowels. There were four participants (two female and two male) in each experiment, and each experiment had a different group of participants; only one male participant participated in both experiments. All were native speakers of the Tokyo dialect of Japanese, and their parents were also native speakers of the Tokyo dialect or had lived most of their lives in a community where the Tokyo dialect was spoken. Five out of a total of seven participants taught Japanese as a foreign language to adults. The age range of the participants was from the late 20s to the early 40s.

The participants were asked to read sentences written in Japanese in a sound attenuated recording studio at three different speech rates – fast, normal and slow – which were determined individually by each speaker. Since a pause would affect the duration of utterances and pitch movement, the participants were instructed not to insert any pauses into sentences. The utterances were recorded on a TANBERG TCR522 cassette-recorder through a microphone and digitized by Pitchworks at a sampling rate of 11,025 Hz. Only the data from fast and slow speech were used for the analysis.

The duration of vowels and pitch fall were measured from the digitized files. The location of the beginning and end of a vowel was determined by the presence of the second and higher formants and also by listening to the actual recordings. Pitch fall was the difference between the highest F0 value in the target vowel and the lowest F0 value in the following mora as illustrated in (5).

(5) Measurement points of pitch fall
Material sentence: *sono k<u>aa</u>do fuite* 'please clean the card'



Because I took multiple measurements from four speakers performing the same task, I used a repeated measures two-way analysis of variance (2-way ANOVA) to analyze the duration of vowels and pitch fall. There were two

different factors used as independent variables – speech rate (fast and slow) and vowel type (long and short).

3. Experiment 1: Involving accented vowels

3.1. Materials

In this experiment, words containing an accented vowel were the target vowels for the data. Three to five minimal pair sentences contrasting vowel length for each of the five Japanese vowels were used as the materials. Examples are shown in (6) (see appendix A for the entire list).

(6)	*sono kaado fuite*	vs.	*sono kado fuite*
	'Please clean the card.'		'Please clean the corner.'
	sore-wa kee desu	vs.	*sore-wa ke desu*
	'That is the letter *K*.'		'That is the letter *ke*.'
	sono chiizu-ga hoshii	vs.	*sono chizu-ga hoshii*
	'I want that cheese.'		'I want that map.'
	kawaii beeru da ne	vs.	*kawaii beru da ne*
	'What a pretty veil!'		'What a cute bell!'
	sore-ga kooi-no araware desu	vs.	*sore-ga koi-no araware desu*
	'That is affection.'		'That is love.'

3.2. Results

The results show that speech rate had a significant main effect on the duration of vowels ([$F(1,3) = 66.729$, $p = .0038$]); that is, the mean durations of both long and short vowels were significantly shorter in fast speech and longer in slow speech. Vowel type (long vs. short) also had a significant main effect on the duration of vowels ([$F(1,3) = 1377.831$, $p < .0001$]); that is, the mean duration of long vowels was significantly longer than that of short vowels in both fast and slow speech. The mean duration of vowels and ratios are shown in (7).

(7) Mean duration and ratio of accented vowels

	Long vowel (ms)	short vowel (ms)	ratio (long : short)
fast speech	119.194	72.104	1.65 : 1.00
slow speech	176.988	100.167	1.77 : 1.00
ratio (fast : slow)	1:00 : 1.48	1.00 : 1.39	

Moreover, there was a significant interaction between speech rate (fast vs. slow) and vowel type (long vs. short) ([$F(1,3) = 12.463$, $p = .0386$]). This means that speech rate had a different effect on the mean duration of long vowels from that of the mean duration of short vowels.

Also, both speech rate and vowel type had a significant main effect on pitch fall (for speech rate [$F(1,3) = 16.824$, $p = .0262$] and (vowel type [$F(1,3) = 22.058$, $p = .0183$]).

(8) Mean pitch fall and ratio

	Long vowel (Hz)	short vowel (Hz)	ratio (long : short)
fast speech	82.433	61.573	1.34 : 1.00
slow speech	96.332	68.329	1.41 : 1.00
ratio (fast : slow)	1.00 : 1.17	1.00 : 1.11	

There was, however, no significant interaction between speech rate and vowel type ([$F(1,3) = 8.093$, $p = .0654$]). This means that the speakers tried to maintain a certain amount of pitch fall in long vowels comparable to that in short vowels.

3.3. Discussion

The results from Experiment 1 indicate that the duration of vowels is more susceptible to speech rate, whereas pitch fall is relatively stable regardless of speech rate. It is not only duration that makes accented long vowels long: F0 also plays a role. Japanese speakers use both duration and F0 to mark accented long vowels. The question, then, is how do speakers produce unaccented long vowels? They must rely solely on duration to distinguish vowel length. The way speakers use durational information in unaccented long vowels should be different from the way they use durational information in accented long vowels. This hypothesis was tested in Experiment 2.

4. Experiment 2: Involving unaccented vowels

4.1. Materials

In this experiment, words containing an unaccented vowel were used to elicit the data. Materials were 18 sets of minimal and near minimal pairs contrasting vowel length and 9 words containing an unaccented long vowel. Examples are shown in (9) (see appendix B for the entire list). They were read in the carrier sentence *ima* _____ *to iimashita* 'I said _____ now'.

(9)

kaari	vs.	*akari*
'red ants'		'light'
seekoo	vs.	*sekoo*
'success'		'construction'
shiiku	vs.	*shiku*
'to breed'		'to spread'
sookai	vs.	*sokai*
'general meeting'		'evacuation'
yuukai		
'kidnap'		

4.2. Results

The results are similar to the results from Experiment 1. Both factors, speech rate and vowel type, had a significant main effect on the mean duration of vowels (for speech rate [$F(1,3) = 33.005$, $p = .0105$], for vowel type [$F(1,3) = 928.971$,

$p < .0001$]). In addition, the interaction of these two factors was also significant ([$F(1,3) = 18.090$, $p = .0238$]). These results showed that the duration of unaccented vowels and accented vowels were equally vulnerable to speech rate. The mean duration of vowels and ratios is shown in (10).

(10) Mean duration and ratio of unaccented vowels

	long vowel (ms)	short vowel (ms)	ratio (long : short)
fast speech	117.285	60.820	1.93 : 1.00
slow speech	201.718	83.205	2.42 : 1.00
ratio (fast : slow)	1.00 : 1.72	1.00 : 1.37	

However, there was a difference in the ratio of the mean duration of long vowels to short vowels for accented vowels and unaccented vowels. I combined the results from Experiment 1 and 2 in (11) for comparison. These results indicate that speakers excessively lengthened long vowels, particularly in slow speech, to produce vowels that were unambiguously long. As I had expected, because pitch was not available in unaccented long vowels, speakers increased their use of durational information by making the ratio of long and short greater.

(11) Mean duration and ratio of vowels

		long vowel (ms)	short vowel (ms)	ratio(long : short)
fast speech	accented	119.194	72.104	1.65 : 1.00
	unaccented	117.285	60.820	1.93 : 1.00
slow speech	accented	176.988	100.167	1.77 : 1.00
	unaccented	201.718	83.205	2.42 : 1.00

5. Interaction of duration and pitch

The results from the two experiments show that the mean duration of long vowels was always longer than the mean duration of short vowels regardless of speech rate. However, the duration of vowels was susceptible to speech rate. The ratio of the duration of long vowels to short vowels varies considerably depending on presence of pitch-accent. In this section, I will examine the interaction of duration and pitch in Japanese vowels.

Note that although the ratio of the mean duration of long vowels to short vowels is greater in unaccented vowels, the actual duration of accented vowels was longer than the duration of unaccented vowels (see (11) in Section 4.2). It is widely accepted that stress affects the duration, intensity, and quality of vowels in English. There are, however, two opposing views on Japanese pitch-accent. These two contradicting positions are due to differences in the methodology used by the researchers.

On one hand, McCawley (1968) states, “The accented mora is characterized solely by its high pitch relative to the following mora; it does not differ in length or intensity from the other moras” (p.135); however, he does not provide any

acoustic evidence for his statement. Homma (1973, 1981) and Beckman (1982a, 1982b) also assert that pitch-accent does not have a significant effect on the duration of vowels. In addition, Larish's (1989) findings from a production experiment support Homma and Beckman's claim.

Homma's (1973, 1981) conclusion is based on measurements done in a single production experiment. The data were collected from a single participant who was a native speaker of the Kyoto dialect (which has pitch patterns distinct from the Tokyo dialect). The durations of accented and unaccented vowels within a bimoraic word were compared with one another; that is, the durations of V_1 and V_2 in CV_1CV_2, such as the words *hana* (HL) 'flower,' *hana* (HH) 'nose,' *kaki* (HL) 'fence,' *kaki* (HH) 'persimmon,' *kaki* (LH) 'vase,' and *kaki* (LHL[4]). Since the environments of the two vowels, V_1 and V_2, were different, the differences in the duration of vowels could have been affected by other factors as well as by pitch-accent. Moreover, material words were uttered in isolation. Therefore, as she admitted in her paper, phrase final lengthening might also have affected the duration of V_2.

The measurements made by Beckman (1982b) were similar to Homma's, although she used several native speakers of standard (Tokyo) Japanese. Beckman, too, compared the duration of CV_1 and CV_2 within two-syllable CV_1CV_2 words. While one could argue that it might be sufficient to simply compare the duration of moras, this would not allow us to accurately investigate the effect of pitch-accent on the duration of vowels. First, the locations of V_1 and V_2 within a word were different, which might have affected the duration of vowels. Second, the duration she measured included the preceding consonants, which, incidentally, were not all identical.

Larish (1989) also rejects the position that pitch-accent affects the duration of vowels. The experiments he conducted were well designed. However, the materials used to examine the effect of pitch-accent on duration were only two minimal pairs *koko* (HL) 'houses' vs. *koko* (LH) 'here' and *kookoo* (HL) 'filial piety' vs. *kookoo* (LH) 'high school.' These words were read in the carrier sentence *sono* ____ *desu* 'It's that _____' at a normal speech rate by six native speakers of the Tokyo dialect (three female and three male). Notice that each set of accented and unaccented vowels consists of a long and a short vowel. Larish's problem is that he combined the mean durations of both long and short vowels to compute the ratio of the duration of accented to unaccented vowels. Recall that speech rate influences the duration of long vowels. Larish observed that some participants were reading material sentences so slowly that he had to coach them to speed up their speech (pp.108-109). It is thus entirely possible that the duration of unaccented vowels was exaggerated. Therefore, combining the duration of long and short vowels could have cancelled out the effect of accent on the duration of vowels, and might cast serious doubt on his conclusions. Because he does not

[4] This HL sequence realized in the final vowel is considered a contour tone. The number of moras that this tone bears is still an unresolved issue.

provide us with the raw numbers used in his calculations, it is difficult to assess the accuracy of his findings.

On the other hand, several studies investigating the relationship between the pitch and duration of vowels have suggested that pitch-accent increases the duration of the vowel (Han 1962, Hoequist 1983, Kuriyagawa & Sawashima 1987).

Han (1962) compared the duration of accented vowels with the duration of unaccented vowels from sets of minimal pair words uttered "in various ways and by a number of native speakers" (p.104). That is, she compared the duration of vowels with contrasting accent, such as /a/ in *hashi* (HL) 'chopsticks' with /a/ in *hashi* (LH) 'bridge.' She found that higher pitch slightly increases intensity and duration.

Hoequist (1983) also suggested that pitch-accent has a significant effect on the duration of syllables. The materials used in Hoequist's study were words of various lengths. They were read in the carrier sentence *kinoo* _____ *ga kita* 'yesterday _____ arrived' at a speech rate that was comfortable for the participants. There were five participants who were native speakers of the Tokyo dialect.

Kuriyagawa and Sawashima (1987) also suggested that the duration of vowels increases significantly when they carry pitch-accent. They conducted a production experiment specifically designed to investigate the effect of pitch-accent on the duration of vowels. There was a single male participant who read material words in the two different carrier sentences, *tsugi-wa* _____ *daroo* 'the next will be _____' and *tsugi-wa* _____ *toiu* 'the next is said _____', at two different speech rates, fast and slow. They used four sets of minimal pairs contrasting pitch patterns but used only the high-back short vowel /u/ for analyses. They found that "the duration of the vowels and the syllables in accented syllables was longer than that in unaccented syllables both for the mean and the normalized values of the duration of the test words" (p.46).

After comparing the methodologies of previous studies, I have come to the conclusion that the latter group of studies more accurately investigated the effect of pitch-accent on the duration of Japanese vowels. The results from the present study also clearly show that pitch-accent affects the duration of vowels. Needless to say, the present experiments covered all five Japanese vowels and compared the duration of accented and unaccented vowels in identical environments for both long and short vowels. The data was collected from four native speakers of the Tokyo dialect.

I performed a repeated measures 2-way ANOVA to analyze the effect of pitch-accent on the duration of vowels. There was a significant interaction between vowel type and the factor 'experiment' ([$F(1,6) = 59.127$, $p = .0003$]). The conditions in the factor 'experiment' were 'accented vowel' and 'unaccented vowel'. Therefore, the significant interaction between vowel type (long vs. short) and experiment (accented vs. unaccented) indicates that pitch-accent affected the mean duration of long vowels and the mean duration of short vowels differently.

The measurements show that the existence of pitch-accent made the duration of vowels longer, and the absence of pitch-accent made the duration of long vowels excessively long in slow speech.

6. Conclusion

I have conducted two production experiments to investigate the phonetic properties of long vowels in standard Japanese. There are two types of long vowels in standard Japanese: accented and unaccented. I have examined each type of long vowels separately in different experiments and compared the results. There were three major findings from these experiments. First, when speakers produce accented long vowels, they employ both duration and F0; when they produce unaccented long vowels in which F0 is not available, they increase durational contrast between long and short vowels. The second finding is that pitch-accent affects the duration of vowels. It increases the duration of vowels. Lastly, we found that long vowels are more susceptible to speech rate. The duration of long vowels increases in slow speech, especially when they are unaccented. Minagawa et al. (2003) examines a spontaneous speech corpus and reports that the ratio of the duration of long vowels to short vowels increases in slow speech, which supports the present study.

In summary, native speakers of standard Japanese employ both duration and pitch unconsciously when they produce Japanese long vowels. How does this relate to the perception of the mora? Japanese vowels are often used to explain the notion of the mora as a timing unit. Vowel length is vulnerable to speech rate and to pitch-accent, and yet Japanese speakers perceive two moras in a long vowel. A couple of studies suggest (Nagano-Madsen 1990, Kozasa 2002) that F0 cues are more robust for the perception of the mora count in a vowel. Nagano-Madsen moved the pitch peak within a vowel, and then had listeners judge vowel length. She found that listeners had a tendency to perceive the vowel as a long vowel, although it had the same duration as a short vowel. However, when the pitch peak was at the end of the vowel, the vowel was perceived as short, even though the duration was the same as a long vowel. Kozasa manipulated the duration of vowels while maintaining the pitch contour, and then had Japanese speakers judge vowel length. In other words, the vowels Kozasa used had the duration of long vowels and the pitch contour of short vowels. The participants were not able to judge vowel length consistently. Responses were distributed evenly between long and short vowels.

The evidence is mounting, from the present study and others (such as Nagano-Madsen and Kozasa), that pitch-accent is a vital key to unlocking the mystery of the phonetic reality of the mora in Japanese vowels.

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Tomoko Kozasa
Department of Linguistics
University of Hawai'i at Mānoa
1890 East-West Road, Moore Hall 569
Honolulu, HI 96822-2318

kozasa@hawaii.edu

Appendix A: Materials used for Experiment 1

Long vowel	**Short vowel**
/aa/	/a/
sakki ***aaru*** *to iimashita*	*sakki* ***aru*** *to iimashita*
'I said *aaru* while ago.'	'I said *aru* while ago.'
watashi-wa ***naasu*** *ga suki desu*	*watashi-wa* ***nasu*** *ga suki desu*
'I like nurses.'	'I like egg-plants.'
sono ***kaado*** *fuite*	*sono* ***kado*** *fuite*
'Please clean that card.'	'Please clean that corner.'
/ee/	/e/
kore-wa ***kee*** *desu*	*kore-wa* ***ke*** *desu*
'This is a *K*.'	'This is a letter *ke*.'
kawaii ***beeru*** *da ne*	*kawaii* ***beru*** *da ne*
'What a pretty veil!'	'What a cute bell!'
watashi-ga ***reeji****-ni iku*	*watashi-ga* ***reji****-ni iku*
'I will go there at midnight.'	'I will go to the cash register.'
kyonen-mo ***seeto****-wo tazuneta*	*kyonen-mo* ***Seto****-wo tazuneta*
'I visited a student last year, too.'	'I went to *Seto* last year, too.'
/ii/	/i/
kono ***biiru****-ga takai*	*kono* ***biru****-ga takai*
'This beer is expensive.'	'This building is high.'
ano ***chiizu****-ga hoshii*	*ano* ***chizu****-ga hoshii*
'I want that cheese.'	'I want that map.'
kinou ***niisan****-ga roku-to kotaeta*	*kinou* ***nisan****-ga roku-to kotaeta*
'My brother said six yesterday.'	'I said 2 times 3 was 6 yesterday.'
/oo/	/o/
yamamichi-o ***rooba****-ga oruiteiru*	*yamamichi-o* ***roba****-ga oruiteiru*
'An elderly lady is walking on the mountain path.'	'A donkey is walking on the mountain path.'
kore-ga ***dooki****-no sakura desu*	*kore-ga* ***doki****-no sakura desu*
'This is my former schoolmate.'	'This is earthen cherry blossoms.'
sore-ga ***kooi****-no araware desu*	*sore-ga* ***koi****-no araware desu*
'That is the affection.'	'That is the love.'
/uu/	/u/
ima ***kuuru*** *to iimashita*	*ima* ***kuru*** *to iimashita*
'I said *cool* now.'	'I said *to come* now.'
kimi-o ***Yuuki*** *to yoboo*	*kimi-o* ***Yuki*** *to yoboo*
'I will call you *Yuuki*.'	'I will call you *Yuki*.'
ano hito-ga ***Yuuka*** *san desu*	*ano hito-ga* ***Yuka*** *san desu*
'That is *Yuuka*.'	'That is *Yuka*.'
Jyon-ga ***suuri*** *ni yarareta*	*Jyon-ga* ***suri*** *ni yarareta*
'John failed in Math theory.'	'John got hit by a pickpocket.'

Appendix B: Materials used for Experiment 2

Long vowel		**Short vowel**	
/aa/		/a/	
akaari	'red ants'	*akari*	'light'
haaku	'to grasp'	*haku*	'to put on (shoes)'
jaaku	'evil'	*shaku*	'a unit of length'
kaaki-iro	'khaki'	*kaki-iro*	'color of persimmon'
suupaamaaketto	'supermarket'		
/ee/		/e/	
kareeraisu	'rice curry'	*kareru*	'to wither'
seekoo	'success'	*sekoo*	'construction'
keekoo	'tendency'		
meekyappu	'makeup'		
toreenaa	'sweatshirt'		
/ii/		/i/	
hiikime	'with favor'	*hikime*	'time to withdraw'
keshiin	'post mark'	*keshin*	'to transform'
niigata	'*Niigata* prefecture'	*nigata*	'the type 2'
shiiku	'to breed'	*shiku*	'to spread'
okiishi	'mile stone'		
sukiijoo	'ski slope'		
/oo/			
hoosoo	'broadcast'	*hosoo*	'pavement'
kooritsu	'efficiency'	*koritsu*	'isolation'
kooshi	'Confucius'	*koshi*	'waist'
moomoku	'blind'	*momokuri*	'chestnut & peach'
sookai	'general meeting'	*sokai*	'evacuation'
tookai	'a district name'	*tokai*	'big city'
/uu/		/u/	
fuuchoo	'trend'	*fuchoo*	'bad condition'
kuuchi	'empty lot'	*kuchi*	'mouth'
suushiki	'math formula'		
tsuushinhanbai	'mail order'		
yuukai	'kidnap'		

"*Ajak* of all trades": Problems with Categorizing Balinese *ajak* Across Discourse Genres*

EDMUNDO LUNA
University of California, Santa Barbara

0. Introduction

Determining "lexical categories" has been an elusive enterprise in linguistic analysis. For example, one of these distinctions that are presumed to be applicable in most languages is that of "verbs" versus "nouns". However, even this distinction is unclear in some cases, e.g. Tagalog and Nootka (Schachter 1985). In a similar vein, "verbs" are especially susceptible to forces that would drastically affect their "verbal" membership. For example, many studies have examined the grammaticization of verbs into prepositions (König and Kortmann 1991, Kortmann and König 1992, Xing 2003, *inter alia*). Other studies such as Hopper and Thompson 1984 address such issues by incorporating discourse-functional considerations into their analysis, with the underlying notion that lexical categories are primarily determined by discourse factors.

This perspective may be refined further if the following questions are addressed: a) how would the determination of lexical categories be affected by discourse genre?; and b) can this comparison provide additional insight into the diachronic development of such categories? Variability across discourse genres appears to characterize *ajak*, a morpheme in Balinese that is traditionally described as a verb of accompaniment. Balinese is an Austronesian language of the Sundic sub-branch spoken primarily on the Indonesian island of Bali.

In written Balinese, this study will show that *ajak* has three manifestations: as a morphosyntactic verb (with verbal morphology), as a preposition-like element in serial verb constructions, and as an incorporated element in quantifying expressions. In spoken discourse, *ajak* is more ambiguous in status: it occurs most frequently in its unaffixed form. The unaffixed form may point towards an advanced stage of grammaticization where *ajak* has developed into a preposition

* I would like to express my deepest appreciation to Susanna Cumming and Sandra Thompson, whose suggestions have greatly improved the quality of the present study. An earlier version of this paper was presented at the 20th Scandinavian Conference on Linguistics at Helsinki, Finland, January 7-9, 2004. Thanks also to the audiences at BLS 30 and 20 SCL for their comments.

and an element within quantifying expressions that encode collectivity among a group of associated referents.

This study further shows that even though the examination of *ajak* across discourse genres illustrates some of the difficulties of determining its exact lexical category/categories synchronically, it provides a rather clear picture of a grammaticization process whereby *ajak* is in the process of losing many of its attested verbal characteristics.

1. Data and Methods

The discourse corpora used in this study represent both written and spoken genres of Balinese, as mentioned above. The written Balinese corpus is comprised of eight short stories (*satua bawak* in Balinese) from two edited volumes of modern Balinese literature (Bagus and Ginarsa (eds.) 1978, Jendra (ed.) 1977) and a novel (Manda 2001) that were written in the past fifty years. The spoken Balinese corpus is comprised of a number of short procedural texts, i.e. recipes and related texts, and a long narrative collected by the investigator during the summer of 2003 in Desa Bangah, Bali.[1]

Each corpus was examined for the occurrence of *ajak*, including tokens with any overt verbal morphology, e.g. the prefix *N*- and the suffix *–a*, which will be explained in further detail below. This resulted in 206 tokens for the written corpus. These tokens were then coded for accompanying elements such as following NPs, quantifiers, and preceding verbs. The quantitative findings below reflect only the written corpus. (The spoken corpus only has 25 tokens - not enough to draw any definite conclusions from this corpus, but may provide some further implications nonetheless.)[2]

2. The verbal nature of *ajak*

Ajak, as noted above, has been traditionally described as a Balinese "verb of accompaniment". Barber (1977) provides the following definitions: *take with one, take along, invite to do sth with one* (153). This notion of accompaniment is clearly seen in examples (1)-(3) below:

(1) yadiapin tiang tusing nu dini **ng-ajak** bapa.
although 1(M) NEG still here N-AJAK father
'Although I was no longer there **with** Father.' [WRITTEN: MATEGUL]

[1] Text titles and/or speakers (identified by pseudonyms) are enclosed by square brackets in the examples.

[2] A note on Balinese "speech styles" (after Errington 1988) since the language is perhaps best known for its usage of these socially conditioned styles: almost all the texts used in this study represent low speech styles since *ajak* is considered a low speech style form; the closest counterpart from the higher speech styles would be *sareng*. A future study on the behavior of *sareng* in discourse would be in order.

(2) Nah, ...jemak jaja-ne **ajak** biu-ne Tu!
okay take rice.cake-DEF AJAK banana-DEF NAME
'Okay, ...take the rice cake along with the bananas Tu!' [WRITTEN: TOGOG]

(3) ..campur ba to **ajaka** gula to.
mix 2 that AJAK-3 sugar that
'Then you mix [it] along with the sugar.' [SPOKEN: Bu LIS]

As illustrated above, the notion of accompaniment is the most salient characteristic of *ajak.*

Considering now the degree to which *ajak* is a bona fide verb across these genres, one needs to take into account the degree of co-occurrence between *ajak* and relevant verbal morphology in Balinese. The verbal morphology attested in the data comes in two forms. Firstly, *ajak* can occur with the homorganic nasal prefix *N*-, which has been traditionally described as an "active voice" or "nasal transitive" (Pastika 1999) prefix. I will refer to this as an "Agent Trigger" prefix, a more neutral term based on Cumming's (1991) analysis of the Indonesian prefix *meN*-.[3] This prefix is illustrated in (4) and (5) below:

(4) pedas meme mati **ng-ajak** pianak,
obvious mother die **N-AJAK** child
'It's obvious that the mother died **with** her child.' [WRITTEN: NGANTEN]

(5) Sing ne kadong dawa nyatua **ng-ajak** I Ketut,
NEG this because long.time N-story **N-AJAK** TITLE NAME
'It's not because he's been telling stories **with** Ketut for awhile.' [WRITTEN: IWANG]

Secondly, *ajak* can occur with the suffix *-a*, which has been traditionally described as a "passive voice" suffix or a third person agent clitic attached to a "zero transitive" form (Pastika 1999). Examples of this are shown in (6) and (7):

(6) Wayan Tamba nyangkol meme-n-ne **ajak-a** ka bale dangin.
NAME NAME N-carry.in.forearms mother-LNK-3:POSS **AJAK-3** to pavilion in.east
'Wayan Tamba carried his mother in his arms to the eastern pavilion.'
[WRITTEN: TOGOG]

(7) ..bumbune to **ajaka,**
spice-DEF that **AJAK-3**

kene ento dadi ba ento kuah ento ba,
like.this that become already that soup that already
'With the spices [mix it], like this it already becomes a soup.' [SPOKEN: Bu LIS]

Tokens with verbal affixes co-occurring with *ajak* occur less frequently than tokens with no affixation, as seen in Table 1:

[3] In this case, the "trigger" of a clause would be an argument that functions as its "subject"; more crucially, the trigger argument serves as a shared argument in clause combinations.

With *N-*	With *-a*	Neither	Total
30 (14.5%)	29 (14.1%)	147 (71.4%)	206 (100.0%)

Table 1: Token frequencies of *ajak* co-occurring with vs. without verbal affixes.

What does this mean at this point? For the most part, it means that *ajak* occurs most frequently in its unaffixed form, with only about 30% of the tokens having some sort of verbal affixation.[4] Does this necessarily mean that *ajak* can no longer be considered just a verb in Balinese? Although this question cannot be answered at this time, perhaps other functions associated with *ajak* can provide a clearer picture of its lexical status.

3. *Ajak* and prepositionhood?

Verbs of accompaniment cross-linguistically are highly susceptible to forces of grammaticization that can gradually lead to their reanalysis as prepositions, cf. Kortmann and König 1992 and Xing 2003. Taking an analysis of semantic source vs. target domain, the grammaticization path for *ajak* would be:

Source Meaning		**Target**
'take along, invite someone to do something'	⟶	'with'
FOLLOW		**COMITATIVE**

(after Heine and Kuteva 2002:139-140)

Crucially, this pathway is generally only evident in languages that allow serial verb constructions (König and Kortmann 1991, Kortmann and König 1992). Balinese can be considered such a language if one were to employ the criteria for serial verb constructions given in Englebretson (2003) for a closely related language, (colloquial) Indonesian. According to these criteria, serial verb constructions have the following: (1) the occurrence of two (or more) adjacent verbs without any intervening material, and (2) at least one argument shared between the verbs in question. An example is illustrated in (8):

(8) kadang-kadang,
<sometimes>

...(0.7) makatetelun kaden bapa **luas** **melali,**
COLL-REDUP-three-LNK think father **go.out** **go.around**
'Sometimes the three of them would think that I went around.'
[SPOKEN: PAK MANGKU]

[4] The question remains of whether verbal affixation is that frequent for Balinese in general. To give some idea of how frequent verbal affixation is in a particular discourse genre, the procedural texts used in the spoken corpus contain 522 tokens of verbs: out of these tokens, 126 of them have the N- prefix while only 16 have *–a*; in contrast, 282 have no affixation. This initially suggests that verbal affixation is not particularly robust in Balinese procedural texts; the degrees of robustness across genres and related languages have yet to be ascertained.

Serial verb constructions can also contain *ajak*, as seen in (9). However, with *ajak,* there are cases that are ambiguous as to whether *ajak* is acting as a verbal element in a serial verb construction or a preposition that directly follows the verb, as in (10):

(9) Uduh, suba magede lamun jani mara bapa **matemu ngajak** cening."
EXCL already MA-big if now just father **MA-meet N-AJAK** 2
'Oh, you've already become big since the last time I met you.' [WRITTEN: SAKIT]

(10) ..ba ba meme ngidih tulungan,
already take mother N-request assistance

nyait ..a%jak dadonge,
N-sew AJAK grandmother-DEF

..di desa.
LOC village
'I ask for help in sewing [the offerings] with Grandmother in the village.'
[SPOKEN: Bu TRI]

In the written corpus, 63/206 tokens of *ajak* (30.6%) occur in serial verb constructions. (In the spoken corpus, there are only three such tokens.)

In order to ascertain the degree to which *ajak* has attained a preposition-like status in Balinese, one must examine the frequency in which unaffixed vs. an affixed forms of *ajak* co-occur with a preceding verb in possible serial verb constructions. In other words, if *ajak* occurs more frequently with verbal morphology, then its verbal status must still be quite strong. Conversely, if *ajak* occurs more frequently without any verbal morphology, then it may be acting as a preposition in these constructions, like in (10). As shown in Table 2, the non-inflected forms of *ajak* are much more frequent in the written corpus (there are no tokens of this type with verbal morphology in the spoken corpus):

With *N-*	**With *-a***	**No verbal affix**	**Total**
15 (23.8%)	4 (6.4%)	44 (69.8%)	63 (100.0%)

Table 2: Co-occurrence frequencies of inflected vs. non-inflected *ajak* in serial verb constructions.

Therefore, the data from the written corpus suggest that *ajak* may very well be attaining prepositionhood, at least within the context of serial verb constructions. (The spoken corpus is so limited with respect to this point that nothing can be strongly argued for at this time.)

4. *Ajak* in quantifying expressions

Ajak may also occur as an "adverbial" (for lack of a better term) element in Balinese quantifying expressions – "constructions" as per Fillmore (1989) and Fillmore, Kay, and O'Connor (1988) – with the quantifying element being either a

quantifier or a numeral. Thus, these expressions take the following general forms: [AJAK + Quant] and [AJAK + Num]. Examples illustrating both types of expressions are illustrated in (11)-(15) below:

(11) lantas **ajak-a** **makejang** gangsar nuun-ang ka tukad-e.
then **AJAK-3** **all** hurry N-descend-APPL to river-DEF
'Then all of them quickly went down to the river.' [WRITTEN: BUNGA]

(12) Nah kemu suba luh **ajak** **makejang**
okay thither already woman **AJAK** **all**
'Okay, all the women are over there already.' [WRITTEN: BUNGA]

(13) ...Apang selamat **ajak** **onya=ng,**
PURP well **AJAK** **all**
'So that everything is well." [SPOKEN: Bu TRI]

(14) Kedek nguntul **ajak-a** **dua** lantas gangsar ma-jalan.
laugh N-bow.head **AJAK-3** **two** then hurry MA-walk
'The two of them bowed their heads laughing then walked away quickly.'
[WRITTEN: BUNGA]

(15) Lantas ia **ajak** **patpat** nuju ka bale pagongan
then 3 **AJAK** **REDUP-four** N-head.towards to pavilion gamelan
'Then the four of them went towards the gamelan pavilion.' [WRITTEN: BUNGA]

In these expressions, *ajak* provides the notion of collectivity for the groups of referents associated with such expressions, e.g. *ajak dadua* 'the both of them', *ajak onyang/makejang* 'all of them', and so on (cf. Luna 2003 for a more detailed description). Thus, the notion of accompaniment is still evident in these expressions, albeit in a slightly different form.

There are 40 tokens with numerals and 17 tokens with quantifiers in the written corpus (57/206 tokens altogether: 27.7%). With both quantifiers and numerals, *ajak* tends to not occur with any verbal affixation, although interestingly enough *ajaka* (with the third person agent) is still strongly attested with constructions containing numerals. The figures are shown in Table 3:

NUM with *-a*	**NUM w/o *-a***	**Quant with *-a***	**Quant w/o *-a***	**Total**
17 (29.8%)	23 (40.4%)	2 (3.5%)	15 (26.3%)	57 (100%)

Table 3: Token of affixed vs. unaffixed *ajak* in quantifying expressions.

On the other hand, the spoken corpus only has five ajak tokens in quantifying expressions; only one of these tokens contains the form *ajaka*.

It appears from Table 3 that the overtly verbal form of *ajak* remains in the minority. Furthermore, since the verbal form of *ajak* may only take the form with the third person suffix, i.e. *ajaka*, and that the meaning of *ajak* is slightly altered from the notion of accompaniment illustrated elsewhere, it may be more useful to

consider these forms as lexicalized "adverbial" elements in these quantifying expressions.

5. Concluding remarks

In order to address what possible lexical category/categories *ajak* might belong to, the following schema may be instructive:

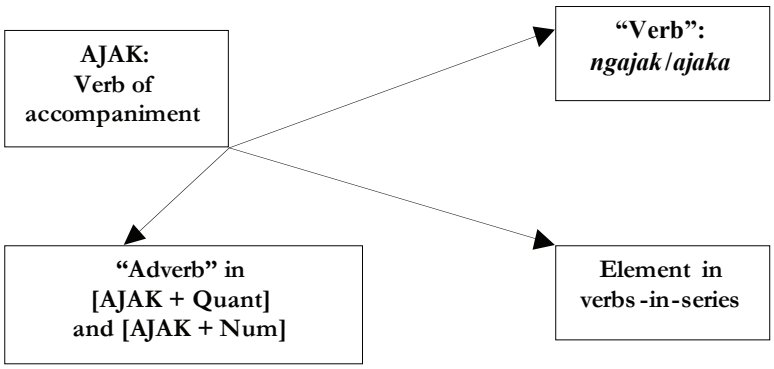

Figure 1: Summary schema of categorizing *ajak* in Balinese discourse.

In this study, it was shown that in written Balinese discourse:

a) *Ajak* most frequently occurs in its unaffixed form, i.e. it does not behave like a morphosyntactic verb in most cases, even though affixed forms are still attested;

b) Within serial verb constructions, *ajak* takes on preposition-like characteristics (provided that it does not appear with any overt verbal marking);

c) Within quantifying expressions, *ajak* and *ajaka* appear to be adverbial elements.

Thus, these three points illustrate the extreme difficulty in determining the exact lexical status of *ajak*.

However, the trends seen in the spoken data, in conjunction with the written data, further suggest that *ajak* is gradually losing its verbal status by not occurring with its associated verbal morphology in Balinese. This suggests that cross-genre examinations are instrumental in determining diachronic processes such as grammaticization.

Glosses Used:

1	first person
2	second person
3	third person
AJAK	*ajak* morpheme
APPL	applicative
DEF	Balinese "definite" suffix (-*e*/-*ne*)
EXCL	exclamatory particle
LNK	linker
LOC	locative
MA-	Balinese "Subject Trigger" prefix
N-	Balinese "Agent Trigger" prefix
NAME	name
NEG	negative
POSS	possessive
RED	reduplicated form
TITLE	Balinese caste title

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Edmundo Luna
Department of Linguistics
UC Santa Barbara
3607 South Hall
Santa Barbara, CA 93106-3100

ecluna@umail.ucsb.edu

Apical and Laminal Articulations in Hakha Lai

IAN MADDIESON and KENNETH VANBIK
University of California, Berkeley

0. Introduction

Almost every spoken human language has at least one coronal plosive, but only a minority have minimal contrasts between two (or more) coronal plosives made at different places (e.g. dental and alveolar) or with differing tongue gestures (e.g. apical vs laminal). Hakha Lai is one such language: it has four voiceless coronal plosives differing in both place and aspiration. These are exemplified by the words given in Table 1.

Table 1. Words showing four-way voiceless coronal plosive contrast in Hakha Lai

Unaspirated:	/t̪aa/ 'possession'	/t̠aa/ 'brother (female speaker)'
Aspirated:	/t̪^{h}aa/ 'sinew'	/t̠^{h}aa/ 'good'

In this paper we will examine the articulatory and acoustic characteristics of the coronal place contrasts between these voiceless stops in Lai (the transcription used above anticipates our conclusions) and compare their production with that of other coronals in the language. We will also briefly compare the instantiation of the coronal place contrast in Lai with that in certain other languages with generally similar distinctions, and examine the historical origin of the contrast in Lai through its correspondences in related languages.

Hakha Lai is a Tibeto-Burman language of the Kuki-Chin group, spoken in the north-western border region of Burma (Myanmar) and adjoining parts of India (mainly in Mizoram) and Bangladesh. It is the native language of the second author of this paper.

1. Articulatory Contrast

We examined the articulatory contrast between these words in the second author's speech using (static) palatography and linguography (for descriptions of these techniques see Ladefoged 1997). The palatograms and linguograms show that the initial segments in the words on the left in Table 1 have a lingual contact which is broad in the sagittal plane, extending over the upper teeth and onto the alveolar ridge behind the teeth. This pattern is illustrated in Figure 1, which shows palatograms of two repetitions of /t̪aa/ 'possession' (top row) and one of /t̪^{h}aa/ 'sinew'

(lower left) produced in phrases beginning with the third person marker /a/. The lower right panel of the figure shows a linguogram of the utterance /a t̪aa/ 'his/her possession', confirming that there is a broad contact area on the tongue blade.

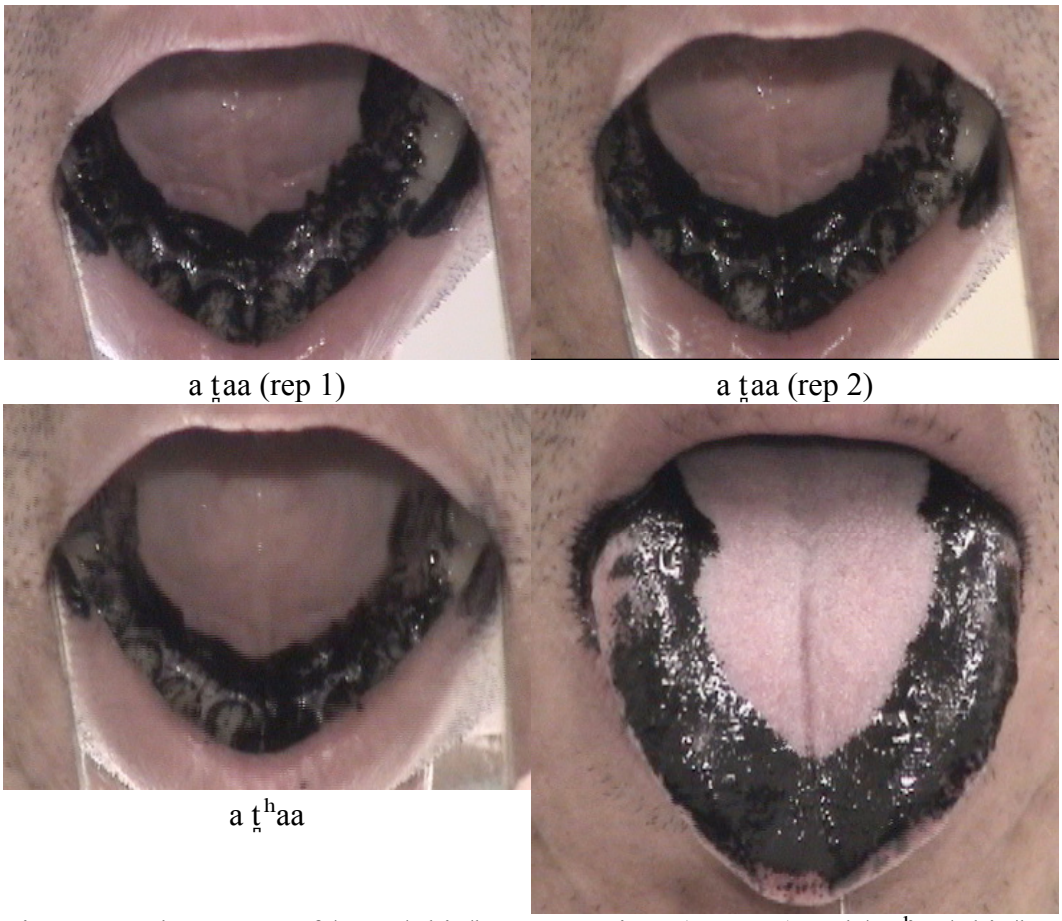
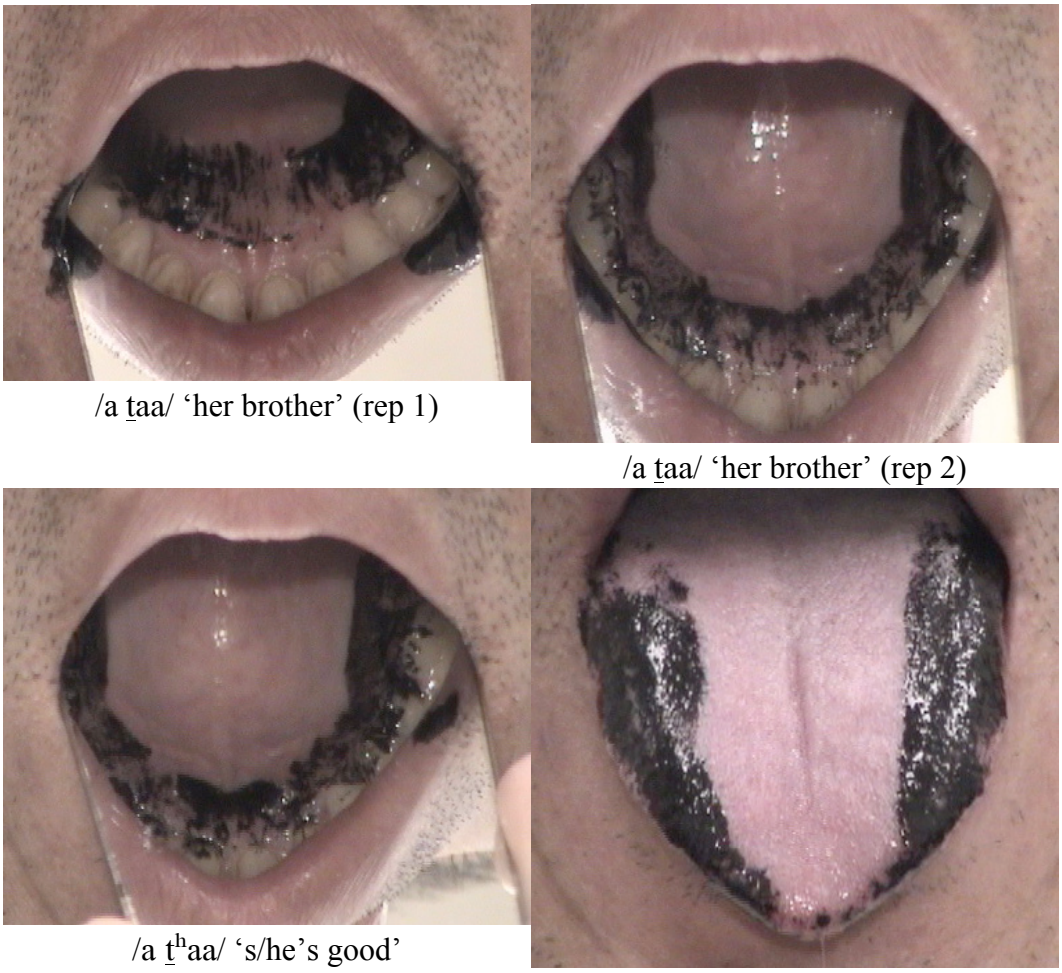


Figure 1. Palatograms of /a t̪aa/ 'his/her possession' (top row) and /a t̪ʰaa/ 'his/her sinew'(bottom left); linguogram of of /a t̪aa/ (bottom right).

On the other hand, the initial segments in the words on the right of Table 1 have a narrower lingual contact in the sagittal plane that is principally behind the teeth. The palatograms for the segment /t̲/ show that the contact area primarily lies behind the teeth, on and behind the alveolar ridge. In the first token in Figure 2, the contact pattern is blurred, which suggests that this segment is produced with a dynamic articulation in which the location of contact moves (probably forward) during the closure phase. In the second token the contact area is on the alveolar ridge but extends laterally onto the back of the teeth. This token also shows some evidence of dynamic articulation. The linguogram in the lower right panel of Figure 2 shows that the contact area on the tongue is very narrow at tip. The lower left panel confirms that there is a similar alveolar contact pattern for the aspirated counterpart.

The palatographic and linguographic data indicate that the articulatory

contrast between the segments can be appropriately characterized as between laminal dental for the segments on the right in Table 1 and apical alveolar to slightly post-alveolar for the segments on the left in Table 1. This conclusion has been anticipated by the choice of diacritics employed in the transcriptions.



/a t̪aa/ 'her brother' (rep 1)

/a t̪aa/ 'her brother' (rep 2)

/a t̪^{h}aa/ 's/he's good'

Figure 2. Palatograms of /a t̪aa/ 'her brother' (top row), /a t̪^{h}aa/ 's/he's good'(lower left), and linguogram of /a t̪aa/ (bottom right).

2. Acoustic Differences

We also investigated what acoustic differences correlate with this articulatory distinction. Preliminary inspection of waveforms and spectrograms suggested that both the release burst and the adjoining formant transitions show consonant-specific features. A sample spectrogram contrasting /a t̪aa/ and /a t̪aa/ is shown as Figure 3 below. This unaspirated pair /t̪aa/, /t̪aa/ was chosen for further study. Recordings of two speakers were used, one male (S1), one female (S2), the male being the second author of this paper. The recordings were made digitally at a 44 kHz sample rate in a sound-attenuated room using a head-mounted close-talking microphone and down-sampled to 22 kHz for analysis.

The values of the second and third formants at the onset of the post-

consonantal /aa/ vowels were measured in 20 tokens of each of the selected words for S1, and in 16 tokens for S2. In half the tokens the consonants were preceded by the possessive marker /a/; in the other half the consonants were initial. Formant values were generally obtained from a 24-coefficient LPC analysis using the MacQuirer speech analysis package. A 1024-point FFT analysis and a broadband spectrogram were simultaneously examined to verify the formant estimates, and occasional corrections made based on the FFT spectrum. The mean values are compared in Figure 4. In a two-way analysis of variance with consonant and speaker as independent variables there is a significant difference ($F(1,68) = 140.9$, $p < .0001$) in the second formant onset after /t̪/ and /t̲/ with the laminal dental having the lower mean value (1461 Hz vs. 1621 Hz for S1, 1884 Hz vs. 2084 Hz for S2). No significant difference was found for the third formant onset, which is very similar after the two consonants. There is, as expected, a significant difference between the speakers in both formant onsets, with the female speaker having higher onset values.

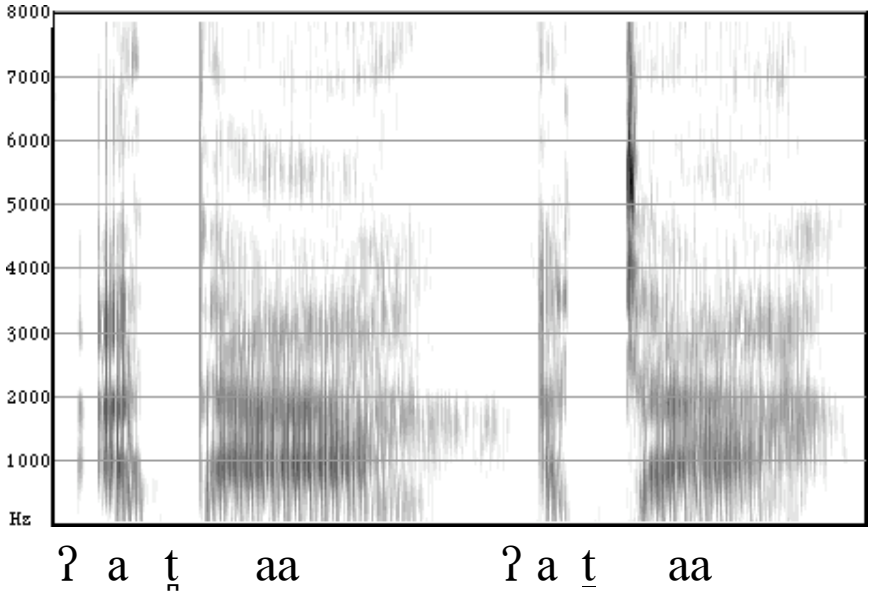


Figure 3. Spectrogram of /a t̪aa/ and /a t̲aa/

Since second formant (F2) onset values following the consonants differed, we compared the second formant offset preceding the consonants in those tokens which had a preceding /a/ (10 tokens of each consonant for S1, 8 for S2). Differences in the tongue position for the two consonants might be anticipated at the moment of closure, or if there is movement during the closure for the alveolar, as is hinted at in the palatograms, disparate values for F2 at the edges of this consonant would be expected. The results were different for the two speakers, as shown in Figure 5. S1 did not show a significant difference between the consonants in preceding F2, but for S2 the second formant is higher before /t̲/ than before /t̪/, matching the direction of the difference observed for the offset. For both speakers there is a slight rise in the measured F2 value across the closure for the laminal dental (88 Hz for S1, 57 Hz for S2). Surprisingly, S1 shows

effectively identical F2 values on either side of the alveolar consonant, whereas his palatograms suggested that the closure location is moving during the consonant's production. S2 on the other hand shows a notable rise in F2 of 142 Hz across the consonant closure, which would be consistent with a forward movement of an apical closure during the consonant.

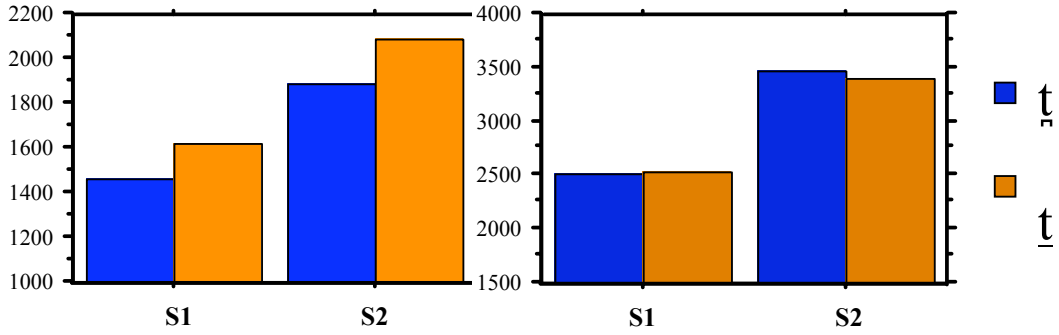


Figure 4. Mean second (left) and third (right) formant onset values after /t̪/ and /t̲/

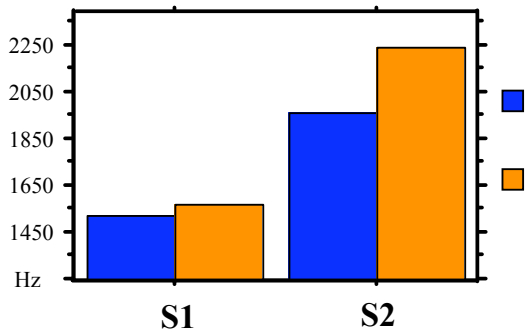


Figure 5. Mean F2 offset

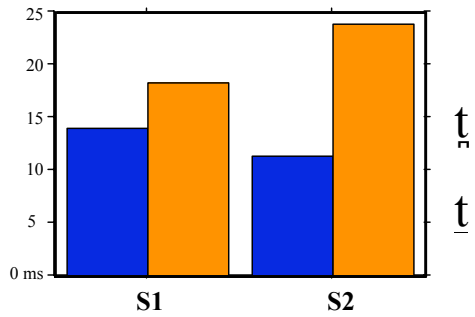


Figure 6. Voice onset time

As noted above, the release bursts after the consonants differ. The interval containing the burst transient and frication noise before the onset of voicing for the following vowel (voice onset time) is significantly longer after /t̲/ than /t̪/ ($F(1,68) = 199.8$, $p < .0001$). The results are plotted in Fig. 6. There is also a significant speaker/consonant interaction, the contrast being greater for S2 than for S1.

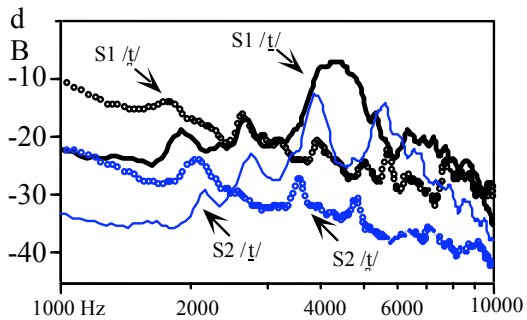


Figure 7. Burst spectra

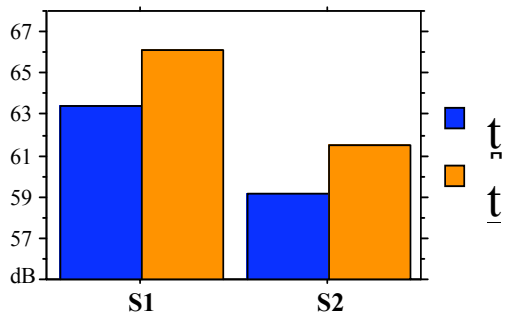


Figure 8. Burst amplitude.

The energy distribution in the bursts is also distinct. There's a relatively flat-falling spectrum for /t̪/ but a peaked spectrum for /t̲/ with one (for S1) or two (for S2) peaks around 4000-5000 Hz. Mean five-point smoothed FFT spectra calculated over an 11 ms window from 1000-10,000 Hz for 20 tokens of each consonant for S1 and 16 for S2 are plotted on a log frequency scale in Figure 7. Amplitude is shown relative to the peak in the spectrum for each consonant. There is also a significant difference between the consonants in the amplitude of the burst ($F(1, 32) = 10.7$, $p = .0026$) measured in the intervocalic tokens. The alveolar has greater amplitude, as shown in Figure 8.

The closure durations in the intervocalic tokens were also measured and found not to be distinct. The mean durations are plotted in Figure 9, and compared with mean closure duration of /d/ (5 tokens of /d/ for S1, 4 for S2). There is an overall significant difference between speakers, mainly because S2 has considerably longer closures for both voiceless segments, while voiced and voiceless closures are the same for S1.

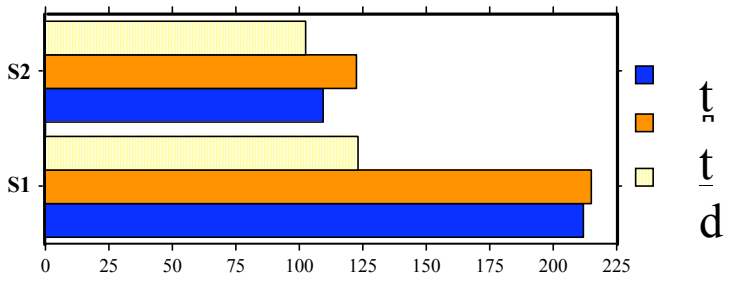


Figure 9. Closure duration in /a t̲aa/, /a t̪aa/ and /a daa/

3. Production of Other Coronal Consonants in Lai

Lai has a large set of coronal consonants but only the voiceless plosives have a laminal dental/apical alveolar contrast. How do the non-place-contrasting coronals align in place? A number of other coronals were investigated using palatography, and a subset of these were also briefly examined acoustically.

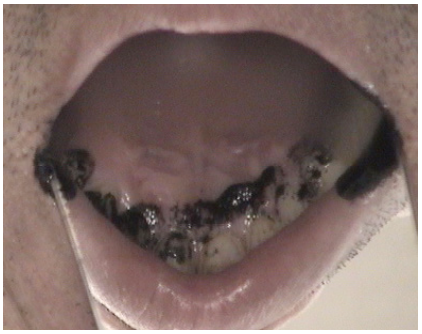
The palatography indicates that /d/ and the sibilant affricates /ts, ts^h/ are laminal dental (see Figure 10); the sonorant coronals—nasals, lateral continuants and rhotics—are apical alveolar (Figure 11). The fricatives /s, z/ and lateral affricates are more ambiguous in terms of their assignment to these categories. Their articulation appears to be more alveolar than dental, but the contact is less apical than is seen in the other alveolar segments (Figure 12). Similar differences in place of non-contrasting coronals have been reported for certain other languages: e.g. in the Spanish described by Navarro Tomás (1961), /t, d/ are noted as dental, while /n, l, s, r/ are classed as alveolar, and Dart (1988) shows French /l/ as most typically apical alveolar while /t, d/ are dental.

a d̪aa

a t̪s̪aa

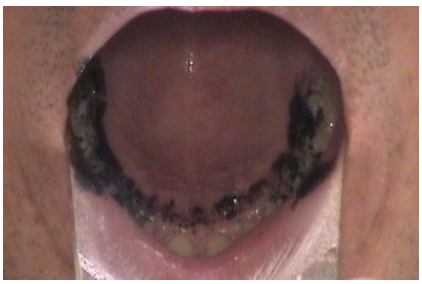
a t̪s̪^{h}aa

Figure 10. Laminal dental articulation of /d, ts, ts^{h}/

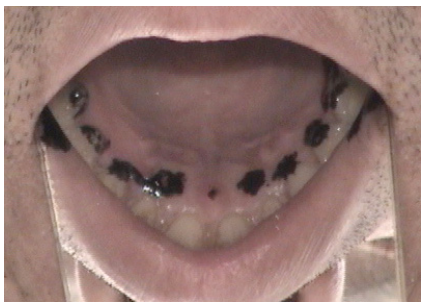


a l̪aa

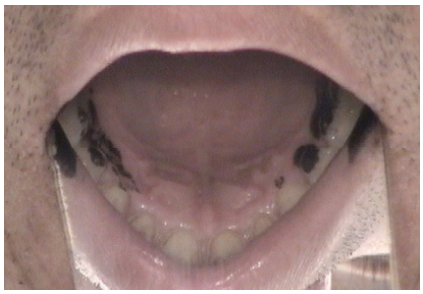
a l̪̊aa



a n̪aa



a r̪aa



pa r̪̊aa

Figure 11. Apical (post-)alveolar articulation of sonorant coronals

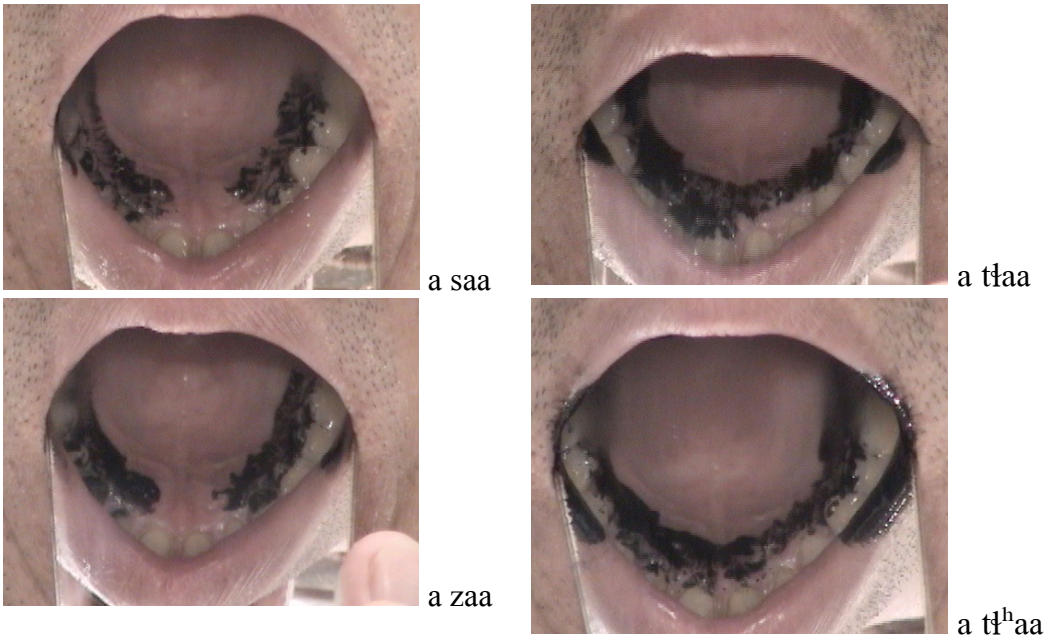


Figure 12. Broad alveolar contact for sibilant fricatives and lateral affricates

The second formant onsets after /d, n, l, r, z/ were also measured in tokens from the two speakers (at least 8 tokens of each type). The level of F2 onset does not correlate with the laminal dental/apical alveolar contrast across the segment types. As shown in Figure 13, [t̪, d̪, n̪] have the highest F2 onsets, [r̪] the lowest.

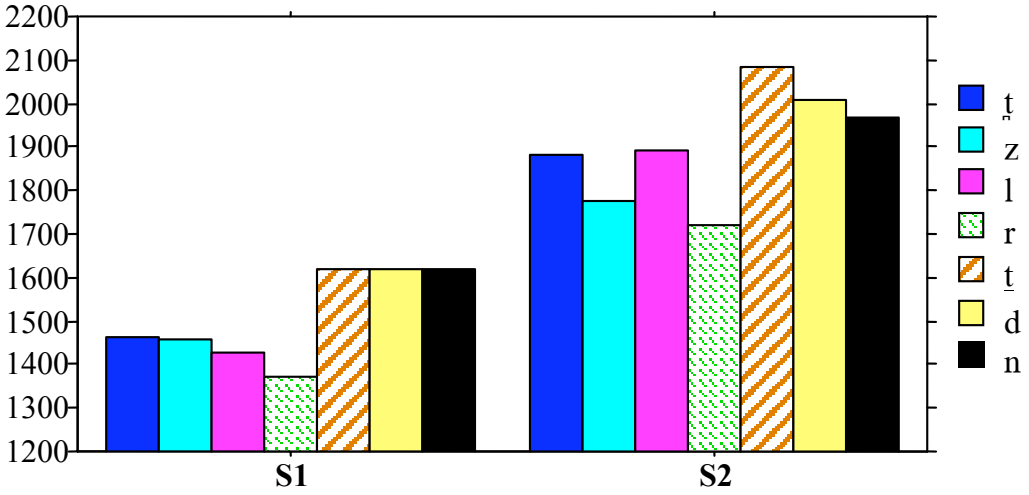


Figure 13. F2 onset after various coronals

4. Comparison with Dental/Alveolar Stop Contrasts in Other Languages

Among languages with a broadly similar articulatory place contrast in stops are several languages of the Western US, including O'odham (Pima-Papago) (Dart 1993), many Australian languages, such as Tiwi (Anderson & Maddieson 1994)

and Arrernte (Anderson 2000), many languages of India, including Malayalam (Dart 1991) and Toda (Shalev et al 1993), as well as a number of Austronesian languages, e.g. Ndumbea (Gordon & Maddieson 1999) and African languages such as Dahalo (Maddieson et al 1993). In the five selected comparisons in the boxes that follow similarities with Hakha Lai are shown in *italics*, differences in **bold**. There is substantial cross-language variation in implementation. The most consistent pattern seems to be the difference in the burst spectrum, which is flatter for laminal dental stops but more peaked for apical alveolar stops. Burst amplitude is not consistent across the languages, and timing properties are notably variable. We would speculate that some of these differences reflect different origins of the contrast in the various languages, with earlier traits maintained.

O'odham /d̪/ vs /d̲/ (Dart 1993)

Formant transitions	*Higher F2 offset before /d̲/;* **No difference in F2 onset. Lower F3 (and F4) with /d̲/**
Burst spectra	*Flat spectrum for /d̪/,* **falling for /d̲/ (less energy in higher frequency range)**
Burst duration (VOT)	**No significant difference, but slightly longer for /d̪/ (15 ms) than for /d̲/ (11.5 ms)**
Burst intensity	No data
Closure duration	No data

Toda /t̪/ vs /t̲/ (Shalev et al. 1993)

Formant transitions	**No difference in F2 offset before /t̲/ and /t̪/**
Burst spectra	*More high-frequency energy in burst for /t̲/ than for /t̪/*
Burst duration (VOT)	**No significant difference between /t̪/ (22 ms) and /t̲/ (25 ms)**
Burst intensity	*Stronger burst for /t̲/ than for /t̪/*
Closure duration	No data

Tiwi /t̪/ vs /t̲/ (Anderson & Maddieson 1994)

Formant transitions	No data
Burst spectra	*More peaked spectrum for /t̲/ than for /t̪/*
Burst duration (VOT)	*Longer release duration for /t̲/ than for /t̪/*
Burst intensity	**More intensity in burst for /t̪/ than for /t̲/**
Closure duration	*No significant difference between /t̲/ and /t̪/*

E. Arrernte /t̪/ vs /t̲/ (Thaxter & Maddieson, unpublished)

Formant transitions	No data
Burst spectra	*Flat spectrum for /t̪/, peaked spectrum for /t̲/*
Burst duration (VOT)	*Slightly longer for /t̲/ (22.8 ms) than for /t̪/ (18.5 ms)*
Burst intensity	No data
Closure duration	**Significantly longer closure for /t̪/ (193 ms) than for /t̲/ (134 ms)**

Ndumbea /t̪/ vs /t̲/ (Gordon & Maddieson 1999)

Formant transitions	*Higher F2 onset after /t̲/ than /t̪/; no significant difference in F3*
Burst spectra	*Flat spectrum for /t̪/, peaked spectrum for /t̲/*
Burst duration (VOT)	*Longer burst for /t̲/ than for /t̪/*
Burst intensity	**No significant difference in burst intensity**
Closure duration	**Longer closure for /t̲/ (154 ms) than for /t̪/ (115 ms) (limited data)**

5. The Origin of the Dental/Alveolar Contrast in Lai

Hakha Lai dental plosives derive from simple coronal onsets, */t/, */d/ for /t̪/, */s/ for /t̪ʰ/. We would therefore presume that the proto-segments were dental in articulation. The alveolar plosives derive from clusters of a labial or velar plosive followed by */r/, as first noted by Solnit (1979). If */r/ had an alveolar articulation at an earlier stage, the origin of alveolar stops is a *fusion* of manner from the first element of the cluster and place from the second. We will give a brief sample of data supporting this interpretation of the development of each of the four voiceless coronal plosives of Hakha Lai. Space limitations prevent the inclusion of further material, but details on the reconstruction and history of each of the coronal segments can be found in VanBik (in progress).

On comparative evidence VanBik divides the Kuki-Chin languages into four branches: Northern, Central, Southern, and Maraic. Hakha Lai is a member of the Central branch. The other branches do not have the dental/alveolar contrast, but show distinct correspondences for the two sets. In the boxes below, sample correspondences for the four Hakha Lai stops are given. The proposed Proto-Kuki-Chin reconstructions (VanBik, in progress) based on these correspondences as well as Proto Tibeto-Burman reconstructions from Matisoff (2003) where available are also shown.

Cognates of Hakha Lai **unaspirated dental plosive**.

	Northern (Thado Kuki) /t/	Central (Hakha Lai) /t̪/	Southern (Mindat Cho) /t, ts/	Maraic (Mara) /t/
'water'	tûy	t̪îi	tui	tí
'nephew, niece'		t̪ûu	a tu	tú

	Proto-Kuki-Chin */t/	Proto Tibeto-Burman */t, d/
'water'	*tûy	*t(w)i(y)
'nephew, niece'	*tùu	*du

Cognates of Hakha Lai **aspirated dental plosive.**

	Northern (Thado Kuki) /tʰ/	Central (Hakha Lai) / t̪ʰ/	Southern (Mindat Cho) /s, tʰ/	Maraic (Mara) /tʰ/
'fruit'	tʰêy	t̪ʰǎy / t̪ʰayʔ	tʰei	tʰéy
'die'	tʰĭi / tʰìi	t̪ʰîi / t̪ʰiʔ	m-sih	tʰî

	Proto-Kuki-Chin	Proto Tibeto-Burman
	**/tʰ/ (*/s/)*	**/s/*
'fruit'	*tʰay	*sat
'die'	*tʰii ~ m-sii	*səy

Cognates of Hakha Lai **unaspirated alveolar plosive**.

	Northern (Thado Kuki) /k, g/	Central (Hakha Lai) /t̲/	Southern (Mindat Cho) /kr, k/	Maraic (Mara) /ts, r/
'weep'	kàp / kàa	t̲ap / t̲aʔ	krap	tsa
'decrease'	kûm / kùm	t̲ûm / t̲ŭm		tsə́w
'uncle'	gǎŋ	t̲âŋ		pə-rà

	Proto-Kuki-Chin	Proto Tibeto-Burman
	**/kr/*	**/kr, gr/*
'weep'	*krap	*krap
'decrease'	*krum	*grum
'uncle'	*kraŋ / raŋ	

Cognates of Hakha Lai **aspirated alveolar plosive**.

	Northern (Thado Kuki) /kʰ, pʰ/	Central (Hakha Lai) /t̲ʰ/	Southern (Mindat Cho) /kʰ, ?/	Maraic (Mara) /t(s)ʰ, pʰ/
'beads'	kʰĭi	t̲ʰîi	kʰüi	tʰì
'be good'	pʰàa / pʰat	t̲ʰǎa / t̲ʰat		pʰa

	Proto-Kuki-Chin	Proto Tibeto-Burman
	**/kʰr, pʰr/*	**/kr, ?/*
'beads'	*kʰruy	*krwi(y)
'be good'	*pʰraa ~ pʰrat	

6. Summary

Hakha Lai's stop inventory includes a contrast between laminal dental and apical alveolar voiceless plosives. The dental plosives derive from simple coronal

onsets, */t/, */d/ for /t̪/, */s/ for /t̪ʰ/. The alveolar plosives derive from clusters of labial or velar plosives followed by */r/. Primary perceptual cues to the distinction are likely to lie in characteristics of the release bursts and the F2 onset of following vowels. Articulatorily similar contrasts are implemented in different ways in different languages, resulting in language-specific timing, frequency, and amplitude patterns.

Acknowledgements
The work reported in this paper was supported in part by grant BCS-9817345 from the National Science Foundation to Ian Maddieson and by the Sino-Tibetan Etymological Dictionary and Thesaurus.

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Department of Linguistics
1203 Dwinelle Hall
University of California, Berkeley
Berkeley, CA 94720-2650

ianm@berkeley.edu
vanbik@berkeley.edu

Aspect in ASL: A Typological-Functional Analysis

ELISA M. MARONEY
University of New Mexico

0. Introduction

This research reports on patterns of aspect in American Sign Language (ASL). Typological research already done on aspect in spoken languages provides a framework from which the aspectual system in ASL is investigated. The findings of this study show that aspect in ASL has formal, semantic, and functional properties comparable to other languages of the world and that the majority of the aspectual categories already identified in ASL are expressed lexically and derivationally rather than inflectionally as previously reported (Fischer 1973, Fischer and Gough 1978, Klima and Bellugi 1979, Anderson 1982, Liddell 1984, 1990, Sandler 1990, Brentari 1996, 1998, Sutton-Spence and Woll 1999). The aspectual senses reported on here include progressive, continuative, habitual, frequentative, iterative, anterior (or perfect), completive, resultative, and inceptive. These findings have implications for all of the research that has been done on morphology in ASL. Broad statements saying that morphological categories in ASL are inflectional need to be re-examined.

1. Language consultants

The five language consultants who participated in this research are Deaf, native ASL signers. Initially, data was gathered from four language consultants. Each one of the four is a native ASL signer who began acquiring ASL as an infant. Each considers ASL her/his first language. At the time that data was collected, the language consultants were between the ages of 27 and 42. Each of the language consultants has either taught or currently teaches ASL at the postsecondary level. All are from the western United States (Oregon, Idaho, Montana, and Colorado). Each of the four language consultants holds a Master's degree in Deaf Education or a very closely related field. Of these four language consultants, two were female and two male. The fifth language consultant was identified to provide native insights for the researcher during the analysis stage of the investigation. This consultant was a female, native signer, age 29. She was an undergraduate student majoring in linguistics, involved in linguistic research, as subject, consultant, and/or research assistant. She has taught ASL at the postsecondary level.

When discussing the data, there were times when specifying the language consultant was important. They are simply "the first language consultant", "the second language consultant", "the third language consultant", "the fourth language consultant", and "the fifth language consultant". The first and fourth language consultants are male and the second, third, and fifth are female.

2. Methodology

The procedures for this research included two narratives and a written questionnaire adapted from Dahl (1985). Language consultants were videotaped during each procedure. The narrative elicitation consisted of two parts. In the first part, language consultants were asked to view a wordless action story on videotape, titled "The Pear Story", after which they were asked to narrate the story in ASL (See Chafe 1980, for other studies using "The Pear Story"). In the second part, language consultants were asked to narrate in ASL a picture story, titled "Frog, where are you?" (Mayer 1969). Language consultants were asked to look through the story in its entirety and then to sign the story while viewing the pictures a second time (See Berman and Slobin 1994 for other studies using "Frog, where are you?").

The sentences adapted from Dahl's (1985) questionnaire were translated from written English to ASL by the ASL consultants**.** The translation process influences results of the Dahl (1985) survey. However, if there were obligatory markings for any or all of the aspectual categories, they would have occurred. Translation was used to develop a typologically oriented database from which to compare and contrast the aspectual systems of several different languages.

The questionnaire adapted from Dahl (1985), was comprised of twenty-five sentences and three connected texts (short paragraphs consisting of two to five sentences each). The aspectual categories and their prototype sentences reported by Dahl (1985) were isolated[1] and included in the questionnaire for this project. The results from the progressive, habitual, and perfect (or anterior) sentence types will be reported here. The Dahl questionnaire does not elicit iterative, continuative, frequentative, completive, resultative, or inceptive, because they are not prototypically found in languages to be inflectional categories.

Transcription conventions that will be used in this paper are:

1. ALL CAPS represents the English gloss for the sign used.
2. Hyphen (-) indicates that more than a one-word English gloss is necessary.
3. A plus sign (+) is used to indicate total or partial reduplication.
4. A number sign (#) represents a fingerspelled loan sign.
5. PRO.1, PRO.2, PRO.3 indicates 1s, 2s, and 3s, respectively.
6. Specific labels are used for the two forms of FINISH following Janzen (1998): Main verb: BE.FINISHED and Anterior: FINISH.AUX$_{(ant)}$

[1] The Dahl (1985) questionnaire is comprised of 165 items to elicit information on tense and aspect. For this survey, only the items used to elicit information on aspectual categories were used.

3. Expression of imperfective aspectual senses in ASL

In this section, the focus is on the aspectual meanings that relate to ongoing, repeated, or present situations. Expressions of the imperfective, progressive, and frequentative will be touched upon briefly, because no evidence of markers for these categories were found in the data for this study. The related aspectual meanings that will be described in more depth are iterative, habitual, and continuative.

For the purposes of this research, inflectional, derivational, and lexical expression are best understood when placed on a continuum of expression types. Inflectional morphology has a high degree of productivity and obligatoriness, while derivational morphology is characterized by a low degree of productivity and lack of obligatoriness. Both inflectional and derivational expressions are characterized by boundedness. Lexical expression is highly fused. In other words, lexical expression is characterized by the expression of both meaning and form with one morpheme. Some categories of aspect are more commonly expressed inflectionally, while others are more commonly expressed derivationally. The aspectual meanings that are expressed in ASL derivationally and/or lexically will be described. Imperfective and progressive, both commonly found as inflectional categories in the languages in which they occur will be discussed briefly here to establish the difference between inflectional and derivational aspectual categories.

Comrie (1976) writes that meaning is considered imperfective when an event is viewed from the inside and can be separated into parts or the internal structure of the event may be distinguished, such as the beginning or ending. An imperfective event may also be seen as ongoing without a beginning or an end. When an event is viewed imperfectively, it is viewed as a series of phases from inside the event. In the ASL data for this research, an obligatory, productive marker for an inflectional category of imperfective meaning was not found.

3.1. Repeated Situations

Signed languages are unique in their ability to express meanings with a high degree of iconic representation. The data for this research provides many examples of the iconic relationships between aspectual expression and the real-world event that it represents. Bybee (1985) writes that "reduplication is more common among derivational processes than among inflectional". Bybee et al. (1994) predict that the earlier, more complete forms of a reduplicated stem are maximally iconic in that the repetition of the verb signals repetition of the action described by the verb. In their sample, they found that the meanings most commonly expressed with total reduplication are the closely related senses of iterative, frequentative, and continuative. They believe that evidence is strong indicating that iterative is the original meaning associated with full reduplication. They found that the differences between iterative and continuative have to do with the types of verbs with which they may occur. The iterative applies best to punctual or telic verbs while the continuative best applies to both telic and atelic predicates. The iterative may generalize to continuative by expanding to atelic verbs.

Frequentative implies occurrence on different occasions, again seeming to generalize from iterative meaning that occurs on one occasion. No examples of frequentative were found in this data. Habitual and progressive are more general still, and Bybee et al. (1994) suggest that habitual develops from frequentative while progressive develops from continuative.

Since the meanings of iterative, frequentative, and continuative tend to be closely related to the stem that is reduplicated, these meanings are more likely to be expressed as derivational morphology. Further, semantic restrictions (i.e., the uses of each aspectual meaning with specific verb types) are more characteristic of derivational morphology. As will be seen below, the semantic specificity and semantic restrictions characteristic of derivational morphology appear in the aspectual expression in ASL.

Iterative expresses the repetition of an event occurring during a single occasion and is particularly relevant to telic verb forms. The iterative refers to a situation that is repeated (e.g., 'a series of coughs') on a particular occasion and may also carry continuative meaning, as in to 'keep on doing'. In this data set, iterative was used with telic verb forms, the vast majority of which were activities with one example of a semelfactive verb. Both activities and semelfactives are telic verb types. Several examples of iterative appear in the two narratives procedures used in this research, "The Frog Stories" and "The Pear Stories".[2] Reduplication was the only way that the iterative meaning was expressed in the narrative data for this research.

The reduplicated forms of the verbs with iterative meaning fit more appropriately into a derivational process than an inflectional one. Rather than having a constant, obligatory, and productive phonological shape, each reduplicated stem has a different movement allomorph with which the reduplication occurs. The iterative tends to be produced with a straight movement and then an arc movement down and back. However, this movement varied depending on the sign. For example, when language consultants signed picking pears, the movement was more circular. When they signed LICK, the repetition that expressed iterative was the repetition of the index and middle finger. The movements of the entire hand expressed distributive meaning (i.e., while the index and middle finger were repeating the movement meaning 'lick', the hand was moving to various places on the arm or chest indicating that those areas were being licked).

In this data, the total number of repetitions for both adjacent and non-adjacent reduplicated forms ranged from 1-19. The reduplicated forms that were adjacent had repetitions that ranged from 1-6. In every example of iterative aspectual expression on a verb that was reduplicated more than once by an individual signer or among more than one signer, the number of repetitions is unpredictable, a characteristic of derivational morphology. Although idiosyncrasies and unpredictable forms are often considered characteristic of grammaticization, the reduplication used to express iterative meaning in ASL only occurred on activity verbs.

[2] The narratives require use of the iterative and continuative, but not habitual and frequentative.

This semantic restriction is indicative of non-inflectional morphology. The meanings of the forms used to express iterative are close to the original source meanings, representing repetition of the original event, and the meanings have not generalized semantically. Instead, the meanings are quite specific with the repetition of the original source simply indicating that the action being represented is repeated on that occasion.

The meaning of habitual is that a situation is characteristic of a period of time. Narrative discourse usually refers to an event that occurred before reference time and within a well-defined temporal frame. Habitual was not readily elicited with the two narrative texts. No examples of habitual occurred in the two narrative discourse sets. However, examples of habitual meaning did arise in the Dahl (1985) questionnaire.

In every instance of habitual, an aspectual verb (e.g., TEND) and/or a noun (e.g., HABIT) and/or an adverbial sign (e.g., NOW-AND-THEN) were used. In the questionnaire data, the most consistent item that occurred in habitual contexts was the verb, TEND. This data indicates that if a language consultant chooses to use reduplication, then another form (e.g., a verb or a noun) must be used to express habitual meaning. ASL users have options in how to express habitual meaning. There is no obligatory, grammaticized form of habitual in ASL. If reduplication is used when habitual is the intended meaning, something in addition to the reduplicated form of the verb must occur to distinguish habitual meaning from iterative or continuative. The verbs that were reduplicated had 1-6 repetitions and the number of repetitions is not predictable.

3.2. Ongoing situations

The continuative expresses that a dynamic situation is ongoing and that the agent of the action is deliberately keeping the action ongoing. The progressive is more generalized than continuative and occurs more frequently as inflectional morphology in the languages in which it occurs. No progressive marker was found in the data for this study. If there were an obligatory progressive marker in ASL, it would have shown up in the data when the progressive was being elicited.

The examples of continuative are from the two narratives. Like other aspectual expression in ASL, signers have options for how to express the continuative meaning. Continuative expression in the ASL data for this research included reduplicated forms, lexical items, a nonmanual marker, and the representation of two events co-occurring on two separate articulators.

When reduplication was used to express the continuative, some other marker was used to distinguish it from iterative. With continuative meaning, the movement was sometimes circular, while the iterative was sometimes produced with a straight movement and then an arc movement down and back. When the continuative is produced with the arc movement, it may be distinguished from iterative by using a nonmanual marker that is formed by putting the mouth in an ‘mm’ position. When this nonmanual marker was used, the continuative could be differentiated from iterative meaning. A third way that continuative meaning

could be distinguished from iterative was by the use of a lexical item, such as MORE or CONTINUE.

Berman and Slobin (1994) note that simultaneity can signal that two events are ongoing or co-occurring. Signed languages are unique in that different things may be expressed simultaneously on different hands. Thus, another way to express that two activities are co-occurring is by signing two activities happening on separate hands at the same time. For example, when the boy was bicycling away from the tree and then a girl started bicycling toward him, all of the language consultants represented a vehicle classifier, CL: $3_{vehicle}$, on separate hands, the vehicles coming toward each other, in front of the signer, and then passing each other at the midpoint. This represents two events co-occurring simultaneously. The second language consultant signed the following example:

(1) _____mm_____
LOOK-AT (1-hand to 2-hands)+++++ 'hands-on-chin.'
[frog in jar] [dog and boy]
'The boy and his dog are watching the frog for awhile.'

This is an interesting example, because several means for expressing continuative meaning were utilized within the same construction. First, the language consultant used two articulators simultaneously to represent the boy and the dog continuing to look at the frog. Second, the sign LOOK-AT was reduplicated with iterative movement accompanied by the nonmanual signal, 'mm'. Finally, she put her hands on her chin to show that the boy was still watching the frog. This is the unique feature of iconicity in ASL that affords the signer an opportunity to act out the action portrayed in the stories they tell. These constructions express continuative meaning; while one event is taking place, another event is happening simultaneously.

4. Perfective, anterior/perfect, and related senses

Perfective senses are used to represent the situation as bounded, often emphasizing the beginning or ending of an event. In the data for this study, completive, anterior, resultative, and inceptive meanings were expressed. Perfective is used for narrating sequences of discrete events, so, if there were an obligatory perfective marker, the narrative data for this research should have elicited it. In the narrative data, there were no examples of the perfective form. Further, four items in the Dahl (1985) questionnaire were used to elicit perfective meaning and no examples of perfective forms were expressed in response to these items.

Bybee et al. (1994:57) write that the completive means 'to do something thoroughly and to completion' (e.g., 'to eat up' and 'to shoot someone dead'). Completives tend to have other uses, as well. First, the object of the action may be totally affected, consumed, or destroyed by the action (as in 'eat up'). Second, the action may involve a plural subject of intransitive verbs or objects of transitive verbs, especially exhaustive or universal plural, such as 'everyone died' or 'he

took all the stones'. Third, the action may be reported with some emphasis or surprise value. The emphatic value was especially mentioned in connection with the use of a completive in imperative sentence types. There is also a certain emphasis inherent in the notion of having brought an action to a thorough conclusion.

Completives differ from resultatives in that the completives all come from dynamic verbs or directionals, all suggesting action or movement. Resultatives, on the other hand, derive from stative verbs. The mode of expression for completives tends to be periphrastic and derivational. They tend to be rich in lexical meaning and have lexical restrictions, or they are not used frequently enough to have become inflectional. Those completives that are believed to have 'finish' as the lexical source, may develop into anteriors.

In the data for this research, the completive meaning was primarily expressed through the use of verb types that have the inherent lexical meaning of completion. The examples were accomplishment verbs that are telic in nature and are comprised of a process and a change of state. The lexicalized signs that were found with the inherent sense of completion were in the narratives.

In the Frog Stories, the signs DISAPPEAR, VANISH, and ESCAPE have inherent completive meaning. All of these verbs are accomplishment verb types. Each begins with some entity present and ends with the disappearance of the entity. In example (2) below, from the Frog Stories, the boy and the dog have awakened to find that the frog, who was there in the jar the night before, has completely disappeared. This sentence was expressed with surprise. As mentioned above, Bybee et al. (1994) found that the completive tends to have meanings attached to it, such as the action being reported with some emphasis or surprise. In example (2), VANISH has been used in just this way.

(2) BOY, #DOG WAKE-UP LOOK (at jar) VANISH (2 handed)!
'The boy and the dog wake up and look at the jar; the frog has vanished!'

In the Pear Stories, GONE was used by three of the language consultants. It appeared in sentence-final position each time it was used. The third and fourth language consultants used the sign GONE when describing how the boy got back up on his bicycle after stopping and picking up the basket of pears, then rode off and disappeared. The third language consultant used GONE again when the boy is hobbling away after he fell off of his bicycle. The first language consultant used GONE at the very end of the story, the very last sign in his narrative, when the three people walked out of the scene and were gone, as in example (3):

(3) CL: 3 ("three people walking away") GONE.
'The three people walked away and were gone.'

BE.FINISHED was used as a main verb six times in the narrative data to express completive meaning. The second language consultant used this verb to

conclude an episode in the Pear Story and the fourth language consultant used this verb in the same way once in the Frog Story. The third and fourth language consultants used BE.FINISHED at the end of the Pear Story. The fourth language consultant stopped, looked directly at the camera and signed "FINISH". This was a complete clause meaning that the narrative had ended; perhaps, something like 'The End'. The first and fourth language consultants used BE.FINISHED at the end of the Frog Story. The first language consultant signed, "FINISH. (Pause) BOY HAPPY. GO HOME". The fourth language consultant signed a number of things that indicated that the story had ended, as can be seen in (4) below:

(4) FINISH. T-H-E E-N-D. LINES-MOVE-UP-SCREEN.
CURTAIN-CLOSE. LIGHTS-OFF.
'Finished. The end. The credits move up the screen. The curtains close. The house lights go dark.'

FINISH in this context, means that the story is completely done.

The definition of anterior is 'a past action with current relevance'. The goal of the utterance is not to locate a situation at some definite point in the past, but only to offer it as relevant to the current situation.

Bybee et al. (1994:62) write that anterior (what Dahl refers to as 'perfect') is frequent in conversational discourse. They also report that Givón found that anterior is expressed in narrative discourse where it is used for events that are out of sequence, that is, events that occurred earlier but are relevant to the events located in the discourse "now". The language consultants for this research did not express this meaning in the two stories they narrated. However, in the Pear Stories, the second language consultant did use FINISH pre-verbally once. The sign had the sense of completion and the current relevance is clear from the context, as can be seen in example (5) below:

(5) PUT ("in apron") +++++++ (alternating hands). FINISH FILL.
CLIMB-DOWN L-A-D-D-E-R INDEX-down.
'He put [lots of pears] in his apron. When he finished filling his apron pocket [with pears], he climbed down the ladder.'

Janzen (1995) explains that when FINISH is used to express anterior meaning, it is auxiliary to the verb directly following it, rather than acting as a main verb. He labels FINISH with anterior meaning as FINISH.AUX$_{(ant)}$. He writes that FINISH.AUX$_{(ant)}$ has become semantically more general, no longer meaning 'to complete something', and has the added sense of current relevance. FINISH with the anterior reading is produced with a single movement, rather than the hold-movement-hold of FINISH in the main verb form. The synchronic data for this research provides some support for Janzen's (1995) claim that FINISH is grammaticizing along the same path that other anteriors with similar sources in spoken languages are grammaticizing.

There are several examples of anterior meaning and form in the responses to the Dahl (1985) questionnaire. Due to the nature of these questionnaire items, most of the responses were short constructions with little context. Definitively determining whether the meanings expressed in the responses to these items are anterior and not completive or perfective is difficult and requires further research. When FINISH.AUX$_{(ant)}$ was used to transcribe the form used by the language consultants, the form closely resembled the characteristics Janzen (1995) attributed to the auxiliary in his study, including occurrence before the main verb, semantic generalization, and current relevance.

In response to the Dahl (1985) questionnaire, there were 28 opportunities for the anterior form of FINISH described by Janzen (1995) to occur. FINISH.AUX$_{(ant)}$ was used 18 times before the main verb in the sentence and consisted of a movement rather than the hold-movement-hold of the main verb, FINISH. If FINISH.AUX$_{(ant)}$ had grammaticized and become inflectional in ASL, it should have occurred every time the anterior meaning was elicited. The fact that it did occur so frequently does support the premise that grammaticization is taking place.

Bybee et al. (1994) write that the resultative denotes a state that was brought about by some action in the past and persists at reference time (i.e. 'He is gone' or 'The door is closed'). Resultatives differ from anteriors in that the resultative indicates that a state persists at reference time, while an anterior indicates that a past action is relevant to the time of speech. Like passive constructions, resultative constructions are usually comprised of the patient as the subject of the clause, with no agent present. Unlike passive constructions, a resultative is only compatible with a predicate that indicates a change of state. Resultatives are used with telic verbs that have an inherent endpoint. Several examples of resultative meaning occurred in the narrative data. The verb that was used to express resultative meaning was MISSING.

In the Pear Stories, MISSING was used by the first and third language consultants to express resultative meaning in regard to a basket of pears being gone, as in example (6), which comes from the third language consultant:

(6) MAN PICK++++ CLIMB-DOWN-LADDER. REACHES -INTO-APRON-POCKET. CONFUSED. PRO.3 (left) PRO.3 (center) MISSING. ONE B-A-S-K-E-T MISSING. (mouths 'gone')
'The man picking pears climbs down the ladder. He reaches into his apron to begin putting them into a basket, when he notices that something is wrong. He counts his baskets and finds that one is missing. One basket is gone.'

In this example, the third language consultant expresses the meaning that something happened before the time of reference and is still in effect at reference time. The basket of pears is gone. Furthermore, as Bybee et al. (1994:54) write, the patient is the subject of the clause and there is no agent present. The meaning of

the sign, MISSING, includes the idea of a change of state: something was there, but now it is gone.

The cross-linguistic definition of inceptive provided by Bybee et al. (1994: 318) is that 'the action or event begins'. The only example of inceptive expression in the data for this research was in the Pear Stories. The Dahl (1985) questionnaire does not elicit inceptive meaning. In the Pear Story example, the boy began to pick up a single pear, but then stopped himself and picked up an entire basket. The third language consultant produced the following example.

(7) CL:1 ('boy standing') LOOK-UP-LOOK DOWN REACH-FOR headshake ('boy begins to grab one pear, but stops') REACH-FOR (2-handed) PICK-UP (2-handed) WHOLE B-A-S-K-E-T PICK-UP (2-handed).
'The boy looks up at the man, then down at the pears, begins to grab a single pear, but quickly changes his mind and picks up the entire basket.'

In the production of the sign REACH-FOR, the third language consultant produced the sign with the original features of the citation form and a straight movement. She subtly dropped her jaw and shook her head while holding the sign REACH-FOR, immediately followed by reaching with both hands to pick-up the whole basket of pears.

5. Conclusion

Researchers have long been claiming that ASL's categories of aspect, agreement, and classification are inflectional. A thorough investigation of ASL aspect was needed and, because of its relevance to the verb, was a logical means of addressing the questions regarding inflectional and derivational morphology.

There is no evidence that aspectual categories in ASL are inflectional. There are no obligatory markers to express aspectual meaning and productivity is restricted to specific verb types (e.g., iterative reduplication only occurs with telic verbs). ASL users have a number of derivational and lexical options in the expression of aspectual meaning, including aspectual verbs and nouns, adverbial signs and phrases, verb reduplication, movement modifications, non-manual markers, and combinations of the above.

Bybee (1985) writes that aspect is the most relevant meaning category to the verb, followed by tense, mood, and person/number agreement. Person/number agreement has the least influence on the verb, and is therefore the least relevant to the verb. This implies that if a language has person/number agreement on the verb, then the language would also have tense or mood and aspect marked inflectionally on the verb. I have shown that ASL does not have an inflectional category of aspect. Thus, it is unlikely that it would have inflectional categories of agreement, mood, and tense.

Attempts have been made to fit linguistic phenomena that we are finding in ASL, such as aspect and agreement, into discrete categories of derivational or

inflectional morphology without fully understanding what it means to be derivational or inflectional. Liddell (2003:52) argues that directing verbs in space has nothing to do with agreement and is not inflectional. He writes that if he is correct, then the strongest candidate for an inflectional process is not inflectional. He asks if there are any true inflectional processes in ASL grammar. This question needs to be investigated further. Other morphological categories in ASL, especially verbal categories (e.g., aspect and agreement), that have been identified as inflectional are likely expressed lexically and derivationally. The morphological categories identified as inflectional categories thus far in ASL need to be re-evaluated in light of the typological-functional research done on similar categories in the world's languages.

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Elisa M. Maroney
ASL/English Interpretation Program
Regional Resource Center on Deafness
Western Oregon University
Monmouth, OR 97361
503-838-8735

maronee@wou.edu

Investigating the "Hidden" Structure of Phonological Systems*

EGIDIO MARSICO[#], IAN MADDIESON[+], CHRISTOPHE COUPÉ[#], FRANÇOIS PELLEGRINO[#]
[#]*Laboratoire Dynamique Du Langage, UMR 5596 CNRS – Université Lumière Lyon 2*
[+]*Department of Linguistics, University of California, Berkeley*

0. Introduction

Observed phonological systems are only a very small subset of what is theoretically conceivable considering the possibility of the human vocal tract. In other words, given the number of possible phonetic features (corresponding to the vocal tract generative capacity), the number of attested segments is incredibly lower than what is combinatorially possible. The same observation is valid when comparing the number of attested systems with the set of theoretical ones predicted from the attested number of segments.

Obviously, it cannot be doubted that phonological systems are not just unorganized sets of segments picked up at random and, consequently, phonological theories and typological studies have focused on showing that these systems are structured according to various constraints from the perceptual, articulatory, or cognitive levels (Troubetzkoy 1929, Sedlak 1969, Crothers 1978, Maddieson 1984).

Yet the task of identifying these constraints and the way they interact is still relevant today, even if numerous works have investigated some of them, especially in the case of vocalic systems (Liljencrants and Lindblom 1972, Lindblom 1986, Stevens 1989, Vallée 1994). However, the constraints affecting consonantal systems have been only partially investigated and our comprehension is still limited (Lindblom and Maddieson 1988, Vallée et al. 2002). Lindblom and Maddieson sketch out—in one of the first attempts to study consonantal systems—the basis of an "all-inclusive universal phonetic space" (hereunder UPS) which can be considered as the first study of phonological systems as a whole.

* This research is supported by the French Ministère de la recherche: ACI "Systèmes complexes en SHS", 2003.

UPSID (UCLA Phonological Segment Inventory Database; Maddieson 1984, Maddieson and Precoda 1990) provides a powerful tool to observe the attested systems in the languages of the world. Moreover, considering the whole set of features or segments found in the database gives a way to approximate the UPS. Our main hypothesis is that whatever the level of the constraints is (articulatory, perceptual, etc.), we can take advantage of this twofold information (attested systems and possible systems) to reveal their effects on the structure of the phonological systems.[1] Consequently, we propose to explore the UPSID database in an unbiased perspective leaving aside *a priori* considerations about perceptual or articulatory levels.

Three main questions are addressed in this paper:

- Will this "data mining" approach reveal information about the structure of phonological systems?
- Will the nature of the features used influence these results?
- Do phonological systems exhibit properties compatible with the complex adaptive system paradigm?

The first question is obviously the core target of this research, and is the focus of the next sections. The second question deals with the identification of possible methodological bias due to the nature of the data. The third question is a way to address the relations existing between the constituents of the systems (features and segments) and the systems themselves. The theoretical framework and our goals are further developed in section 1. We have developed a set of descriptive indices and structural parameters that are defined in section 2. Results and interpretations are also given in section 2, while the specific question of the influence of the feature description on the indices is addressed in section 3.

1. Framework and Aims

1.1. Universal Phonetic Space and Phonological Inventories

For a long time, vowel and consonant systems have been studied apart due to their different role and nature. However, it is likely that the structural constraints affecting both systems are not totally independent. For this reason, studying phonological systems as a whole may be informative. This point of view adopts the notion of the UPS introduced by Lindblom and Maddieson.

This systemic perspective is subsumed under the general "size principle" first defined by Maddieson (1984). According to him, the content of a particular phonological system is a function of its number of segments. This principle also specifies that the constraints at work belong to two main classes, one of articulatory ease and one of perceptual salience. In this sense, phonological systems are trade-offs between the "ease of articulation" which tends to generate

[1] We are aware that considering only the phonological inventories is a serious limitation for any kind of conclusion; nevertheless, the structure of UPSID does not provide material to investigate dynamic and phonotactic constraints.

similar segments (articulatory economy) and "perceptual salience" which (ideally) requires very different ones (maximum or sufficient acoustic distance).

From a typological point of view, it seems that small phonological systems recruit few dimensions (height, frontness, and rounding for vowels; place, manner, and voicing for consonants) since perceptual salience is guaranteed by the low density of segments in the theoretical space defined by these dimensions. On the contrary, when the size of the systems gets larger the need for perceptual contrast seems to imply new (secondary) dimensions (see Vallée et al. 2002). Consequently, and following Lindblom and Maddieson, the dimensions structuring phonological systems are not invariant in number as well as in quality. Nevertheless, even if the number of dimensions is related to the number of segments, some dimensions seem to be more elementary. Thus each language considers *some* other dimensions of the UPS and one can ask (i) which dimensions are recruited (among all the potential dimensions) and (ii) how segments spread along these dimensions.

Our approach rests on this hypothesis of variable phonetic space. We depart from classical typological studies on two main points: (i) by not considering patterns' frequency of distribution and (ii) by trying to unify consonantal and vocalic levels.

Regarding (i), instead of building classes of types and studying their frequency of distribution in the world's languages, we decided not to consider these frequencies and to examine the structure of the set of "possible phonological elements" obtained from the UPSID database. This relies on the hypothesis that by analyzing the set of possible phonological elements provided by the UPSID database (100 features, 833 segments, 451 languages) it is possible to reveal the "hidden" structure of phonological systems or, at least, to identify part of the main constraints responsible for their shape.

Regarding (ii), our approach aims at studying the whole phonological system even if there are some pitfalls due to the distinction between vowel and consonant in the feature-based description (for example, a single articulatory phenomenon may be covered by two different terms: e.g., "nasals" for consonants and "nasalized" for vowels). This issue is partly addressed in section 4.

1.2. Aims

As pointed out previously, our main hypothesis is that exploring the UPSID database in an unbiased perspective may reveal how the constraints, whatever they are, influence the phonological systems.

We can now develop in more detail the three questions introduced above.

The first point may be split into several questions about the correlations and relations between the size of the systems and the nature of their components (number of features and number of segments, relations between the segments, etc.). We also try to answer to the classical question about the complexity of the segments (what is a simple or complex segment, which segments are simple, etc.)

without falling in the trap of the frequency/simplicity circularity (or the markedness issue).

The second question deals with the identification of possible methodological bias due to the nature of the data. This methodological aspect is actually crucial since it can severely affect the results. However, it is not simple to handle. From the standard feature set used for the UPSID database, we propose to test the effect of a reduction (resp. expansion) of the number of features to describe the languages of the database. The goal is therefore to estimate the impact of these changes on the relations that arise from our analysis.

Complex Adaptive Systems (CAS) are common in many natural phenomena. Phonological systems may exhibit several characteristics of such a theoretical description: the structure of the systems is not linearly deducible from the constituents and the term "emergent" may be suitable to define several global characteristics of the systems. The CAS paradigm is consequently a way to address the question of the relations existing between the constituents of the systems. In addition, it provides a convenient framework to deal with the notion of inner complexity of a system and to avoid the difficulties encountered when comparing the complexity between different systems (an attempt to perform this kind of comparison is detailed in Marsico et al. 2002).

1.3. Diachronic and Synchronic Constraints

Phonological systems are constrained at different levels by different forces. Some are manifested at the level of features, and they are likely to be mostly articulatory since they are the results of the way speech sounds are produced; they organize the features at least in groups and probably in a certain hierarchy. Some others are systemic and maybe mostly perceptual, e.g., for the sake of contrast, segments are not randomly recruited. Additionally, the synchronic state of a phonological system is always a function of its history, thus it is necessary that diachronic considerations be part of the explanation.

This covers the traditional distinction between internal and external forces (Labov 1994, 2001). Internal forces ensure the efficiency of a system, given its size, and in that view several systems of different or same sizes are equally efficient. External forces (social factors, language acquisition) may temporarily modify the state of a system, such that the changes are oriented but not highly constrained and they lead to the appearance of new—possibly non-optimal—systems.

Finally, and following Greenberg (1978), the frequency of distribution of any type of phonological system is a function of the probability of entering into that given state and of the probability of staying in that state ("transitional and rest probabilities") (Greenberg 1978:75). For this reason and because the inventories only provide one "time slice" sample from the system's diachronic trajectory, we consider that the frequencies of distribution of types must be the end point (validation) of our approach, not the starting point, since the past trajectory of a given language is unknown. In this view, frequencies of distribution are emergent

properties, resulting from complex interactions at different levels. High frequencies are not more important than low ones, because the model must explain not only why certain types are preferred but also why there are so many co-existing different types.

The result of this is that the frequency of distribution of a particular type should be a function of (i) its responsiveness to synchronic constraints and (ii) its positioning at the crossroads (or not) of evolutionary trajectories. In addition, the impact of the capacity of adaptation of a system (number of possible extensions) will also be addressed; some kinds of systems may indeed be considered as dead-ends or evolutionary sinks from which the evolution would be highly costly and consequently very unlikely.

2. Descriptive Indices, Structural Parameters, and Initial Results

2.1. UPSID Database

The raw data we use are taken from UPSID. This database was purposely compiled for typological studies, thus the sample of 451 languages is representative of both genetic and geographic diversity of the world's languages. These 451 phonological systems are composed of 833 different segments, which in turn are described with 100 different phonetic features. These three levels (features, segments, and systems) represent what we call the "set of possible phonological elements." Again, considering that the frequency of distribution of these elements is a consequence of their "hidden structure," all the elements at any level have the same weight with no regard to their frequency of distribution in the world's languages. We thus defined several indices in order to capture the hierarchical ties between features and between segments. They will be presented hereunder along with the associated results.

2.2. Basicness

This index is elaborated first at the feature level. It represents the quantification of the fact that some features are more necessary than others to the definition of segments. In the literature, we find for example the opposition between primary and secondary features (more often dimensions) and the same idea is found in Lindblom and Maddieson (1988), with the scale of simple, complex, and elaborated consonants that can easily be projected at the feature level.

The basicness of a feature is a function of its ability to belong to the set of features that can minimally define a segment. In other words, a feature is "basic" if, when removed from the definition of a segment, the remaining set of features does not define another existing segment (searched in the 833 ones of the database). For example in (1), if we remove the feature "front," {high unrounded} does not correspond to any segment, thus "front" is basic. Whereas in (2), if we drop "long" we still have a valid definition of an existing vowel.

(1) i {high front unrounded}
(2) i: {long high front unrounded}

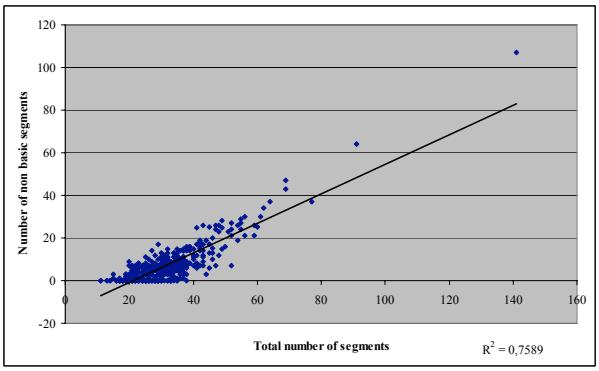
Therefore, "front" has a basicness of 0 while "long" has a basicness of 1. For most of the features, their basicness is consistent among the segments. However, and especially with segments described by many features, removing one feature may result in an unattested segment, even if it may theoretically be produced. To handle these features, the basicness value is normalized by dividing it by the number of segments in which the feature appears. Basicness consequently ranges from 0 (true basic features) to 1 (features that are never basic) with intermediate values (features that are essential to the definition of some of the segments in which they occur).

For instance, the feature "palatalized," which is a secondary articulation, would intuitively be classified as a pure non-basic feature with a value of 1. However, its value is not exactly 1 because of the {*palatalized* voiceless alveolar flap}. The fact that no language in UPSID has a "voiceless alveolar flap" makes "palatalized" a partially basic feature. Obviously, even if our index is gradual, it seems more interesting to distinguish between basic segments (0 or almost 0 in basicness) and non-basic ones (1 or almost 1).

The notion of basicness may be intuitively extended to segments and systems: a basic segment would be a segment described by basic features, and a basic system will consist of basic segments or basic features. However, these consolidated indices may be based on two measures whether the basicness of the constituents of the segment (resp. of the system) are summed or averaged. Correlation coefficients (R^2) between all these measures range from 0.53 to 0.95.

Many analyses may be driven studying the basicness at the three levels (features, segments, and systems). An example is provided in (3). It shows the way the number of non-basic segments is correlated to the total number of segments in UPSID's 451 languages ($R^2 = 0.76$). Moreover, this relation seems to be linear even for very complex systems (as for !Xu).

(3) Number of non-basic segments as a function of the total number of segments for each phonological system from UPSID



Basic segments are very common (37.8%). Furthermore, a large amount of the 833 segments are derived from basic segments by adding one feature (46.8%).

Finally, more complex segments are pretty uncommon in the inventory of segments (15.4%).

2.3. Derivationality

The index of basicness applied at the level of segments distinguishes two classes of segments: basic vs. non-basic segments. All non-basic segments are a combination of a basic one plus one or several additional features; they are by definition more complex than basic segments. Derivationality measures the capacity of a basic segment to be the core of non-basic ones by calculating how many existing segments are derived from it by addition of features. For example, a basic segment for which no attested segment is derived has a derivationality of 0.

Though derivationality is defined at the segment level, it may be relevant at the system level since the underlying hypothesis is that the non-uniform distribution of segments described by a similar number of features may be due to the fact that the ones with a high derivation capacity may give better adaptive power to the systems (see section 2.5).

(4) displays the five most derivational vowels of UPSID. For example, /a/ may be modified to generate 12 other vowels. It happens that these five vowels are the most frequent in the world's languages.

(4) Most derivational **vowels** with their description, derivationality, and frequency of distribution in the UPSID languages

Segment name	Derivationality	Frequency (in languages)
/a/ voiced low central unrounded	12	86.9%
/i/ voiced high front unrounded	11	87.1%
/o/ voiced higher-mid back rounded	11	68.7%
/u/ voiced high back rounded	9	81.8%
/e/ voiced higher-mid front unrounded	9	64.5%

(5) provides the same information for consonants (see next page). The most derivational segment is /k/ and it is also the most common segment. However, the list shows that very rare segments may also present a high derivational power (e.g., /qχ/).

2.4. Redundancy

It has long been argued convincingly that phonological systems tend to do a "maximum use of available features" (see among others Ohala 1980, Clements 2003a, b). A consequence of this hypothesis is that a system would be structured to minimize the descriptive distance between two "neighbor" segments, in terms of number of contrasts.

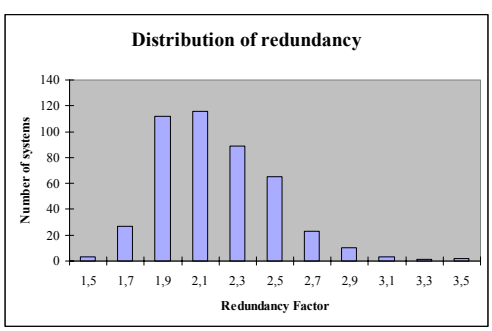
(5) Most derivational **consonants** with their description, derivationality, and frequency of distribution in the UPSID languages

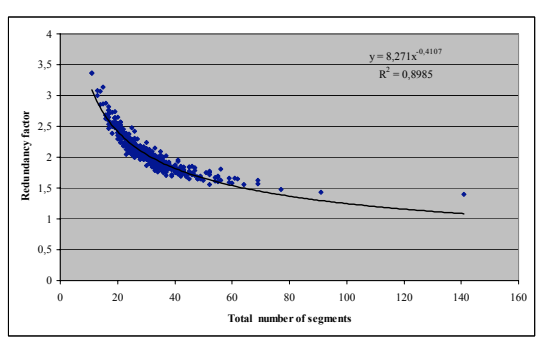
Segment name	Derivationality	Frequency (in languages)
/k/ voiceless velar stop	17	89.4%
/tʃ/ voiceless postalveolar sibilant-affricate	14	41.7%
/t/ voiceless alveolar stop	13	73.8%
/q/ voiceless uvular stop	13	11.5%
/p/ voiceless bilabial stop	11	83.1%
/ts/ voiceless alveolar sibilant-affricate	11	23.7%
/qχ/ voiceless uvular non-sibilant-affricate	10	0.9%
/b/ voiced bilabial stop	9	63.6%
/d/ voiced alveolar stop	9	46.8%
/s/ voiceless alveolar sibilant-fricative	9	73.4%

To test this hypothesis, we computed the redundancy factor in order to catch the way systems make use of features for contrasts. This index is calculated by averaging over the system the distances between each segment and its nearest neighbor. In this definition, a highly redundant system is therefore one where oppositions between segments can be expressed by more than one feature. On the other hand, a system where pairs of neighbor segments consist only of "minimal pairs" will have a redundancy of 1.

The mean redundancy factor among UPSID is 2.1 (the distribution is displayed in (6-Left)). It means that systems are far from minimizing the number of features for a given size and that two neighbor segments tend to differ by two features, allowing speakers and listeners to develop individual strategies and providing degrees of freedom that may be important in language evolution terms. (6-Right) shows the relation and very high correlation ($R^2 = 0.90$) between the redundancy and the size of the system. This curve asymptotically tends to 1 (no redundancy) in a non-linear way, but for most systems, redundancy is greater than 1.5.

(6) Left: Distribution of redundancy within UPSID. Right: Redundancy as a function of the number of segments of the systems.





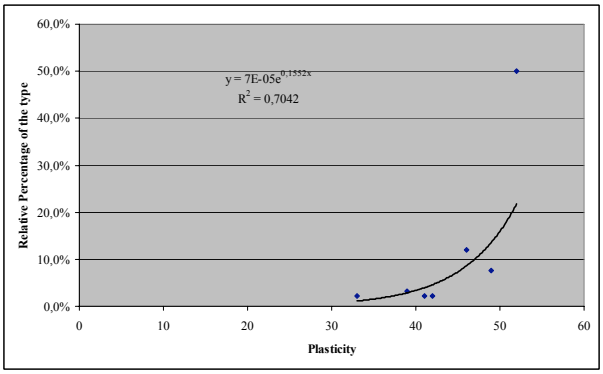
2.5. Plasticity

The index of plasticity is to some extent equivalent to derivationality at the system level. Nevertheless, it is hypothetical: whereas derivationality gives the *actual* number of attested non-basic segments derivable from a particular basic one, the plasticity index gives the *putative* adaptive power of a system. This index can be viewed as a diachronic one; it has been conceived to test the idea that preferred systems are systems that can easily respond to external forces of change. One way of doing so is to be able to recruit new phonemes at low articulatory cost, i.e., by using modified existing basic segments instead of new basic ones. Of course, beside the addition of segments, the loss of segments is also frequent. In each case (acquisition or loss), what counts may be that minimal perturbation is brought to the system, and one way to achieve that is by not modifying the core of a system, i.e., the set of basic elements. Thus the more derivational segments a system may have, the better its adaptive capacity.

The value of the plasticity index of a system is the sum of the derivationality of its segments minus the number of segments. Since several non-basic segments may result in the same derived segment, redundancies are discarded.

Plasticity may play an important role in the selection of segments by providing a low-cost way to recruit new segments in the evolutionary process. However, comparing plasticities is complex as soon as systems with different sizes are concerned. For this reason, (7) only displays an example for the five-vowel systems. Only systems shared by at least two languages are considered. The frequency of distribution of each type is plotted against the plasticity of the system. A rather high correlation is reached ($R^2 = 0.7$), but this result must be considered with caution because of the low number of types.

(7) Example with five-vowel systems: relative percentage of each type × Plasticity of each type. $R^2 = 0.7$



3. Testing the Set of Features

Since Jakobson, Fant, and Halle (1952), several grids of distinctive features have been proposed in phonological theories, e.g., Chomsky and Halle (1968). Beside the question of the nature of features (monovalent, binary, or scalar), choosing the correct

set is bound up with the question of what are the best cues engaged in phonological contrasts. This question arises again here in some slightly different terms: what is the impact of the set of features used on the values of our systemic indices? Our assumption is that as the set of available features conflates articulatory, acoustic, aerodynamic, and perceptual properties of segments, even if our analysis is feature-dependent, a change in the set of features should lead to comparable results. To test this assumption, we compare the results for three sets of features: standard (100 features), reduced (55), and expanded (159), detailed below.

3.1. Standard Set of Features

The standard set consists of 100 features and is not far from the features extracted from the IPA chart. There are only a few differences between the traditional way of describing segments and ours. The treatment of consonants is almost the same, place, manner, and laryngeal settings being the primary features, except that we distinguish between "sibilant-fricative" vs. "non-sibilant-fricative" and between "sibilant-affricate" vs. "non-sibilant-affricate." The main differences concern vowels and diphthongs. For the vowel description we add the feature "voiced" in order to be congruent with consonants. Regarding diphthongs, we describe them as being doubly articulated vowels (in a similar way to consonants, e.g., labial-velar stops, /kp/ and /gb/). For instance the diphthong /iu/ is described as "voiced high front-back rounding" and /oi/ as "voiced higher-mid-high back-front unrounding."

3.2. Reduced and Expanded Sets of Features

The reduced set of features was defined by splitting double features (like labial-velar, lateral-approximant, etc.) into two single ones. The same feature "nasal" is also used for both vowels and consonants, the plain nasals being characterized by the feature "stop." We thus have, for example, /m/ {voiced bilabial nasal stop}. This set amounts to 55 features.

The expanded set is based on the opposite attitude, i.e., joining any co-occurring features dealing with the same articulatory dimension (place, manner, laryngeal settings, etc.). For example, "velar labialized," "prenasalized sibilant-fricative," and "voiced ejective" each became one single feature. This set amounts to 159 features.

3.3. Comparison of the Three Sets of Features

(8) gives the correlations between the redundancy computed with each set (R^2 values from 0.97 to 0.99), indicating that the index is almost invariant to a change of feature set.

(8) Table of correlation of the redundancy factor computed with each set

Redundancy correlation	Reduced set	Standard set	Expanded set
Reduced set	1		
Standard set	0.97	1	
Expanded set	0.97	0.99	1

4. Conclusion and Future Work

We propose in this paper a new approach to the exploration of phonological inventories. Initial results show that the most frequent vowels are those from which the most segments may be derived, while this fact is not as clearly verified for consonants. At the system level, languages are far from maximizing the density or use of the available features (though an asymptotic trend is visible) and the first considerations about plasticity may confirm its role in the frequencies of distribution of each type in the world's languages. Further studies are obviously necessary to assess the relevancy of this approach. Finally, studying the relations between the feature, segment, and system levels may bring significant information and confirm or reject the interest of a Complex Adaptive System approach.

Acknowledgments

We would like to thank René Carré, Björn Lindblom, John Ohala, and Michael Studdert-Kennedy for their helpful comments during the preliminary presentation of this work.

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Egidio Marsico, Christophe Coupé, François Pellegrino
DDL – ISH
14, av. Berthelot
F-69363 LYON Cedex 7
FRANCE

Egidio.Marsico@ish-lyon.cnrs.fr

Ian Maddieson
Department of Linguistics
1203 Dwinelle Hall
University of California at Berkeley
Berkeley, CA 94720-2650
USA

‘We’ll be dead by then!’ – Comical Self-Disclosure by Elderly Japanese Women*

YOSHIKO MATSUMOTO
Stanford University

0. Introduction

While the elderly population in developed nations increases, among the general public, elderly people are still often perceived as separate, with lives that are unrelated to those of more socially dominant age groups, and as uniform, without the range of individual variation found in youth. They tend to be seen as the target of health care, as consumers of social security savings, and as reminders of inevitable and fateful decline. In terms of their language, the decreased ability caused by age and illness has attracted more attention than the content and intention of their speech.

In sociolinguistics in general, the speaker’s age has been an important factor in analyzing the state and conditions of language use. However, despite some notable works in the last decade or so on language and the elderly in English-speaking contexts (e.g. Coupland, Coupland and Giles 1991, Coupland and Nussbaum 1993, Hamilton 1994, Hamilton (ed.) 1999, Williams and Nussbaum 2000) and a few cross-cultural communication study (Giles, Ota and Noels 2002, Ota, Giles and Gallois 2002), the study of discourse and language used by (and to) the elderly is still underdeveloped in comparison to the research achievements on the early years in life. It is conceivable that this inattention is related to the perception that the old age is the terminal point of one’s life after the peak of adulthood, indicating decline from the full competence, linguistically or otherwise. This perception in turn ignores an aspect of old age as the phase that displays the wealth of accumulated personal history and identity of its own.

Among studies on elderly speech, many have been conducted in the context of intergenerational discourse, largely that of first-time acquaintances, such as

* This research was partly supported by a Japan Foundation Research Fellowship. I am the grateful for generosity of the people who recorded their conversations, and for the research access provided by the Life Planning Center in Tokyo. I am indebted to Susan Ervin-Tripp, Toshiko Hamaguchi, Heidi Hamilton, Natsumi Morita, and Keiko Takahashi for discussions and for their encouragements on the topic.

interviews by younger people (with some exceptions such as Hamilton's (1994) longitudinal interaction with an Alzheimer patient, and a peer gossip study by Saunders 1999). Such studies have found that the fact of old age and the associated hardships are foregrounded in the interactions. A frequent observation that characterizes speech of the elderly is "painful self-disclosure" (Coupland, Coupland, and Giles 1991), in which unhappy personal information on one's ill health, immobility, disengagement, or bereavement is revealed, and the elderly often describe themselves in terms of negative stereotypes. Although it is important to investigate the motives and effects of elderly speakers' disclosure of these personal events to first-time acquaintances, it is possible that these negative and old-age focused characterizations of elderly discourse are heavily influenced by the settings of the conversations. Indeed, Coupland, Coupland, and Giles (1991) report more extensive use of "painful self-disclosure" by the elderly in intergenerational first-time acquaintance interviews than in a peer group setting. In a situation where participants do not share much in common – for example, if they did not gather for personal or professional purposes, but in response to the linguistic researcher's solicitation – it is possible that a clear age difference between the various speakers is an obvious and relatively uncontroversial property of the interlocutors that functions as a conversational topic. If the context remains at the level of introductions and small talk among non-intimates, we should not be surprised that the researcher finds the data to center around events stereotypically associated with age.

1. The Present Study

The present study is intended to add a number of other dimensions to the investigation of how elderly people verbally present themselves by drawing more attention to the multiplicity of interpretations that are available in the discourse of the elderly, not just the interpretation from the viewpoint of the analyst or of the young and socially dominant group. First, the data are of peer interactions among friends or relatives, a more naturalistic setting than the more often studied intergenerational conversations among first-time acquaintances. While it is true that intergenerational first-time encounters occasion 'natural' conversations, such a setting presents only one among many other equally, if not more, common settings of verbal interactions. Indeed, the past study of language used by women, for example, was greatly enhanced by the examination of female peer conversations, rather than confining research to mixed-gender situations or interviews. Studies of conversations among peers are likely to reveal different aspects of the verbal interaction of the elderly that are not clearly indicated in intergenerational interviews.

This study also focuses on conversations among elderly women who are in relatively good health. The focus on relatively healthy elderly is not to discount the seriousness of health issues in old age and their influence on communication, but to pay heed to lives of the less noticed and discussed population that in fact represent the experience of many elderly people. The life expectancy of Japanese

women at birth was 84.62 years in the year 2000 (Ministry of Health, Labor and Welfare survey), as compared with 77.64 years for males. Among the Japanese elderly population above age 65, approximately 50% are in the normal health with no need for nursing, and approximately 25% are in good health, making three-quarters of the Japanese elderly population in relatively good health. This suggests that, although there is a tendency to predetermine the elderly population as generally ill, that is not an accurate reflection of reality, and we cannot therefore hope to understand communication of the elderly without expanding the scope of our investigation to the population outside of the stereotyped images.

A third point that emerges from the data examined in this study is the complexity of the motivations underlying "painful self-disclosure" in peer group conversations among the elderly. As we will see in the discussion of the examples, stereotypical labels of elderly talk as 'disengaged', 'egocentric', and 'grumbling' (as pointed out by, e.g. Coupland, Coupland, & Giles 1991) present an inaccurate and unidimensional picture of a complex and multi-faceted expression of self by elderly speakers.

The examination in this paper is based on informal peer conversations of elderly Japanese women (above 65 years of age)[1] who are in relatively good health and who share a common background to various degrees. The occasions were not set up solely for the purpose of this research, but there were other independent purposes, such as gatherings of friends, or volunteer work.

One common feature that is noticeable in the ten 60-90 minute audiotape recordings of interactions that I examined is that the participants laughed often, even during verbal interaction similar to "painful self-disclosure". Laughter during "painful self-disclosure" was not easily predictable from the stereotypical characterization of speech by the elderly. Although the events and situations referred to in such conversations could be considered as painful and negative, the recorded conversations reveal that the stories were told comically and without apparent solicitation of sympathy.

In this paper, I will concentrate on examples of such age-related disclosure that are presented with laughter and humor, and discuss the meaning and effects of such interactions. The presented examples suggest that disclosure of age-related personal matters does not necessarily carry negative import, but can be used to enliven story telling and strengthen solidarity.[2] References to age and decline, rather than being simply stereotypical images of complaint and unhappiness, may be viewed as complex images of awareness, coping, and ability to view the unwelcome situation objectively. It is hoped that the present study indicates the depth and breadth of verbal interaction of older speakers, providing reasons for anti-ageism, and emphasizes the importance of examining naturally-occurring data from a variety of contexts to gain insights into language use and speakers' lives.

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[1] As discussed by Eckert (1984), the biological age is not necessarily an indication of the person's social age reflected in language, but I used 65 years of age for convenience in data collection.

[2] Saunders (1999) also found that gossiping is used for the reasons of solidarity despite the common view of gossip as "lazy small talk".

2. Painful self-disclosure and humor

The examples I consider are from conversational data collected between summer 2001 and early 2003 for a larger interdisciplinary exploration of the interactions of language use, old age and gender, with particular attention to verbal interactions of elderly women in Japan. Peer conversations were recorded either by one of the participants of the conversation or by me. When I recorded conversations, I was mostly not an active participant but was engaged in another activity or conversation. The topics of conversation were various, but included experiences of past trips and plans for the future trips, food, shopping, sports, books, acquaintances' health and death, family members' health condition. As I mentioned earlier, there were many occasions of laughter, which is similar to an observation by Ervin-Tripp and Lampert (1992) of informal conversations among the younger people that they studied.[3]

I will discuss three examples in this paper: (1) a comical description of how the speaker's husband died without making any sound, (2) a twin sister's comment in response to her sister's discussion of expected events 20 years in the future, reminding her that she (or they) would be dead by then, and (3) an account of the speaker's recent forgetfulness.

The first example is from a 90-minute conversation among senior volunteers who belong to a seniors' association affiliated with an organization called the Life Planning Center that promotes elders' awareness in physical and mental health. When I visited the association, four senior volunteers, two female and two male, all aged above 75, were gathered in a room to receive telephone calls from other elders who might like a conversational companion over the phone. The volunteers take turns to perform this service. While they were waiting for phone calls, which were very few, they chatted among themselves.

In this segment of the conversation, two male participants were mostly quiet and listening. One of the female participants, N, had been talking about how lucky she was to receive the assistance of Dr. Hinohara, the founder of the Center, in advising with respect to her late husband's medical condition. N, the main speaker, is in her late 70's, while the other (female) participant, M, is in her early 80's. N's utterances are shown in bold and her utterances that are comical and/or that accompanied her chuckles are in small capitals. The designation '<laughter>' refers to some sustained laughing, while '<laugh>' marks a short and light laugh. The temporal positions of back channeling and laughs indicated in the translation in this and other excerpts are approximations due to the word order difference between Japanese and English.

(1) Husband's Death

N1:	**[tyanto sensei ga**	**[moo teha**	**[tehai-site kudasatte**	[
M1:	[a	[a, mo, oisyasan mo	[tyanto site,	[aa
T1:				[haa

[3] In Ervin-Tripp and Lampert, 8.3% of the turns occasioned laughter.

N2: de sensei ga sugu tonndekite kudasutte [kangofu-san to [
M2: [a [aa
T2: [aa
N3: sorede nee, nakunatte ne, nijikan hodo site odenwa ga [kakatte
M3: [aaa
T3: [aaa
N4: de dodesuka tte sensei mo nijikan mae ni nak
N5: sore mo hontoni ne, sobani itemo wakan nai gurai
N6: UN TOMO SUN <LAUGHTER> TOMO KYUN TOMO IWANAIDE [NE
M6: [un
N7: ANO <LAUGH> WATASI MO SIROOTO DESU KARA [NE,
M7: [un
N8: iki ga tomatteru nante.
N9: yome ga ne, [soba ni ite, otoosama ne, ikisiterassyaranai mitai desuyotte kara
M9: [un
N10: EEEE (ANIMATED) <LAUGHTER> NANTEYUTTE NE
M10: < laughter > so.
N11: soide koosite, nn sinzooni naan tomo wakannai n desu ne.
N12: soide raifu puranningu sentaa ni sugu denwa simasita no.
N13: sositara ne < LAUGH >
N14: NANKA ANOO ARE TISSYUPEEPAA O NE HANA NO SITA NI NOKKETE [KUDA..
M14: **< LAUGH >** [uun un
N15: nokketemo ne ugoiteru ka ugoitenai ka wakan nain desu.
N16: sositara, moo sensei to kangohu san ga sugu kite kudasatta[te,
M16: [unn
N17: demo moo wakatta n desu ne moo
N18: KORE WA MOO DAMEDATTE < LAUGH >YUU KOTO GA NE
N19: daakara sensei no okage de nee, aan na.

Translation

N1: Dr. (Hinohara) had already made arrangements
M1: mm mm already a doctor was already arranged to be sent, hmm
T1: I see
N2: and the doctor rushed to my house with a nurse
M2: ah hmm
T2: ah
N3: and y'know, about two hours after my husband passed away, I got a phone call
M3: mmm mm
T3: mmm mm

N4: **and, Dr. Hinohara asked me "how is he?", (and I said) two hours earlier**
N5: **and it was really, you wouldn't have noticed even if you were right next to him**
N6: **(MY HUSBAND) DIDN'T SAY A PEEP <LAUGHTER> OR EVEN A SQUEAK**
M6: mm
N7: **WELL <LAUGHTER> SINCE I AM A LAY PERSON, YOU KNOW,**
M7: mm
N8: **I couldn't imagine that he stopped breathing.**
N9: **my daughter-in-law was beside us and said "Father (in-law) doesn't seem to be breathing," so**
M9: uhuh
N10: **"GEE, REALLY?" (ANIMATED VOICE) <LAUGHTER> I SAID**
M10: < laughter > I see.
N11: **so, like this, um, (I touched) his heart, but I couldn't tell anything.**
N12: **so, I called the Life Planning Center right away.**
N13: **then <laugh>**
N14: **THEY TOLD ME THAT I SHOULD PUT A TISSUE PAPER UNDER MY HUSBAND'S NOSE.**
M14: <laugh> mm
N15: **even when I put the tissue paper on him, I couldn't tell if it was moving**.
N16: **then, Dr. Hinohara's nurse came to our house right away**
M16: <laughter> **I see**
N17: **but I understood then**
N18: **THAT MY HUSBAND COULDN'T < LAUGH > BE SAVED**
N19: **so, I'm thankful to Dr. Hinohara.**

The theme of this stretch of narrative is bereavement, one of the core categories of self-disclosure associated with old age. The time of her husband's death about 10 years ago is recounted by N calmly with expressions of gratitude to Dr. Hinohara, but her narrative becomes animated and even comical when she describes the specifics of how she encountered her husband's death, and how she did not notice exactly when he died.[4] What is most striking in this example is her utterance numbered N6. The expression *un tomo sun to mo iwanai*, which I translated as '[he] didn't say a peep', is a commonly used expression, literally meaning that someone does not say *un* or *sun*, and describes a state in which someone does not give even a slight verbal response. N may have expected to hear at least a slight sound at the last moment of her husband's life, but this was not what actually

[4] 5 – 10 years after a bereavement, according to Coupland, Coupland & Giles (1991), seems to be the common time to start recounting the story.

happened. She continues to express her surprise at this unexpected ending of her husband's life by adding *kyun tomo iwanai,* 'didn't even squeak'. The onomatopoeic *kyun* suggests a small creature such as a mouse or a tiny dog as the source of the sound. The association of a small creature's squeaks with one's husband's last moment, which would normally be expected to be described with dignity, is unexpected and humorous, illustrating N's surprise quite vividly, especially because the narrator appears to be a proper and traditional upper-middle class homemaker. N discloses her memory of the very moment of her husband's death comically with laughter. She goes on to describe further her surprise and confusion. N's reaction in N10 to the observation made by her daughter-in-law is given with an animated and vivid voice quality accompanied with laughter. The detail of testing breath by using a tissue paper in N14 adds another important but trivial aspect to the description of the situation, inviting a laugh. Humorous descriptions and laughs described above may be said to have contributed to the story telling of the important moment of N's husband's life by adding vividness of the situation, but a little laugh in N18, as the speaker recounts her realization that her husband would not come back, seems different, giving the impression of resignation and acceptance. I will discuss more the effects of laughs in self-disclosure later.

The next example was the basis for the title of this paper 'We'll be dead by then'. It is an excerpt from a conversation recorded at a family gathering at a Japanese restaurant. The group of eight people included three generations of women – four cousins in their early 70's (S, H, G & Y), of whom two (S & H) are twins; the grand-daughter (Lisa) of one of the cousins, along with her mother and English-speaking father (J). The four cousins generally carried out their conversations among themselves, leaving the younger ones on their own, although the conversations occasionally converged at least partially. Just before the excerpted part, the cousins were talking about their experience of past trips to Europe as well as about various room arrangements at the restaurant. One of the twins (S, 71 years old) wondered aloud about the bilingual ability of the child, Lisa, and started to ask questions to the child's father, J, crossing the lines of the conversation group boundary. Her twin sister H and her cousins were not actively engaged in this conversation as it started.

(2) Death in the future

[S has been wondering about bilingual literacy of a 7-year old, while H, her twin sister, and their cousins G and Y are only half engaged in that topic. J, the English-speaking father of the 7-year old (Lisa), joins in the conversation at this moment to respond to S.]

S: zya kooyatte otoosan no kaita no wa yomeru wake ne, soizya
J: un, yomeru
S: e?
J: motiron
S: n, yomeru no ne. un. (pause) yonde wakaru wake da. eigo dakara.
G: [with others, talking about other private rooms in this restaurant]

S: ii wa ne. obatyan ni eigo osowaroo kana. Lisa tyan ni.
H, Y: < laughter >
H: LISA TYAN NI, O, SENSEI NI NARU KORO NI WA SIN DEN <LAUGHING> ZYA NAI
Y, G, S, etc.: < loud laughter>
S: honto. nee.

Translation
S: then, she can read what her father (you) wrote, right? then
J: yeah, she can
S: huh?
J: of course
S: hmm, she can read. yes. (pause) She can understand it when she reads it. Since it's in English.
G: [talking about other private rooms in the restaurant with H and Y]
S: That's nice. I might ask her to teach me English. Ask Lisa.
H, Y: < laughter >
H: BY THE TIME LISA BECOMES A TEACHER, YOU (WE) WILL BE DEAD <LAUGHING>
Y, G, S, etc.: < loud laughter>
S: True. Isn't it.

When S says that she might want to ask the 7 year-old Lisa to teach her English, her twin sister and others began to shift their attention to this conversation, as indicated by their laughter. This utterance by S should not particularly be classified as an age-related disclosure, although adults make this type of unrealistic statement to half flatter children. Hearing this utterance, however, her twin sister H points out another reason why S's wish may be unrealistic – by the time Lisa grows up to be able to teach, S will be dead. Because of the frequent ellipsis of referential expressions in Japanese, it is not completely clear whether the person who will be dead is only S, or whether H also includes herself, as S and H are exactly the same age. This is not a stereotypical self-disclosure since the speaker points to the future death of another. S laughs and agrees with H's assertion. H's utterance in this sense can be viewed as an age-related wisecrack directed as much to herself as to her sister. H could have commented on the unrealistic nature of S's earlier utterance by pointing out Lisa's being still a child, or could have teased S by saying that she would never learn anything now which she had not learned already. But, by referring to a more shocking truth, H's utterance was more effective and comical in this instance of verbal communication. H's humorous remark could be misunderstood and possibly be taken to be offensive if H and S had not had a close relationship and if the audience had not shared that knowledge.

The third example is an excerpt from a conversation among five women who have traveled overseas together. Four members were in their 60's at the time of

recording, and K, the main speaker in this example, and N were in their mid 70's. One of the members invited all for a meal to talk over photographs from the last trip that all except K made. Just before the excerpt, the participants were talking about their past trips to Austria and K began to disclose her worry about her recent forgetfulness, which she presented as a possible sign of dementia, an impairment often associated with advanced age.

(3) Recent forgetfulness

[Talking about past trips in Europe]

K1: demo atasi nee, <cough>
K2: koo huu ni, mukasi no bun wa kooyatte omidasu kedo nee
X2: un
K3: saikin no koto tasikani moo ne
K4: ISSYU NO TIHOO ZYA NAI KA < LAUGH. VOICE> [TO OMOO.
N4: iya atasi soona no yo
T4: [iya iya minna onnasi ne
K5: KATAPPASI KARA [WASURE TYAU [NO YO. <LAUGHTER>
M5: [onnasi onnasi
T5: [ie, minna hontoni. ne
K6: DAKARA NANNEN NI DOKO ITTA KA MO WASURETYATTERU NO <L'TER>
M6: onnasi onnasi
T6: moo syasin nannka

<u>Translation</u>

K1: but I, you know, <cough>
K2: like this, I can recall things from long past, like this, but
X2: mm
K3: in terms of recent things, I really don't
K4: I almost think it's a kind of < laughing voice> dementia
N4: I am like that, y'know
T4: It's like everyone right?
K5: I forget one after another. <laughter>
M5: same here, same here
T5: everyone, really right.
K6: So, I've forgotten where I went in which year <laughter>
M6: same here, same here
T6: y'know, photos and all

When K mentions the possibility of her developing dementia, others jump into the conversation, repeatedly confirming that they all experience the same symptoms. These overlaps indicate the participants' involvement in the interaction. K's allusion to dementia and further reference to her forgetfulness can be understood

as a serious self-disclosure of age-related heath problems, but the possible gravity of the matter is lightened because of the accompanying light laughter, sounding as if she was just reporting somewhat disturbing but also amusing facts.

The content of K's utterance can be viewed as a self-disparaging exaggeration, and, in that regard, it can be interpreted as comical, but K is the only person who is laughing. K's disclosure, however, elicited others' empathy. That outcome may be accounted for by the fact that K's conversants were her good friends who shared similar experiences and viewpoint. In fact, humorous self-disclosure has been suggested to display friendship and solidarity among English-speaking females in their late teens to 30's (Rubin 1983, Ervin-Tripp and Lampert 1992, Hay 2000). Here, similar observations are made in conversations of elderly Japanese female friends. If K's conversants had not had such background, but were, for example, intergenerational first-time acquaintances, it would be less likely that K's utterance would have prompted as clear empathy as we see in this example.

The humor and laughter in the case of K's self-disclosure, as well as in other examples that I discussed above, may have lightened the weight of the content of the self-disclosure. Ziv (1984), according to Ervin-Tripp and Lampert (1992), suggested the following four social functions of self-directed humor: (1) Equalizing: Redefining the social hierarchy by higher status individuals in order to create solidarity among group members of differing social status; (2) Defending: Protecting the self by identifying a weakness before anyone else does; (3) Sharing: Sharing similarities between self and others; and (4) Coping: Coping with weaknesses by making light of them. We could rephrase the discussion of example (3) as showing that humor was used as a coping and/or a sharing strategy. Indeed, Ervin-Tripp and Lampert (1992), who provided the headings to these functions, also found in their study that the coping and sharing strategies are most relevant to women's use of humor.

3. Conclusion

This paper presents examples of peer conversations among elderly Japanese women. As in intergenerational interview situations, the elderly women disclose age-related "painful" events and situations, but such "painful" stories are presented humorously and with laughter. Among the explanations suggested for the use of humor in conversations among elderly female peers, one is a strategy employed to help sharing and coping with difficult situations. Such an explanation is similar to that presented for the use of humor among young English-speaking U.S. females studied by Ervin-Tripp and Lampert (1992) and among young female New Zealanders of European descent studied by Hay (2000). The difficult situations presented in my study of elderly female speakers, however, are mostly age-related such as their decline in function, shortness of remaining lifespan or experience of bereavement. Besides the function of sharing and coping, it is likely that the elderly are aware of the conversational function of humor making the speech more vivid and interesting, especially when pointing out a humorous detail

in an otherwise sad situation. Humor might have also been used to indicate the speaker's intimacy with the target of description – a neighbor, for example, would not have the privilege to describe N's husband's death in the same way as N did in the first example. Finally, in connection to the intimacy and sharing functions mentioned above, humorous self-disclosure aided the reinforcement of solidarity among the speakers, again similarly to the cases of younger females observed in Ervin-Tripp and Lampert (1992) and Hay (2000).

In sum, whether young or old, female friends exhibit humorous self-disclosure in their conversations, and in that sense the elderly do not seem to be different from the younger generation, yet the topics of their self-disclosure are much more closely associated with decline and death, age-related topics that are not commonly shared by the younger speakers.

Some psychologists have observed that more complex emotions are found in the case of the elderly than in younger people (Carstensen, Pasupathi, Mayr and Nesselroade 2000). We see some of this complexity in the examples analyzed in the present study, in which painful facts are presented comically, and in which humor serves multiple conversational purposes. Painful age-related situations including the advanced stage of one's life are not denied, unlike the "postmodern" myth of the old age being "youth with gray hair" (pointed out by Coupland and Coupland 1999), and are not taken simplistically. Further analyses of naturally-occurring peer conversations among the elderly would, I believe, yield even more valuable insights into the emotional depth and complexity of this frequently misunderstood and undeservedly marginalized group.

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Yoshiko Matsumoto
Department of Asian Languages
Stanford University
Stanford, CA 94305-2034

yoshikom@stanford.edu

Devoicing and its Environments in Perception: Kinki Japanese, or Tokyo?

MIDORI Y. MORRIS
Gettysburg College

0. Introduction

Vowel devoicing in the Tokyo dialect is a common topic in Japanese phonology. The most general description of vowel devoicing is the one found in, e.g., Vance (1987) and Tsujimura (1996). That is, the high vowels /i/ and /u/ are devoiced between voiceless consonants and between a voiceless consonant and a pause. For example, /i/ and /u/ in /k*i*kan/, /k*u*kan/, and /hon des*u*/ are devoiced (italicized). Studies of different aspects of vowel devoicing in the Tokyo dialect have been extensively reported. Vowel devoicing in non-Tokyo dialects, like the Kinki dialect, which is spoken in the Kyoto-Osaka area, has also been studied, but not as fully as the Tokyo dialect, and studies on the perception of devoicing are even rarer. Some sociolinguistic studies have reported that people can detect language varieties based on his or her speech, and that their judgments can be affected by social information. In the case of vowel devoicing in Japanese, the results of perception experiments may not be predictable because of the allophonic status and the gap between the general belief about devoicing and actual devoicing in the Kinki dialect.

I conducted a perception experiment to examine how Tokyo and Kinki people judge a speaker as a local or a non-local person for them based on his or her devoicing variation and pitch accent patterns. The results show that both Tokyo and Kinki people tended to make judgments based on devoicing variation as well as on pitch accent, but the tendency of Kinki people to make use of devoicing variation is weaker. People also seem to use more covert knowledge of phonological factors in devoicing in production, and made judgements on that rather than audible pronunciation.

1. Previous studies

1.1. Vowel devoicing in the Tokyo dialect

In previous studies, different aspects of vowel devoicing in the Tokyo dialect have been reported. Those include physiological characteristics, phonology, and variability (Han 1962, Sugito 1969, Yoshioka 1981, Vance 1987, Jun and Beckman 1993, Kondo 1994, Imai 1997, and others). Devoicing is avoided when

a devoiceable vowel is in an accented mora, in a mora that carries intonation, in a successive devoicing environment, and at a morpheme boundary. Devoicing shows variation. Imai (1997) collected data from natural conversation and found out environments and features that promote devoicing in production.

1.2. Vowel devoicing in the Kinki dialect

Generally it is believed that vowel devoicing does not occur in the Kyoto and Osaka dialects (Horii 1972, Peng 1993). Data from previous studies show, however, that devoicing does occur there. In Tahara's (1998) database, 33 out of 40 tokens of devoiceable vowels are devoiced. Nakai (1991) reported the sentence ending /u/ is devoiced by elementary school children. Sugito (1988) shows devoicing variations by both Tokyo and Kinki people.

Their data cover, however, very limited phonological environments or social variants. Another problem is that the devoiceable vowel is not always compared with a vowel in the same phonological environment in another dialect, for example /kusa/ 'grass' in LH (Low-High of the pitch accent pattern) in Tokyo and /kusa/ in HL in Kinki. Kinki people may avoid devoicing here because of accentuation, just as Tokyo people do. Such comparison could lead to an inaccurate evaluation of overall devoicing rates.

Table 1 shows the devoicing rates in some studies. The rates by Tokyo speakers are quite similar, while the rate in Tahara's data is very high. Vowels in Tahara's data are all in the most general devoicing environment, that is, a high vowel between two voiceless consonants in an unaccented mora. Some re-calculated devoicing rates in such environments are shown in Table 2. Morris's data were obtained by asking Tokyo people to read a prepared passage. The devoicing rates of Tahara's data and two other data sets are quite comparable. It is necessary to collect a larger amount of more controlled Kinki production data to determine distribution and variation of devoicing before making comparison. Nevertheless, it is tempting to assume that the devoicing rate in Kinki is not all that different from that in Tokyo, at least in the most general environment, and I take this as a tentative assumption.

Table 1: Variations of devoicing

	Tokyo subjects		Osaka subjects	
	Devoicing	Nondev.	Devoicing	Nondev.
Sugito (1969)	65.8%	34.2%	29.4%	70.6%
Sugito (1988)	55.6%	44.4%	32.2%	67.8%
Yoshioka (1981)	56.5%	43.5%	N/A	N/A
Tahara et al. (1988)	N/A	N/A	82.5%	17.5%

Table 2: Devoicing variations in different positions (Tokyo subjects)

	Unaccented		Accented		Consecutive
	Dev.	Nondev.	Dev.	Nondev.	Devoicing
Yoshioka (1981)	76.8%	23.2%	16.1%	83.9%	N/A
Morris	80.6%	19.4%	N/A	N/A	92.9%

1.3. Perception of dialects and attitude toward them

Labov (1972) discusses the benefits of sociolinguistic investigation derived from isolating a significant linguistic variant that may serve as an index to measure social behavior. There are many studies on dialect perception within this general framework. Kerswill (1985) shows that people judge those who speak a mixture of dialects in Norwegian correctly but cannot describe the differences they based their judgments on. Preston (1996) shows that people can identify the regions from which different speech samples came in accordance with their perception about distinctiveness of speeches. Purnell et al. (1999) show that people can discriminate the ethnicity of the speakers of different varieties of English without seeing their faces. Strand (1999) and Niedzielski (1999) show that people judge the speaker's pronunciation based on social information, rather than the actual pronunciation they hear. These studies support the following ideas: (i) respondents may identify someone's ethnicity or dialect region from their speech, (ii) they can do this based on forms they are not aware of and cannot describe accurately, (iii) such judgments are affected by social information, that is, stereotypes about the speaker who has it, as well as linguistic information.

Using Japanese, Warner (1997) shows that Tokyo and Kinki people can acquire pitch accent patterns in the other's dialect and that difficulties of acquiring such differences show the same pattern as in acquiring segmental differences. Pitch accent patterns in Japanese are suprasegmental but phonemic.

It seems quite reasonable then to collect quantitative data from Tokyo and Kinki people to examine how they perceive and judge variation of vowel devoicing because devoicing is not phonemic unlike accent patterns. In addition, since the devoicing rate could be similar in the most general devoicing environments in both dialects, people might, unconsciously, have some knowledge of that.

It is important to consider attitudes toward the standard language and dialects. Both the Tokyo and Kinki dialects are considered to be prestigious by the local people. People tend to recognize prestige in the Tokyo dialect because it is spoken in the capital metropolitan area and the standard language was based on it. Shibuya (1995) reports that Kyoto people give positive descriptions about their own dialect, and that they tend to speak their dialect, instead of trying to speak standard Japanese, in any situation asked.

My assumptions in this study are that a user of devoicing and Tokyo pitch accent is more likely judged as a Tokyo person by Tokyo people and as a non-Kinki person by Kinki people, and that a user of nondevoicing and Kinki pitch accent is more likely judged as a non-Tokyo person by Tokyo people and as a Kinki person by Kinki people. If the results confirm this, it suggests that both

Tokyo and Kinki people could make judgments based on stereotypes, roughly speaking, that Tokyo people devoice vowels and Kinki people do not.

2. Methods

In my experiment, I presented a test tape that consists of a word list to Tokyo and Kinki people and asked them to make judgments for each word whether the speaker is from the same region as their own. I chose words with only one devoiceable vowel in the most general devoicing environment, and prepared two tokens for each word with devoicing variation as much as possible as in (1a) and (1b). I also used words that contain no devoiceable vowels and are pronounced in different pitch accents in Tokyo and Kinki as in (1c) and words that contain no devoiceable vowels and are pronounced in the same pitch accents as in (1d).

(1)	Word	Gloss	Speaker	Devoicing/Accent
a.	ataf*u*ta	'hurriedly'	J	Devoiced
	atafuta	'hurriedly'	K	Nondevoiced
b.	nadesh*i*ko	'a pink'	K	Devoiced
	michihide	'by high and low tides'	M	Nondevoiced
c.	kawari	'replacement'	H	LHH (Tokyo)
	kawari	'replacement'	G	HHH (Kinki)
d.	tabun	'probably'	E	

Table 3 below shows how the responses were tabulated (PA refers to 'pitch accent'). This manner of tabulation allows the overall results and comparisons between devoicing variation and accent patterns to be analyzed consistently with my assumptions for this study. The question to the respondents was "Is the speaker from the same region as yours?" The expected response is that Tokyo pitch accent and devoicing are judged as "from the same region" by Tokyo respondents and as "not from the same region" by Kinki respondents, and Kinki pitch accent and nondevoicing are judged as "not from the same region" by Tokyo respondents and as "from the same region" by Kinki respondents. The opposite response for each token is unexpected. Neutral tokens are expected to sound like their own.

Then I analyzed the responses, determining the significant factors for making judgments, among both phonological environments and social factors. I used a multivariate logistic regression program, which identifies insignificant factor groups and weight of each factor, and allows further analyses.

Table 3: Way of Tabulation

Respondent	Token type	Expected	Unexpected
Tokyo	Devoiced	from the same region	not from the same region
	Tokyo PA	from the same region	not from the same region
	Nondev.	not from the same region	from the same region
	Kinki PA	not from the same region	from the same region
	Neutral	from the same region	not from the same region
Kinki	Devoiced	not from the same region	from the same region
	Tokyo PA	not from the same region	from the same region
	Nondev.	from the same region	not from the same region
	Kinki PA	from the same region	not from the same region
	Neutral	from the same region	not from the same region

3. Results and discussion

3.1. Overall results

Tables 4 and 5 below show the overall results by token types with Tokyo data and with Kinki data showing token numbers and percentages. The results show that devoicing tokens as well as Tokyo accent tokens are more likely judged as 'Tokyo' or 'non-Kinki' while nondevoicing tokens as well as Kinki accent tokens are more likely judged as 'Kinki' or 'non-Tokyo', as expected.

Table 4: Overall results by token types (Tokyo)

Token Type	Expected	Unexpected	Total
Devoiced	1712 (70.11)	730 (29.89)	2442 (100)
Tokyo PA	377 (67.20)	184 (32.80)	561 (100)
Nondevoiced	1174 (59.90)	786 (40.10)	1960 (100)
Kinki PA	507 (86.22)	81 (13.78)	588 (100)
Neutral	155 (73.81)	55 (26.19)	210 (100)
Total	3925 (68.13)	1836 (31.87)	5761 (100)

Table 5: Overall results by token types (Kinki)

Token Type	Expected	Unexpected	Total
Devoiced	1765 (52.17)	1618 (47.83)	3383 (100)
Tokyo PA	724 (86.84)	131 (15.32)	855 (100)
Nondevoiced	1505 (54.69)	1247 (45.31)	2752 (100)
Kinki PA	777 (87.60)	110 (12.40)	887 (100)
Neutral	275 (88.42)	36 (11.58)	311 (100)
Total	5046 (61.63)	3142 (38.37)	8188 (100)

Tables 6 and 7 show more clearly that devoicing variation affects the expected judgments in similar tendencies as accent patterns do. These results can be said to have moved the field from segmental and suprasegmental but phonemic features such as pitch accent patterns into allophonic features, and show that such lower level features can be recognized, have social meaning, and be used as clues in making judgments.

Table 6: Overall results by types of variants (Tokyo)

Token Type	Expected	Unexpected	Total
Pitch Accent	884 (76.94)	265 (23.06)	1149 (100)
Voicing Variants	2886 (65.56)	1516 (34.44)	4402 (100)
Total	3770 (67.92)	1781 (32.08)	5551 (100)

Table 7: Overall results by types of variants (Kinki)

Token Type	Expected	Unexpected	Total
Pitch Accent	1501 (86.17)	241 (13.83)	1742 (100)
Voicing Variants	3270 (53.30)	2865 (46.70)	6135 (100)
Total	4771 (60.57)	3106 (39.43)	7877 (100)

The results also show some differences between Tokyo and Kinki results. Tokyo and Kinki respondents tend to make expected judgments but Kinki respondents do so more weakly, as shown with lower percentages. The weaker tendencies in the Kinki results can support the speculation that devoicing occurs in Kinki as frequently as in Tokyo at least in the most general devoicing environments, and that is why Kinki respondents did not use devoicing variation efficiently as a criterion in making judgments. It is possible that Kinki people assume that devoicing is a non-Kinki feature based on the higher nondevoicing rate in other phonological environments (for example, in an accented mora), but confirmation of that interpretation would require a different study.

Comparison of the Tokyo and Kinki results of the tokens by different pitch accent patterns also reveals differences. It is reasonable to assume that a non-local feature induces the response 'non-local' more easily than a local feature induces the response 'local'. For this point, the results with Tokyo data are reasonable. The Kinki results do not show this pattern. The Kinki accent induces expected responses at as high a rate as the Tokyo accent does.

I believe the explanation lies in the different positions and values of the local language in Tokyo and Kinki. Kinki is an ancient capital region, so it is very natural for present-day people to share the Kinki dialect as a native one inherited from many previous generations. Tokyo, on the other hand, became the capital in 1868, and people started moving in after that. Consequently, people living in Tokyo may well have a smaller sense of solidarity, placing less value on local language. These results show a similar tendency to other studies and Preston's description of nonprestigious variety, which expresses local identity placing regional solidarity.

> Areas with greater linguistic insecurity focus on regional solidarity ... to express local identity. Areas with considerable security do not use local speech to express such identity, for its 'uniqueness' is already taken up in the expression of status rather than solidarity matters. (Preston 1996: 317)

3.2. Results by the preceding consonants

The respondents seem to make judgments not simply based on devoicing variants but also based on some covert knowledge of how likely it is that vowels are to be devoiced in production.

Table 8 shows the Tokyo results by the consonant that precedes a devoiceable vowel after the first run of the statistics program. Roughly speaking, backness in terms of place of articulation and [-continuant] are promoters, that is, those factors help the respondents make the expected judgments.

Table 8: Results by the preceding consonants with features (Tokyo)

Consonant	Place of articulation	Manner of articulation	Weight
k	velar	-continuant	0.607
tʃ	prepalatal	±continuant	0.544
s	alveolar	+continuant	0.495
ɸ	labial	+continuant	0.440
ç	palatal	+continuant	0.416
ts	alveolar	±continuant	0.411
p	labial	-continuant	0.401
ʃ	prepalatal	+continuant	0.396

When separate results with devoiced tokens and nondevoiced tokens are compared as in Table 9 below, all the consonants except for [tʃ] and [ç] have the same tendencies in effects on the expected judgments. [k] is a promoter, and [s, ʃ, ɸ, p ts] are demoters in almost the same order. [tʃ] and [ç] are promoters in devoiced data, and their weights drop dramatically in nondevoiced data. In other words, when the preceding consonant is [tʃ] and [ç], the respondents chose 'Tokyo' regardless of the actual devoicing or nondevoicing of the devoiceable vowel. These two consonants are among those which Imai (1997) found as the best promoters of devoicing in production. According to her, /i/ with a preceding

fricative and a shared feature between the preceding consonant and the devoiceable vowel, that is, palatal for /i/ and labial for /u/, are the strongest promoters of devoicing. [ç] is exactly such a consonant, and [tʃ] is a pre-palatal consonant with [+continuant] feature. It seems that the respondents knew the best environments and assumed that the vowels were devoiced and chose 'Tokyo'.

Table 9: Separate results by the preceding consonants (Tokyo)

Devoiced Data		Nondevoiced Data	
Consonant	Weight	Consonant	Weight
tʃ	0.749	k	0.654
k	0.591	tʃ	0.504
ç	0.540	ʃ	0.458
s	0.459	s	0.450
ʃ	0.399	ɸ	0.447
ɸ	0.399	p	0.419
p	0.367	ts	0.401
ts	0.311	ç	0.187

The Kinki data show simpler results, and again [tʃ] shows the similar effect, as in Table 10 below. When the preceding consonant is [tʃ], the respondents tend to judge the speaker as 'non-Kinki' regardless of actual voicing status. It seems that both Tokyo and Kinki people use this covert knowledge of best environments, and that they "hear" devoiced vowels in those best environments.

Table 10: Separate results by the preceding consonants (Kinki)

Devoiced Data		Nondevoiced Data	
Consonant	Weight	Consonant	Weight
p	0.656	p	0.656
k	0.555	ts	0.588
ts	0.514	k	0.546
tʃ	0.478	s	0.509
ʃ	0.449	ʃ	0.499
ç	0.430	ç	0.476
ɸ	0.393	tʃ	0.331
s	0.276	ɸ	0.297

3.3. Results by the following consonants

In the results by following consonants as shown in Table 11 below, there is a tendency that [+continuant] promotes the expected judgments with devoiced data and demotes them with nondevoiced data. In other words, just as with palatal [+continuant] preceding consonants, [+continuant] in the following consonants helps the respondents judge a speaker 'Tokyo' regardless of actual devoicing or nondevoicing.

Table 11: Separate results by the following consonants (Tokyo)

Devoiced Data		Nondevoiced Data	
Consonant	Weight	Consonant	Weight
ç	0.813	k	0.910
s	0.693	p	0.649
t	0.650	ts	0.621
ʃ	0.579	t	0.550
h	0.541	ʃ	0.468
ɸ	0.483	s	0.423
p	0.441	ç	0.326
tʃ	0.347	tʃ	0.302
k	0.283	h	0.220
ts	0.244	ɸ	0.077

The Kinki results show similar tendencies to the Tokyo results, but less clearly, as in Table 12 below. The results with devoiced data show a random ordering of weights. The results with nondevoiced data show that [+continuant] tends to be a demoter and [-continuant] a promoter, just as in the Tokyo results. That means that fricatives following the vowel generally help Tokyo and Kinki respondents judge a speaker as 'Tokyo' or 'non-Kinki' regardless of actual voicing status.

Table 12: Separate results by the following consonants (Kinki)

Devoiced Data		Nondevoiced Data	
Consonant	Weight	Consonant	Weight
ç	0.677	h	0.681
k	0.626	k	0.664
ʃ	0.553	p	0.634
s	0.543	t	0.621
t	0.516	s	0.477
tʃ	0.489	ʃ	0.476
ɸ	0.408	tʃ	0.397
h	0.339	ç	0.314
ts	0.331	ɸ	0.301
p	0.282	ts	0.264

The different effects of preceding consonants and following consonants seem to be consistent with a temporal order of perception. After noticing a preceding consonant, the respondent still has a chance to assess the voicing status of the vowel, and judges the speaker accordingly. Different consonants have different effects, but the same consonants help the respondents make expected judgments in the devoiced data and nondevoiced data. Only the best preceding consonants for vowel devoicing make them ignore the voicing status. On the other hand, on hearing following consonants, the respondents cannot retrieve their perception of

the vowel. So once they miss it they cannot help but assume the vowel is devoiced by the series of segments that form devoicing environments, and go on to reason that a devoicer is from Tokyo or non-Kinki. Kinki respondents may well have the same knowledge of the devoicing environments, if their devoicing rate is almost the same as the one by Tokyo people.

When the respondents judge the speaker as 'Tokyo' or 'non-Kinki' using knowledge of good environments for vowel devoicing in production, it is suggested that they "hear" devoiced vowels in those environments. This means the phonological system of its speakers rather than the acoustic information affects their perception and this matches previous studies, for example, Beddor, et al (2002). They conducted perceptual experiments and report that the perception of vowels is affected by language-specific patterns of coarticulation, and they "hear" coarticulation when there is no coarticulation in the coarticulatory context in the respondent's language. My study is not directly asking the devoicing status but the speaker's region assuming they use the devoicing status, but this interpretation does not seem unreasonable.

4. Conclusion

The results of this perception experiment using vowel devoicing and pitch accent patterns in Japanese suggest the following:

First, although devoicing is allophonic and people are not aware of it in natural conversations, its variation contributes to the respondents' judgments that a devoicer is judged as Tokyo or non-Kinki and a nondevoicer is judged as non-Tokyo or Kinki. Both Tokyo and Kinki results show similar tendencies, but the tendencies among Kinki people are weaker. This supports the idea that they devoice vowels as frequently as Tokyo people do at least in the most general devoicing environments while Kinki people are alleged to be nondevoicers.

Also, beyond voicing variants, more covert phonological knowledge contributes to respondents' judgements. Features that form best environments for vowel devoicing in production, namely, [ç] and [tʃ] in preceding consonants and [+continuant] in following consonants, tend to aid in distinguishing between 'Tokyo' or 'non-Kinki' regardless of actual voicing status. These results illustrate the reasonable coordination of the perception and indicate utilization of the knowledge of the phonological system to "hear" what is not in the acoustic information.

The Tokyo pitch accent is not a good clue for Tokyo people, while the Kinki accent is as good as the Tokyo one for Kinki people. This indicates another example of a nonprestigious variety that expresses local identity and regional solidarity.

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Midori Y. Morris
Department of Asian Studies
Campus Box 441
Gettysburg College
Gettysburg, PA 17325

myonezaw@gettysburg.edu

The Emergence of Dorsal Stops after High Vowels in Huishu*

DAVID MORTENSEN
University of California, Berkeley

0. Introduction

Huishu, a Tibeto-Burman language of Manipur belonging to the Tangkhul group, features an unusual sound change in which dorsal stop codas are inserted after high vowels in open syllables. Thus PTB **səy* > PTk > **kə.thi* > Huishu *kə.tik* 'to die'. This development seems both formally and functionally aberrant: epenthesis usually inserts vowels, and consonant epenthesis, when it does occur, usually inserts glides (Blevins to appear).[1]

I propose that this change and others like it were not motivated by either formal or functional factors. Rather, they result from the conjunction of aerodynamic, acoustic, and perceptual facts, which lead to a systematic misperception (and thus, misinterpretation) of the forms involved in these innovations. This model, I argue, is able to account not only for the general facts surrounding the emergence of consonants after high vowels, but is also able to account for specific facts of this phenomenon in Huishu.

1. Huishu

Huishu is spoken by a few thousand individuals in Huishu village and the surrounding area in Ukhrul District, Manipur State, India. It is a member of the closely related family of languages spoken by the Tangkhuls (also called the Tangkhul Nagas). The position of this family of languages within the larger Tibeto-Burman family has not yet been settled, but some evidence suggests that it may be close to Kuki-Chin, Zeliangrong, or both (Mortensen 2003).

Proto-Tangkhul (PTk; Mortensen 2003), in addition to nasal codas (**-m*, **-n*, and **-ŋ*) and liquid codas (**-r* and **-l*) had the stop codas **-p*, **-t*, and **-k*. In pre-

*This paper owes a debt to many individuals including James Matisoff, Larry Hyman, John Ohala, Sharon Inkelas, Juliette Blevins, Takumi Ikeda, Andrew Garrett, and Gary Holland. It is likely that none of these individuals agrees completely with the arguments presented in this paper, and none of them is responsible for its errors and shortcomings, but each of them shaped—in some way—its central ideas. I also owe a special debt to Jonathan and Rufus Zingkai, who provided the Huishu data upon which my argument depends.

[1] An important exception to this generalization is eclipsis; see Hock (1991:122–123)).

Huishu, all instances of PTk *-*t* and *-*k* became **-*ʔ*, as did *-*p* after low vowels (**a* and **ɐ*). This left pre-Huishu with a two-way stop-coda contrast between **-*p* and **-*ʔ*.

Subsequently, dorsal stop codas emerged after high vowels in open syllables. Thus the pre-Huishu rhymes **-*i* and **-*u* (< PTk *-*i* and *-*u*/*-*ɨ*) became /-ik/ [ic^{h}] and /-uk/ [uk^{h}]. All instances of /*k*/ in modern Huishu reflect these emergent or epenthetic stops. There are now open syllables containing high vowels, but these are all the result of a (rather complicated) set of later sound changes and they seem never to reflect PTk high vowels.

The data showing the development of these stops—a process that is almost perfectly regular—are quite plentiful, since the PTk rhymes *-*i* and *-*u* were among the most common in the language. The following table gives the Huishu data along with cognate forms from Standard Tangkhul and Kachai (another Tangkhul language), reconstructed forms for PTk,[2] and Proto-Tibeto-Burman reconstructions (PTB; Benedict 1972; Matisoff 2003).

		PTB	**PTk**	**Tangkhul**	**Kachai**	**Huishu**
[1]	'blood'	*s-hywəy	*ʔa.ʃi	ʔà.ʃi	ʔā.sɐ̀	ʔā.sìk
[2]	'blow'	—	*kə.mə.ri	khə̀.mə̀.ri	—	kə̄.mə̄.līk
[3]	'comb'	*si	*rik-si	rik-si	rɐ́k-sɐ	ʔə̄.róʔ-sìk
[4]	'die'	*səy	*kə.thi	kə̀.thì	—	kə.tìk
[5]	'fear'	*kri	*kə.ŋə.ci	khə̀.ŋə̀.cì	khə́.ŋə̀.tsɐ̄	kə́.tsìk
[6]	'four'	*b-ləy	*pə̀.lì	mə̀.tì	pə̀.tsɐ̄	mə.kìk
[7]	'horn'	—	*ʔa.ŋə.ci	ʔà.ŋə̀.ci	ʔā.ŋə̀.tsɐ̄	ʔa.nə.tsìk
[8]	'medicine'	*r-tsəy	*ʔa.ri	ʔà.rì	ʔa.rɐ̂	ʔa.rîk
[9]	'mother-in-law'	—	*ʔa.ni	ʔa.ni	ʔa.nɐ̄	ʔa.nik
[10]	'one'	—	*kə.si	—	kə̄.sɐ̄	kə.sík-à
[11]	'salt'	*tsyi	*mə.ci	mə̀.cî	mə.tsɐ̄	ʔā.mə̄.tsīk
[12]	'seven'	*s-nis	*ci.ni	ʃí.ní	ʃí.nɐ̂	thi.nik
[13]	'two'	*g-nis	*khə.ni	khə́.nî	khə̄.nɐ̂	khə.nîk
[14]	'bone'	*g-rus	*ʔa.ru	ʔa.rú-kùj	ʔā.rɐ́	ʔā.rūk
[15]	'breast'	*nəw	*ʔa.nu	ʔà.nù	nɐ́-tɐ̂	ʔā.nə̄.nùk
[16]	'carry (on shoulders)'	—	*kə.ŋə.wu	khə̀.ŋə̀.vù	kə̄.hɐ̄	kə̄.nə̀.vúk
[17]	'grandchild'	—	*ru	ʔà.rù	ī-ðɐ̄	ʔā.rúk-rè
[18]	'insect'	—	*ʔa.khu	ʔà.kù	ʔà.khɐ̀	ʔā.khúk-è
[19]	'tie'	—	*kə.mə.su	khə̀.mə̀.sú	khə́.mə̀.sī	kə̄.mə́.sūk
[20]	'dog'	*k^{w}əy	*hwɨ	fu	ʔā.hwì	ʔā.huk
[21]	'egg'	*har-rəy	*har-rɨ	hɐ̀r-ru	hàr-ðî	ʔā.hó-phə̄.rùk
[22]	'laugh'	*m-nwəy	*kə.mə.nɨ	khə̀.mə̀.nù	khə́.mə̀.nî	kə̀.mə̀.nùk
[23]	'water'	*rəy	*-rɨ	tɐ́-ru	tūŋ-ðì	ʔā.rùk

[2]The reconstructions given here are identical to those in Mortensen (2003), with one difference: the rhyme previously reconstructed as *-*ɐj* (the reflex of PTB *-*əy*) is here given the more plausible reconstruction *-*ɨ*.

The above data gloss over some important phonetic facts about these non-etymological velar stops. While all of these stops have been transcribed above as /*k*/, phonetically they differ according to the preceding vowel: /*uk*/ is realized with a velar stop, but /*ik*/ is realized with a palatal stop (not unlike the velar stops in English). Furthermore, unlike Huishu /-*p*/ (and in fact, the coda obstruents of most Tibeto-Burman languages in the India-Burman borderlands region), Huishu dorsal stop codas are produced with an audible release, which—at times—is accompanied by very noticeable frication. They sound rather like the aspirated stops that occur as onsets in Huishu.

The same type of development shown here in Huishu is attested in a number of other languages and language families.

2. Lom (Belom)

Lom is an unclassified Austronesian language of Bangka (an island off the east coast of Sumatra, approximately 200 miles to the south of Singapore; Blust 1994).[3] In Lom, the dorsal stops /-*c*/ and /-*k*/ have intruded after word-final Proto-Austronesian (PAN) high vowels:

		PAN	**Lom**
[24]	'day'	**waRi*	*aric*
[25]	'flesh, meat'	**isi*	*isic*
[26]	'husband; male'	**laki*	*lakeik*
[27]	'to buy'	**beli*	*melic*
[28]	'excrement'	**Caqi*	*taic*
[29]	'ash'	**qabu*	*abek*
[30]	'yes'	**au*	*aok*
[31]	'dog'	**asu*	*asek*
[32]	'stone'	**batu*	*batek*
[33]	'tunnel trap'	**bubu*	*bubek*
[34]	'body hair'	**bulu*	*bulek*
[35]	'put, place'	**taRu*	*tarok*
[36]	'headwaters'	**qulu*	*ulek*

3. Singhi

Singhi, also an Austronesian language, is a Land Dyak language of Sarawak on Borneo. In Singhi, obstruents have also developed after word final high vowels, but they are fricatives rather than stops. Pre-Singhi ***-i* > Singhi /-*is*/ while Pre-Singhi ***-u* > /-*ux*/ (Blust 1994).

		PAN	**Singhi**
[37]	'yam'	**qubi*	*bis*
[38]	'iron'	**besi*	*bosis* 'small axe'
[39]	'this'	**iti*	*itis*

[3]Thanks to Juliette Blevins for directing me to Blust (1994), where Lom and Singhi are discussed.

[40]	'dig'	**kali*	*karis*
[41]	'buy'	**bili*	*miris*
[42]	'spear'	**suligi*	*sirugis*
[43]	'ash, fireplace'	**qabu*	*abux*
[44]	'stone'	**batu*	*batux*
[45]	'new'	**baqeRu*	*baux*
[46]	'louse'	**kuCu*	*gitux*
[47]	'burn'	**CuNu*	*ninux*
[48]	'sugarcane'	**CebuS*	*tobux*

4. Maru (Langsu)

Maru (known in the Chinese literature as Langsu) is a Burmish language of Northern Burma (Kachin State) and Southern China (Yunnan Province). Burling (1966) argued persuasively, on tonal evidence, that some of the stop codas of Maru (which he transcribed as /-*t*/ and /-*k*/) were a secondary development. This same argument was made earlier by Benedict (1948), and Burling's /-*t*/ and /-*k*/ developed regularly after the reflexes of Proto-Tibeto-Burman (PTB) **-əy* and **-əw* (as reconstructed by Benedict), which appear to have become the high vowels ***-i* and ***-u* in pre-Maru. See the following comparisons between Maru, the closely related language Atsi (Burling 1966), Written Burmese (WB), and PTB (Matisoff 2003):

		PTB	**WB**	**Atsi**	**Maru**
[49]	'die'	**səy*	*se*	*šî*	*šìt*
[50]	'leg/foot'	**krəy*	*khre*	*khyí*	*khyìt*
[51]	'water'	**rəy*	*re*	—	*ɣìt*
[52]	'parrot'	**gyəy*	*kyê*	*jì*	*jìt*
[53]	'dung'	**kləy*	*khyê*	*khyì*	*khyít*
[54]	'horn'	**krəw*	*khrui*	*khyúi*	*khyùk*
[55]	'cry'	**ŋəw*	*ŋui*	*ŋâu*	*ŋùk*
[56]	'sky'	**məw*	*mûi*	*màu*	*mùk*
[57]	'bone'	**rəw*	*rûi*	*vùi*	*ɣùk*
[58]	'smoke'	**kəw*	*mî-khûi*	*khàu*	*khúk*
[59]	'steal'	**r-kəw*	*khûi*	*kháu*	*khúk*
[60]	'grandfather'	**pəw*	*ʔəphûi*	*phàu*	*phúk*

It is interesting to note that the secondary stop that Burling (1966) transcribes as /-*t*/ is always transcribed as /-*k*/ by Chinese linguists (Sun 1991; Dai & Huang 1992). This may be due either to a sound change that changed all instances of **-it* to /-*ik*/, or to the conservation of the original place of articulation in Maru dialects spoken in China but not the dialects spoken in Burma (where Burling did his Maru field work). It is most plausible that both Burling's /-*t*/ and the /-*k*/ of Chinese linguists are reflexes of an original ***-c* similar to that found in Huishu and Lom.

5. Momo and Fomopea

The Momo group of Grassfields Bantu languages display an innovation similar to the others discussed here (Stallcup 1978:124–132).[4] Epenthetic /*k*/s appear after

[4]Thanks to Larry Hyman for alerting me to the existence of this case and that of Fomopea.

what must have been high vowels historically. The same development occurred (apparently independently) in Fomopea, a language from the core of the Bamileke group. Take the following examples from Proto-Grassfield Bantu (PGB) (Hyman 1979/1993), Fomopea,[5] and Moghamo (Stallcup 1978):

		PGB	Bafut	Fomopea	Moghamo
[61]	'head'	*tú`	àtú`	àtúk	á-tók`
[62]	'mouth'	*cùl`	ɨ̄cù	ɨ̄cūk	í-côk
[63]	'dog'	*bɨ́à	m̀bú`	m̀bɨ́k	bók`
[64]	'fall'	*gɨ̀a	—	—	gòk
[65]	'eat'	*lɨ́a	—	—	jɔ́k
[66]	'moon'	*mu-V	—	—	í-mɔ́k`
[67]	'knife'	*bé	—	—	fí-bék
[68]	'stone'	*tí´	—	—	aték`
[69]	'tree'	*tí´	àtì	àtík	—

It is not immediately evident that these data parallel the data from Huishu, Maru, Singhi, and Lom, since the "high-vowel" conditioning environment is not evident in either the Proto-Grassfields Bantu reconstructions or the Moghamo forms. However, there is external evidence, from languages like Bafut which reflect these vowels as /*i*/, /*ɨ*/, and /*u*/ and from the aspiration of stops in Bamileke languages, that high vowels were the environment for /*k*/ epenthesis (Hyman 1972:23–24; Stallcup 1978). Applying the inductive hypothesis (without taking the reconstructed phonetics too seriously), we might suppose that there were three contrasting high vowels in Pre-Momo: a high front vowel that became Moghamo /-*ek*/, a high back vowel that became Moghamo /-*ok*/, and a high mid vowel that became Moghamo /-*ɔk*/.

6. Competing Accounts

There are four things that an account of dorsal stop epenthesis in Huishu and other languages should explain:

1. **Mechanism** How the change took place.
2. **Environment** Why high vowels seem robustly to form the environment for this type of epenthesis.
3. **Motivation** Why this sound change converts a "less marked" structure into a "more marked" structure.
4. **Substance** Why the epenthetic obstruents have the place and manner features that they do.

An account which explains these four factors would be additionally attractive if it could explain the odd release of Huishu dorsal stops.

[5]The Fomopea data are taken from Larry Hyman's unpublished field notes. The data from Bafut, a Grassfields language from the Ngemba group, are taken from a Grassfields Working Group notebook, also graciously provided by Larry Hyman.

6.1. Diphthongization Plus Glide Fortition

One possible account for the type of phenomena described here was given by Blust (1994)—that the emergence of these stops was a two-part process[6]: First the vowels diphthongized; then the off-glide was fortified to become an obstruent. Blust notes that there are clear cases of glide fortition word-initially and word-medially in Austronesian languages (Blust 1994:112–113). This seems a plausible explanation for the case of Lom, where the quality of the reflexes of word-final PAN **u* has changed to become /e/ (in exactly those cases where it is followed by the intrusive /k/). But in the Tangkhul family, there is no independent evidence for diphthongization in the affected rhymes. Rather, evidence suggests that PTB diphthongs had become PTk monophthongs in these words before the epenthesis took place. There are many diphthongs in PTk, and yet only the rhymes which we would reconstruct on independent grounds as monophthongal high vowels are affected by the epenthesis.

6.1.1. Buccalization of Glottal Stop ("*nope*-Epenthesis")

Glottal stops sometimes occur at prosodic boundaries and in positions of prominence (see, for example, Dagbani as described in Hyman 1988). For related reasons, English *no!* is sometimes realized as [noʔ] or [nowʔ]. Acoustically, this is similar to [nop], accounting for English *nope* < [noʔ] < *no!*[7]. Likewise, earlier English *oh!* > English [ow] ∼ [owʔ] ∼ [owp]. This, we may call *nope*-epenthesis, after its best-known exemplar.

We might posit that PTk **-u* and **-i* became /-*uk*/ and /-*ik*/ via *nope*-epenthesis: **-u* > ***-uʔ* > /-*uk*/ and **-i* > ***-iʔ* > /-*ik*/. This explanation is problematic for several reasons: other cases of *nope*-epenthesis occur in interjections or other words that are largely confined to special prosodic environments (Hock 1991:124); in Huishu, the epenthesis is a regular sound change. *Nope*-epenthesis should not target one class of vowels preferentially; in Huishu and related cases, high vowels seem to be an essential conditioning environment for the sound change. Furthermore, an epenthesized glottal stop produced by this process would collide with other segments in the Huishu or Pre-Huishu segment inventory, no matter what order of events one proposed.

6.1.2. Constraint against Open Syllables

If sound changes occur in order to enhance the phonotactic well-formedness of the words that contain them, then it would follow that adding coda consonants improves the syllables to which they are added in some way. It makes little sense, however, to say that these developments are motivated by a constraint against open syllables. Indeed, the opposite constraint is widely believed to be a universal tendency. Fur-

[6]It should be noted that Blust (1994) argues both for and against epenthetic stops resulting from glide fortition, depending on the details of the specific case.

[7]For an alternative analysis of this phenomenon, see Hock (1991:124).

thermore, the fact that the process targets high vowels differentially complicates such an appeal. The constraint would have to be against open syllables with high vowel nuclei. But even given such a constraint, it seems odd that the epenthetic segment would not be some "minimally marked" segment such as /ʔ/ (which was already a legal coda in Huishu). And, of course, positing a universal constraint against syllable-final high vowels seems to simply and arbitrarily restate part of the generalization without explaining the phenomenon. Nevertheless, I will argue that there is a (perverse) sense in which this account is true: that open syllables with a high vowel nucleus are a "marked" structure.

6.2. Maintenance of Contrasts (Push Chain)

One might conceive of this type of epenthesis as part of a push chain. This explanation has the virtue of explaining the fact that it is high vowels (and perhaps other peripheral vowels) that are the targets of these epenthetic processes. Peripheral vowels are the most likely to be crowded uncomfortably by encroaching vowels because they have, as it were, no place to run. The distinctions made by such vowels can only be maintained, we might argue, by something drastic like epenthesis. We may also note, referring to the other languages in which the process has been observed, that it never seems to result in mergers.[8]

The impression that this was a kind of chain shift grows if we look at the changes that occurred in the monophthongal rhymes between PTk and Huishu, schematized in Figure 1. Considering only this data, it might seem plausible that

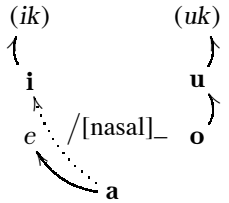

Figure 1: The development of Huishu monophthongs.

Huishu developed velar stops in order to keep the high-vowel rhymes from merging with the reflexes of PTk *-*a*, and *-*o*, which were creeping up from below.

This illusion is shattered quite decisively, however, if we look at a larger subset of the sound changes that occurred in rhymes between PTk and Huishu (Figure 2). If the motivation for the development of dorsal stop codas in Huishu was to preserve lexical contrasts, it is odd that so many mergers seem to have occurred in the language at about the same time. Huishu /*u*/ reflects no less than four PTk rhymes, including two very common diphthongs (PTk *-*ej* and *-*uj*). In light of this evidence, the push chain hypothesis seems contrived.

[8]This observation is due to Larry Hyman, p.c.

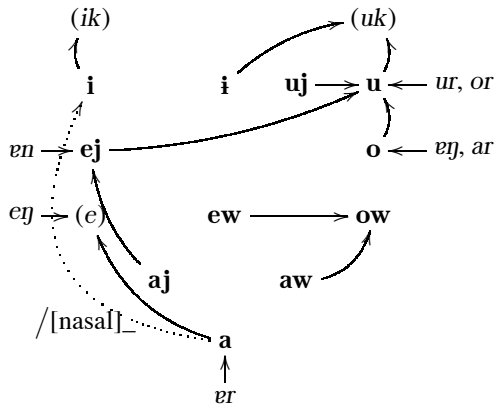

Figure 2: The development of Huishu monophthongal and diphthongal rhymes from PTk rhymes.

6.3. Maximal Use of Phonological Space (Drag Chain)

But what if, instead of a push chain, the development of dorsal consonants was part of a drag chain? The *-*t*, *-*k* > /-ʔ/ sound change left a gap in the coda inventory of Huishu. Perhaps the epenthesis of dorsal codas helped fill this gap. Other rhymes then shifted in the vowel space to fill the place of the high-vowel rhymes. Still other rhymes shifted to fill these gaps, thus accounting for the apparent counter-feeding interactions between pre-Huishu sound changes.

If these sound changes were part of a scheme to give Huishu a more balanced segment inventory that makes better use of the available phonological space, they have failed bitterly. Huishu is left not only with a somewhat odd inventory of rhymes (see Table 1) but with a situation where a disproportionately small number of words contain low vowels. In fact, what seems to have happened is that a

-*a*	(-*ɐ*)	-*e*	-*ej*	-*i*	-*o*	-*ow*	-*u*
-*am*	-*ɐm*	-*em*					
	-*ɐn*			-*in*			-*un*
-*aŋ*	-*ɐŋ*						-*uŋ*
	-*ɐr*						
	-*ɐp*	-*ep*					
				-*ik* [-ic]			-*uk*
-*aʔ*		-*eʔ*	-*ejʔ*		-*oʔ*	(-*ow*)	-*uʔ*

Table 1: Huishu rhyme inventory.

language with a rather symmetrical vowel and rhyme inventory (PTk) has suffered a dramatic reduction in this symmetry. This hypothesis has the further disadvantage of providing no good explanation for the fact that the high-vowel rhymes are the target of the stop epenthesis.

6.4. Syllable Isochrony

The insertion of dorsal stops after high vowels could help bring about syllable isochrony (ensuring that all syllables are about the same length). High vowels are typically shorter than non-high vowels, so something extra (i.e., codas) would have to be added to syllables with high-vowel nuclei in order to bring them into synchrony with the rest of the system. This would explain why the process targets high vowels as opposed to other vowels—it is a matter of duration. It would also explain the aspiration of the dorsal stops (as opposed to /-*p*/, which only appears after mid vowels), since the aspiration prolongs the duration of the syllable. However, this account does not explain why plosives are such a common outcome for this type of process (though their velarity could be explained by the proposal of Carvalho 2004 that velars have the feature [high]). Furthermore, this hypothesis would not predict the raising of *-*o* to /-*u*/ subsequent to dorsal stop epenthesis.

7. Proposal

Let us start with the principle that language change is the result of mistaken inferences. We may then say, as a corollary, that sound change is the result of misperception. By *misperception*, I mean the state of affairs in which a listener incorrectly attributes some intent to a speaker (for related views, see Ohala 1993, Blevins 2004, and others).

High vowels are particularly susceptible to devoicing for aerodynamic reasons, and a devoiced high vowel is (phonetically) a weak fricative. In Huishu and other languages that have developed intrusive obstruents after high vowels, the accidental fricatives resulting from HVD (high vowel devoicing) have been misparsed by perceivers as intentional fricatives or stops.[9]

Initial state	> **Automatic devoicing**	> **Phonetic implementation**	> **Phonologization**
*/u/ [u]	> */u/ [u̥] ∼ [u]	> */u/ [ux] ∼ [u̥]	> */ux/ [ux] */uk/ [uk]
*/i/ [i]	> */i/ [i̥] ∼ [i]	> */i/ [iç] ∼ [i̥]	> */iç/ [iç] */ik/ [ic]

HVD phenomena are widely known and fairly easy to explain from a phonetic standpoint. Since high vowels involve a relatively tight oral constriction (compared to other vowels) and are correlated with a small oral cavity, the superglottal pressure is likely to be higher for high vowels than for non-high vowels. It follows that the pressure drop across the glottis should be relatively lower for these vowels than for other vowels. Thus, the aerodynamic conditions coincident with the articulation of high vowels are less favorable for voicing than those for non-high vowels, and we would predict that unintentional devoicing should occur more frequently in

[9] I must thank John Ohala for informal discussion of these points, which inspired part of the analysis given here.

high vowels than in low vowels. When devoiced, high vowels become weak dorsal (palatal to velar) fricatives.

This tendency for high vowels to become partially devoiced has been phonologized (or, at least, made part of the language-specific phonetic implementation of high vowels) in some cases. A particularly well know example of this is Parisian French, where word-final high vowels devoice to become weak fricatives (Fónagy 1989:247).[10] The fricative codas of Singhi represent a further development of the same type of pattern as is found in French. Speakers reinterpreted devoiced vowels as vowels followed by homorganic fricatives. Speakers may have subsequently attributed the palatality of the fricative after /i/ to the vowel, and thus posited /s/ rather than /ç/ as the correct form for this coda.

Explaining the emergence of stop codas from these fricative codas is somewhat more challenging. It is clear that the fricative was "fortified" to become a stop, but this is a label for the process, not an explanation. The clues for one explanation lie in the phonetics of Huishu: the etymological obstruent codas of Tangkhul (and related languages) are unreleased, but the emergent stop codas of Huishu have a strong audible release—even aspiration. Suppose a pre-Huishu speaker hears the

p	*t*		*k*	*ʔ*
ph	*th*		**kh**	
	ts [tɕ, ts]			
	s [ʃ, *s*]	(*ç)	(*x)	*h*
v	*r*	*j*		
	l			
m	*n*		*ŋ*	

Table 2: Huishu onset inventory.

phonetic implementation that has been assigned to high vowels—a voiceless vowel or a vowel with a fricative coda. She notices the friction at the end of the word and mistakenly parses this friction as an attempt to produce another segment rather than as an aspect of the implementation of the vowel. What segment could it be? She is biased against labelling it a velar or palatal fricative, since these do not occur in her consonant inventory. Coronal and glottal fricatives do occur in her inventory, but fricatives never occur in coda position and so they too are disfavored. Dorsal stops, however, do occur in her consonant inventory. Aspirated velar stops occur word-initially, and other stops occur in codas. So, she assumes that the noise in the vowel was a defective attempt to produce /*k*/, which she then "restores" in her own speech (phonetically implemented as released or aspirated). Repeated enough times, this results in the observed sound change.

[10]Other (non-high) vowels devoice in similar contexts, but with less frequency (Fagyal & Moisset 1999; Smith 2003).

8. Discussion and Conclusions

The seeds of obstruent epenthesis after high vowels are aerodynamic and articulatory. These phonetic seeds take root and grow in the soil of language-specific perception. The emergence of dorsal obstruents after high vowels does not require a grammar-internal or otherwise teleological explanation: the fundamental facts about epenthetic segments of this type fall out cleanly from a perceptual-articulatory model of sound change. The change occurred because of a set of mistaken inferences. Aerodynamically and articulatorily induced variation was mistakenly attributed to speaker intent. It occurred in high vowels because they are more prone to devoicing than low vowels. The existing phonological inventory of pre-Huishu gave the new form the upper hand in a lop-sided perceptual battle. Open syllables with only high vowels are relatively more "marked" than open syllables with low vowels to the extent that processes like this one are more likely to close them. As for the articulatory properties of emergent obstruents, they proceed directly from the articulatory properties of the source vowel.

My account of dorsal stop epenthesis has the added benefit of explaining the fact that, in Grassfields Bantu languages, stop epenthesis and spontaneous aspiration have the same conditioning factor—vowel height. The devoicing of extra-high vowels could be misattributed to a preceding aspirated stop as easily as it could be misperceived as a trailing obstruent. Thus, this aspiration process can be seen as an assimilation to the same environment implicated in the epenthesis process.

This paper has identified an under-studied cluster of empirical phenomena—the emergence of non-etymological dorsal obstruents after high vowels—and in accounting for this set of phenomena, has added an (apparently novel) explanation to the repertoire of perceptual-articulatory accounts of sound change. In doing so, it has also argued that grammatical competence (specifically phonotactic knowledge) plays a significant role in the (mis)perception of speech sounds, but has argued against teleological accounts of sound change.

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David Mortensen
1203 Dwinelle Hall
University of California, Berkeley
Berkeley, CA 94720-2650

mortensen@berkeley.edu

Goal and Source: Their Syntactic and Semantic Asymmetry

SEUNGHO NAM
Seoul National University

0. Introduction

This paper investigates the syntactic and semantic difference between two types of directional PPs – (i) Goal locatives (e.g., *into the store*) and (ii) Source locatives (e.g., *from the store*). Their contrastive syntactic behavior is identified in various constructions, and we account for the contrast by assigning them two distinct underlying base positions. Further, we argue that their systematic semantic differences are predicted by their semantic scope in event structure.

Jackendoff (1983, 1990) does not take thematic roles like Source and Goal as grammatical primitives, and the notions are defined in his lexical conceptual structure of event. Thus in Jackendoff (1990), Goal and Source are defined as the arguments of Path-functions, [$_{\text{Path}}$ TO ([$_{\text{Place}}$ …])] and [$_{\text{Path}}$ FROM ([$_{\text{Place}}$ …])], respectively. Prepositions like *to, into* and *onto* typically take a Goal argument, and *from, from under, from behind,* and *off* can take a Source argument.

The paper is organized as follows: Section 1 illustrates the Goal-Source asymmetry in syntax, specifically in the structures of Preposition Incorporation, Prepositional/Pseudo Passives, PP-dislocation and locative alternations. Section 2 shows the semantic contrast between Goal and Source PPs with respect to adverbial modification and aspectual composition. Section 3 proposes two distinct underlying base positions of Goal and Source locatives, and accounts for the syntactic and semantic contrast in terms of more fine-grained event structure. Further, we propose a set of mapping rules which link the locative PPs in event structure with their syntactic positions.[1]

[1] Koopman (1997) proposes two locative functional heads in Dutch, i.e., 'Place' for non-directional locatives, and 'Path' for directions ones. Thus Path Phrase may contain a Place Phrase. Kracht (2002) also identifies directional and non-directional senses in terms of 'Modalizer' and 'Localizer,' respectively. Maienborn (2001), dealing with only non-directional locatives in German, proposes three syntactic base positions: (i) "frame-setting modifiers"; (ii) "external locatives", and "internal locatives."

1. Goal-Source Asymmetry in Syntax

1.1. Preposition Incorporation

Preposition incorporation (PI, henceforth) reveals the Goal-Source contrast as well as the contrast between directional vs. non-directional locatives. Baker (1988) illustrates that the PPs of Dative and Goal are most common in PI, and claims that the arguments associated with the applicatives are theta-marked ones, i.e., "inner locatives" in the sense of Hornstein and Weinberg (1981). The following data (1) in Kinyarwanda and (2) in Chichewa are from Kimenyi (1980), and Baker (1988), respectively.

(1) a. Abaana b-iica-ye ku meeza
children SP-sit-ASP on table
b. Abaana b-iica-ye-ho ameeza
children SP-sit-ASP-on table
'The children are sitting on the table.'

(2) a. Ndi-na-tumiz-a chipanda cha mowa kwa mfumu
1sS-PAST-send-ASP calabash of beer to chief
'I sent a calabash of beer to the chief.'
b. Ndi-na-tumiz-ir-a mfumu chipanda cha mowa
1sS-PAST-send-to-ASP chief calabash of beer
'I sent the chief a calabash of beer.'

The verbal complex in (1b) contains an applicative suffix *-ho* 'on' instead of the lexical preposition *ku* 'on' in (1a). (2a) has a lexical preposition *kwa* 'to', but in (2b) the applicative suffix *-ir* 'to' (Goal) is incorporated into the verbal complex. Baker (1988) and Kimenyi (1980), however, illustrate few source locatives.[2]

Koopman (1997) shows that Dutch postpositions and particles can incorporate to V deriving a directional interpretation, but prepositions cannot due to their non-directional reading. A prepositional PP may derive a goal directional reading, if it is selected by a motion verb. Thus (3a) has an incorporated (directional) preposition *in* between the auxiliary verb *is* and the main verb *geklommen* 'climb', and (3b) has a directional postposition *door* 'through' incorporated to V after the auxiliary verb *is* 'be.'

(3) a. omdat zij de boom is in geklommen
because she the tree is in climbed
'because they climbed into the tree'

---

[2] The following is the sole example of PI with a Source argument in Baker (1988:240).

(i) Kambuku a-na-b-er-a mkango njinga.
leopard SP-PAST-steal-**APPL**-ASP lion bicycle
'The leopard stole the bicycle from the lion.'

Baker reports that (i) also has a Benefactive reading: i.e., 'The leopard stole the bicycle for the lion.' But the Source reading obtains since the Source is a true argument of the verb 'to steal.'

b. omdat zij het bos is door gelopen
because she the forest is through walked
'because she walked through the forest'

Further, unlike Goal directional PPs, Dutch Source directional PPs do not allow PI. Thus, the goal type particle *heen* may be incorporated to V as in (4a), but the source type particle *vandaan* in (4b) may not.

(4) a. dat zij de jas over de stoel hebben heen gelegd
that they the coat over the chair have prt put
'that they laid the coat over the chair'
b. dat dit book (van) onder het bed is (?*vandaan) gekomen
that this book from under the bed is from come.
'that this book came from under the bed'

Notice that *van* 'from' in (4b) is a preposition. The source PPs with *van*, however, can be dislocated by pied-piping and PP-over-V movement, while goal type PPs cannot. (See Koopman (1997) for examples illustrating this point.)

Munro (2000) shows that some verbs in Choctaw and Chickasaw can occur with more than one applicative prefix. She says "there is a strong constraint against verbs with a total of more than four arguments". Munro (2000) notes that the order of the prefixes in the combinations, specifically in Chickasaw, is subject to the following constraint: Non-directional prefixes precede Source ones which precede Goal-directional ones. This applicative prefix ordering suggests that the different locative argument/adjuncts occupy different syntactic positions, and further they modify different semantic domains.

1.2. Prepositional (Pseudo) Passives

Prepositional passives show a similar contrast between Goal and Source locatives. (5-7) below illustrate active-passive pairs, where the passive sentences have a stranded preposition, and its object NP is promoted to the subject position. When a PP denotes a benefactive (5), goal (6), or comitative (7), its object NP is allowed to be the passive subject. The data are quoted from Couper-Kuhlen (1979).

(5) a. His surviving brother provided <u>for John's widow</u>. [benefactive]
b. John's widow was provided for by his surviving brother.

(6) a. Several magistrates spoke <u>to him</u>. [goal]
b. He was spoken to by several magistrates.

(7) a. Anyone cannot room <u>with Martha</u>. [comitative]
b. Martha can't be roomed with by anyone.

When the PP denotes a circumstantial location or source, however, its NP is

hardly found in the passive subject position. Thus, the (a)-sentences with a goal locative in (8-10) are acceptable, whereas the (b)-sentences with a source locative sound bad.

(8) a. The store can be run to in a matter of minutes … [goal]
b. *The store can be run from in a matter of minutes … [source]

(9) a. If the boat is jumped into … it may capsize. [goal]
b. *If the boat is jumped from … it may capsize. [source]

(10) a. The house was moved into three weeks ago … [goal]
b. ?*The house was moved from three weeks ago … [source]

Notice that the following minimal pairs show the same contrast in between directional and non-directional uses of the prepositions.

(11) a. The road could be driven across only at great risk …
b. *The road could be played across only at great risk …

(12) a. The gate mustn't be gone beyond …
b. *The gate mustn't be played beyond …

1.3. Movement and Ordering

We have other syntactic evidence revealing the contrast between Source and Goal PPs: That is, Source PPs can be easily dislocated, while Goal PPs cannot. The Source PP *from Los Angeles* in (13) can move to the front by Topicalization, whereas the Goal PP *to Chicago* resists movement. This suggests that the Goal PP behaves more like a true complement of the verb *send* than the Source PP does.

(13) a. From Los Angeles, John sent the letter to Chicago.
b. ??To Chicago, John sent the letter from Los Angeles.

Now we note that a Source PP is more ready to scramble with a temporal/aspectual PP. Thus, the PP *from the library* in (14) can move over the durative adverbial *for ten minutes*, but the Goal PP *to the library* in (15) is not allowed to move over the time-frame adverbial *in ten minutes*.

(14) a. He ran from the library for ten minutes.
b. He ran for ten minutes from the library.

(15) a. He ran to the library in ten minutes.
b. ??He ran in ten minutes to the library.

Goal PPs, combining with a transitive verb, always specify the location or the

movement of the Theme argument, i.e., the argument in direct object position. So (16a) entails that 'Mary was in the garden' and (16b) entails that 'the hay moved onto the truck.'

(16) a. John saw Mary in the garden.
b. John loaded the hay onto the truck.

If the verbs take a Source PP, however, it may denote either the location of the subject argument or the location of the object argument. That is, *from the rooftop* in (17a) refers to the location of *John* (the subject), and *from the ground* in (17b) refers to the source location of *the hay*. In other words, we can say that the Source PP *from the rooftop* is 'subject-oriented' and the other PPs in (17a,b) are 'object-oriented.'

(17) a. John saw Mary in the garden from the rooftop.
b. John loaded the hay onto the truck from the ground.

We note here that the PPs are not free in ordering: that is, if an object is followed by an object-oriented PP and a subject-oriented PP in English, the former always precedes the latter. Therefore, the two PPs in (17a) cannot scramble as in (18a), but those in (17b) can as in (18b). (18a) may have a reading where 'the rooftop was in the garden,' which is not the intended reading of (17a).

(18) a. *John saw Mary from the rooftop in the garden.
b. ?John loaded the hay from the ground onto the truck.

We have seen that Goal PPs are always oriented to the object/theme argument but Source PPs may be oriented to the subject argument. The data also show that two locative PPs oriented to the same argument (e.g., Theme) can change their positions, but those oriented to different arguments cannot.

1.4. Locative Alternations

English and many other languages allow locative alternations like the following:

(19) a. Bees are swarming in the garden. ⇔
b. The garden is swarming with bees.

(20) a. John sprayed paint on the wall. ⇔
b. John sprayed the wall with paint.

(21) a. The woman embroidered flowers on the jacket. ⇔
b. The woman embroidered the jacket with flowers.

These alternation patterns have been attested and well described in many languages. In (19a), the intransitive verb *swarm* takes a locative PP *in the garden*, but the same location *the garden* shows up as a subject in (19b). (20) and (21) illustrate more alternation patterns between two transitive structures: one of the structures takes a locative PP, which turns into a direct object in the other structure.[3]

Locative PPs involved in such alternations are mostly Goal-type locatives, i.e., the nouns of the PPs denote a goal/result location of the relevant argument – typically a Theme. Thus, (19-21) entail 'bees are in the garden,' 'paint ends up being on the wall,' and 'flowers come to exist on the jacket,' respectively. Syntactically, the locative arguments are promoted to subject in (19) or to direct object in (20-21), and we claim that the promotion should be subject to a syntactic constraint: that is, only V'-internal/inner locatives can be promoted by locative alternation. In a more general context, we claim that V-modifiers like Goal-type PPs allow locative alternation while VP-adjuncts like Source and Path-type PPs hardly do. Further, non-directional PPs – higher VP-adjuncts – do not participate in locative alternation, either.

2. Goal and Source in Event Structure

2.1. Adverbial Modification and Locative PPs in Event Structure

We argue that the various modes of locative modification require a more fine-grained event structure. Alsina (1999), Tenny (2000), and Travis (2000) identify "outer" (causing) event and "inner" (result/core) event. Pustejovsky (1995), Eckardt (1998) and Ernst (1998) account for (scopally) ambiguous adverbial modification in terms of event structure.

(22) a. Harry departed the room <u>rudely</u>.
b. The police <u>quickly</u> arrested John.
c. John <u>clumsily</u> spilled the beans.

The three sentences above all have an adverb that gives a manner reading, thus (22a) has a reading where Harry might have interrupted others by banging the door, for example. We can easily get such manner readings in (22b,c), too. Further, the sentences have another reading where the adverbs modify the whole event, i.e., they are predicated of the whole event. Thus (22a) means that 'the event of Harry's departing the room was rude'. Pustejovsky (1991) represents the ambiguous readings in a parallel event structure as the following.

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[3] There have been many proposals to account for these locative alternations. Pustejovsky (1991, 1995) accounts for the transitive alternations like the following in terms of "HEAD" underspecification of event structure.

(i) *The enemy sank the boat.*
(ii) *The boat sank.*

Further, Lee et al. (1998) and Alsina (1999) extend the underspecification method to locative and causative alternations.

(23) Pustejovsky (1991): *Harry departed the room* <u>*rudely*</u>.

a.

```
                E0:Transition
               /              \
        E1:Process            E2:State
       /        \                |
    MOD       E1:Process     [harry is-not-in the-room]
     |           |
  [rudely]   [harry departed]
```

b.

```
              E0:Transition
             /              \
          MOD              E0: Transition
           |              /            \
       [rudely]      E1:Process      E2:State
                        |               |
                 [harry departed]  [harry is-not-in the-room]
```

(23a) represents the manner reading of *rudely* in (22a), and (23b) the other reading of (22a) where the modifier (MOD) scopes over the whole event E0.

Let us now see another adverb *again*, a so called "repetitive" adverb, which can be interpreted ambiguously in the following sentences. They are quoted from Dowty (1979).

(24) a. John closed the door <u>again</u>.
b. John fell asleep during the lecture, but Mary quickly shook him awake <u>again</u>.
c. The book had fallen down, but John put it on the shelf <u>again</u>.

According to Dowty (1979), (24a) above is ambiguous: (i) the event of John's closing the door is assumed to have occurred previously, and (ii) the state of the door being closed is assumed to have existed previously, i.e., not necessarily as a result of John's action. In other words, the first reading indicates that the whole event is repeated, while the second reading means that only the result state of being closed is repeated. Tenny (2000) calls the first reading 'repetitive', and the second reading 'restitutive'. We have rather clear ambiguity in (24b,c).

This type of ambiguity in adverbial modification – *rudely, quickly, again* – naturally suggests that each of the adverbs can be generated in two distinct base positions in extended VP structures: i.e., VP-internal subject structure of Koopman & Sportiche (1991); VP-shell structure of Larson (1988); and VP in L-syntax of Hale and Keyser (1993, 2002), among others. Cinque (1999) has proposed various underlying positions for adverbs in his "universal hierarchy of functional head projections," and he assigns two underlying positions to an adverb like *again* or *quickly*. Thus, *again* is generated under either Asp-repetitive(I) or

Asp-repetitive(II), and *quickly* under Asp-celerative(I) or Asp-celerative(II).

Now let us consider how Goal and Source PPs interact with *again*. Their syntactic behavior we discussed in section 2 suggests that Goal PPs should be syntactically much closer to the verb than Source PPs are. Now considering their semantic interaction with *again*, we claim that Goal PPs constitute a core event (i.e., result state) whereas source PPs do not. Therefore, *again* allows a restitutive (narrow scope) reading with a Goal PP but not with a Source PP.

(25) a. John drove to New York again. [ambiguous]
b. John drove from New York again. [repetitive reading only]

(26) a. John sent the book to New York again. [ambiguous]
b. John sent the book from New York again. [repetitive reading only]

Again in (25a) gives two readings: (i) repetitive reading – 'the event of John's driving to New York is repeated', and (ii) restitutive reading – 'the state of John's being at New York is resumed/restituted'. The second reading does not imply that John drove to New York previously. (25b) however, does not give a restitutive reading, since the sentence lacks an expression that may denote a result state. The same contrast holds for (26a) and (26b). We will see shortly that the semantic contrast between Source and Goal PPs can be accounted for by assigning them two independent semantic scopes in the event structure.

2.2. Aspectual Division

Cinque (1999) and Travis (2000) identify (at least) two aspectual domains in syntax, which Tenny (2000) labels "higher/viewpoint aspect" and "middle/situation aspect". We argue that Source-type PPs scope over the whole situation aspect, so they, unlike Goal PPs, do not shift the aspectual character (situation aspect) of the inner event denoted by the lower VP.

(27) a. Mary ran (for ten minutes/*in ten minutes).
b. Mary ran to the store (in ten minutes/*for ten minutes).
c. He ran from the library (for ten minutes/*in ten minutes).

(27a) denotes an atelic activity, which does not normally go with a time-frame adverbial like *in ten minutes*. When a Goal PP combines with the verb, however, it changes the aspectual character of the verb, so the sentence denotes a telic event of accomplishment. Thus, (27b) is fine with a time-frame adverbial but it is bad with a durative adverbial *for ten minutes*. Unlike Goal PPs, the Source PP *from the library* does not change the aspectual character of the verb, so (27c) behaves in the same way as (27a) does. This contrast between Goal and Source PPs on aspectual shift suggests that the Goal PPs should be treated just like an internal argument which participate in aspectual composition. The incremental (or quantized) theme discussed in Tenny (1994), Verkuyl (1993), and Krifka (1995) is an

internal argument which determines the aspectual character of the VP.

Let us assume that, in a fine-grained VP internal structure, Asp-head separates the lower and the higher VPs. Then, we propose that Goal PPs are generated under the AspP while Source PPs are generated in a position higher than the AspP. We will implement the asymmetry in the extended VP structure and event structure proposed shortly in section 3.

2.3. Non-locative Source PPs

Source PPs headed by *from* in English often give a non-locative reading, thus the *from* PPs below refer to Cause in (28-29) and Agent in (30).

(28) a. Harry died from AIDS complications. [Cause]
b. We have reports of death from AIDS complications.
(29) a. No damage was caused from the shooting. [Cause]
b. Their estimates indicate damage from the freeze totals $385 million.
(30) a. We have been promised from the top in Moscow that ... [Agent]
b. … challenge/support/donation/help/approval from the company

The Source PPs in (28) and (29) both denote a state or an event which caused a result state. In (28a) Harry's state of being under AIDS complications caused his death, and in (29a) the shooting event caused no damage. We also find in (28b) and (29b) the same semantic relation between a predicative noun (*reports* and *damage*) and a Source PP. Thus the sentences take these PPs as composing a causing sub-event of their event structures. Further, (30a) shows that a Source PP can denote an Agent of passive sentences, and such Agent reading can be obtained in nominal constructions in (30b). If an Agent argument shows up in a complex event of a transitive verb, it does not play a role in its result state. Instead the Agent role is essential in its causing sub-event. We will see that these non-locative readings of Source PPs can be properly represented in the event structures proposed in 3.2.

3. Proposal: Base Positions of Locative PPs and their Semantic Scope

Here we adopt the extended VP structure of Hale and Keyser (1993), and propose two separate base positions where Goal PPs and Source PPs are generated. Further, extending Pustejovsky's (1991, 1995) event structure, we represent their semantic scope in the event structure. A complex event contains at least two conjoined sub-events: one is typically a Process which denotes a 'causing' sub-event, and the other is a State which denotes a 'result' state. In the event structures we illustrate in this section, the Process sub-event is assumed to temporally precede or overlap with the State sub-event.

3.1. Goal PPs: Internal Locatives

Let us first consider Goal PPs like those in (31): the Goal PPs (PP_G) are generated under the lower VP, where a Goal PP combines with V2 to form V2' as shown in

(32). V2' may contain an internal argument (Theme).

(31) a. John swam <u>to the boat</u>.
b. Marta loaded the hay <u>onto the truck</u>.

(32) $[_{VP1}$ DP1 $[_{V1'}$ V1 … $[_{VP2}$ … $[_{V2'}$ (DP2) V2 … $PP_G]]]]$

As we have seen in section 2, Goal PPs are interpreted as composing a result state. A Goal PP generated under the lower VP specifies the final location of Theme argument, which shows up as a direct object of a transitive verb or as a subject of an intransitive verb. Then the result state will be composed of the Theme and the Goal. Thus, we represent the event structure of (31a) as (33) below. The lexical verb *swim* does not denote a complex event by itself, but the Goal PP extends the simplex event (E1) to a complex one with a result state (E2). (31a) entails the result state (E2) 'John was at the boat'.

(33) John swam to the boat.

```
          E0:Transition
         /              \
   E1:Process        E2:State
       |                 |
  [john SWIM]      [john BE-AT the-boat]
```

We take the event structure (33) as a semantic structure which can be mapped to its syntactic VP structure of (32). Thus, we characterize the mapping as follows:

(34) Mapping-1: PPs constituting a result state are generated in the lower VP.

Notice that the Goal PP is then treated exactly like a resultative phrase, which evidently forms a result state in the following sentences.

(35) a. The potter baked the clay <u>hard</u>.
b. She cooked the food <u>brown</u>.
c. The dog barked <u>the neighbors awake</u>.

That is, each of the resultative phrases in (35) denotes a predicate of a result state, and they are generated under the lower VP. As we discussed in 2.1, *again* modifies a result state to give a "restitutive" reading, then due to (34) Mapping-1 the adverb is also generated under the lower VP.

3.2. Source PPs: Intermediate Locatives

Now let us consider the Source PPs in (36) below: We claim that the Source PP

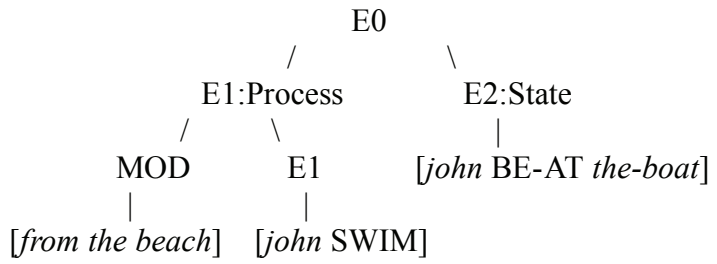
adjuncts (PP_S) should be generated under the higher VP, so they scope over V1' containing the lower VP2 as shown in (37).

(36) a. John swam to the boat <u>from the beach</u>.
b. Marta sent the book <u>from Chicago</u>.

(37) $[_{VP1}$ DP1 … PP_S $[_{V1'}$ V1 … $[_{VP2}$ … $[_{V2'}$ (DP2) V2 …]]]]

As we have seen in 2, the Source PPs do not compose the result state, so they do not affect the aspectual character of the verb. The Source PP in (36a) indicates the initial point of John's movement, so it is represented as a modifier of the causing event in (38) below.[4] (39) states the mapping relation between the semantic structure of (38) and the syntactic configuration of (37).

(38) John swam to the boat from the beach.



(39) Mapping-2: PPs modifying a causing event are generated under the higher VP.

As we have seen in 2, there are other adverbials that modify the causing sub-event (Process): e.g., subject-oriented adverbials like *reluctantly* in (40a), temporal (frame) adverbials like *in an hour* in (40b), and manner adverbials like *clumsily* in (40c). We claim that the adverbials, just like Source PPs, are also generated under the higher VP.

(40) a. The man <u>reluctantly</u> sold the car to me.
b. John painted a picture <u>in an hour</u>.
c. The boy <u>clumsily</u> spilled the beans over the floor.

Some verbs of removing like *empty, remove, clear* and *wipe* take a Source PP as a core argument as in (41). Then the PP should be generated in the lower V2' just like Goal PPs.

[4] Again, the meaning of the verb determines what entity is located by the source PP: (36a) implies John's change of location, and (36b) implies the book's change of location.

(41) a. They emptied water <u>from the tank</u>.
b. He wiped crumbs <u>off the table</u>.

Source PPs may have a non-locative reading, so we noted in 2.3 that the PP *from AIDS complications* in (42) below denotes the cause of Harry's death.

(42) Harry died <u>from AIDS complications</u>.

```
                    E0
                  /     \
            E1:State     E2:State
            |                |
[harry BE-UNDER AIDS compl]  [harry BE dead]
```

In 2.1, we noted that *again* and *quickly* may be ambiguous with respect to their semantic scope. Thus the adverbs in (43) below can modify either a sub-event (result state or process) or the whole event. When they modify the whole event, the PPs should be generated adjoined to the higher VP due to (39). Thus we can represent the ambiguity of *again* as in the following:

(43) a. John drove to New York <u>again</u>.
b. The police <u>quickly</u> arrested John.

(44) a. John drove to New York again. [*again* in restitutive reading]

```
                E0
              /     \
        E1:Process     E2:State
            |        /      \
[john DRIVE-ACT]  MOD      E2:State
                   |          |
               [again]  [john BE-AT New York]
```

b. John drove to New York again. [*again* in repetitive reading]

```
                E0
              /     \
           MOD       E0
            |      /     \
        [again]  E1:Process  E2:State
                    |          |
            [john DRIVE-ACT]  [john BE-AT New York]
```

4. Concluding Remarks

Based on the extended VP-structure of Hale and Keyser (1993) and the event

structure of Pustejovsky (1991), we proposed a more explicit mapping between syntax and semantics of directional PPs – particularly Goal and Source PPs. Thus, we argued that goal locative PPs are generated under the lower VP and compose a result state sub-event, and source locative PPs are generated under the higher VP and modify a process sub-event. The syntactic behavior of Source and Goal PPs discussed in section 2 suggests in general that Goal PPs have more integrity with the verb than Source PPs do. We illustrated their contrast in terms of Preposition Incorporation (1.1), Pseudo-passive (1.2), Movement (1.3), and Locative Alternation (1.4). The semantics of Source and Goal PPs is characterized largely in terms of scope: that is, their scope properties in event structures are supported by the ambiguous readings of various adverbs (like *again*, *quickly*, and *rudely*) (2.1), and further by the clear contrast in their contribution to aspectual interpretation (2.2).

We expect that the proposed account will be supported more firmly if we explore their syntactic and semantic behavior in relation to the wider range of PPs and adverbials. We have not dealt with intensional locative PPs (e.g., frame-setting, perspectival, and speech act oriented locatives) or symmetric Path-type PPs (e.g., *through the tunnel* and *over the bridge*). But these PPs should be included in further research on locative modification.

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Seungho Nam
Linguistics Department
Seoul National University
Seoul, 151-742
Republic of Korea

nam@snu.ac.kr

Meta-constraints: Constraint Interaction and Gender Assignment in Ukrainian*

TORE NESSET
University of Tromsø

0. Introduction

Gender (agreement class) represents a perfect testing ground for hypotheses about constraint interaction in that conflicts between constraints assigning different genders often arise. In this paper I present an Optimality Theory (OT) analysis of gender assignment in Ukrainian. The contribution of the paper is twofold. First, I show that nine ranked constraints suffice to account for the assignment of gender to the vast majority of Ukrainian nouns. Secondly, it is argued that the constraint rankings in part fall out as automatic consequences of universal constraints on constraint interaction – what I refer to as "meta-constraints". In addition to the widely accepted Panini's Theorem, I shall propose a meta-constraint that I call the Core Semantic Override Principle.

The meta-constraint approach explored in this paper bears on a current debate in OT. While ranking of constraints is essential in OT, some researchers have noted that phonological systems display less variation than free ranking would give us (cf. Steriade 2001, de Lacy 2003). My analysis suggests that this does not only apply to phonology, and that overgeneration can be restricted in principled ways by means of meta-constraints.

After a thorough discussion of the relationship between declension and gender in section 1, semantic constraints are investigated in section 2. Section 3 explores constraint interaction and meta-constraints, before the contribution of the paper is summarized in section 4.

1. Morphological Constraints

For the purposes of this paper I adopt Hockett's (1958:231) well-known definition: "Genders are classes of nouns reflected in the behavior of associated words".

* I would like to thank Henning Andersen, Hans-Olav Enger, Bruce Morén, Curt Rice and audiences at BLS, University of Tromsø and University of North Carolina at Chapel Hill for valuable comments on earlier versions of this paper. Thanks also to Tamara Lönngren for sharing her knowledge of the Ukrainian language with me. All errors are mine.

Ukrainian has three genders, masculine, feminine and neuter, as witnessed by the sentences in (1), where the nouns take different agreement targets.[1]

(1) a. Na stoli ležav smačnyj xlib.
on table lay.MASC.SG tasty.MASC.SG bread
'On the table there was tasty bread.'

b. Na stoli ležala smačna perepička.
on table lay.FEM.SG tasty.FEM.SG Ukrainian pastry
'On the table there was tasty Ukrainian pastry.'

c. Na stoli ležalo kopčene salo.
on table lay.NEUT.SG smoked.NEUT.SG bacon
'On the table there was smoked bacon.'

In Ukrainian, there is a close relationship between a noun's gender and its inflection class (declension). I propose six declensions instead of the more traditional analysis with four declensions (cf. e.g. Bilodid 1969 and Hryščenko 1997). Since my analysis is somewhat untraditional, it is useful to start with an explicit definition of inflection class:

(2) Inflection class:
[A] class of lexemes which share:
- a paradigm consisting of a set of "cells", i.e. inflectionally realised morphosyntactic properties or combinations of properties [...],
- all the inflectional markers, or exponents, which realise these cells [...] (Carstairs-McCarthy 2000:630).

On the basis of the definition in (2), I shall say that two nouns belong to the same declension if they have the same inflectional endings in the relevant paradigm cells. If not, they belong to different declensions. However, as pointed out by Carstairs-McCarthy (2000:632), there is one systematic exception. Even if two nouns combine with different endings, it is customary to relegate them to the same declension if the choice between the endings is predictable on independent grounds. This practice will be adopted here. Thus, *zemlja* 'earth, land' and *voda* 'water' belong to the same declension although the former takes the ending *–eju* in the instrumental singular, while the latter has *–oju* in this cell of the paradigm. The reason is that the choice of ending is predictable on the basis of the quality of the stem-final consonant. After a palatalized ("soft") consonant *–eju* is selected, while *–oju* occurs after non-palatalized ("hard") consonants.

With the definition in (2) in mind, consider now the list of endings given in (3). The table contains the endings in the singular only, since this is sufficient to establish the number of declensions that are relevant for gender assignment. In

[1] The sentences in (1) were produced by a native speaker of Ukrainian. Throughout the paper, examples are given in transliterated orthography.

order to avoid unnecessary complications, endings combining with stems in palatalized consonants have been omitted in cells with alternations of the *–eju*/*–oju* type treated above. All endings are given in phonemic transcription. The choice between the alternative endings in column 1 is partly predictable (see e.g. Pugh and Press 1999:70f. and Shevelov 1993:958 for overviews). The endings given in column 5 are those of nouns with (oblique) stems in /t/, e.g. *telja* 'calf' (cf. genitive singular *teljat-y*). Nouns with (oblique) stems in /n/ (e.g. *im'ja* 'name', cf. genitive singular *imen-i*) are inflected somewhat differently. However, since the choice of endings is predictable from the quality of the stem-final consonant, the differences do not form the basis for establishing two declensions. I have only included the endings of the /t/-stems in the table, since these nouns constitute the larger set and even evince some productivity (Shevelov 1993:959). Column 6 comprises so-called indeclinable nouns, i.e. nouns that combine with a zero ending throughout the paradigm. While these nouns are traditionally treated as standing outside the declension system, Corbett and Fraser (2000a:308), observe that the fact that nouns of this type do not combine with other endings than the zero ending is itself a fact about their inflectional behavior. Therefore, including them in the table seems justified.

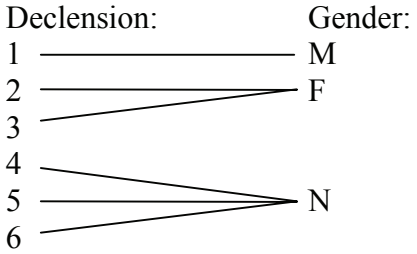
(3) Ukrainian noun inflection: endings in the singular

	1	2	3	4	5	6
Nominative	-Ø, -o	-a	-Ø	-o	-a	-Ø
Accusative	-Ø, -a	-u	-Ø	-o	-a	-Ø
Genitive	-a, -u	-y	-i	-a	-y	-Ø
Dative	-u, -ov'i	-i	-i	-u	-i	-Ø
Instrumental	-om	-oju	-ju	-om	-am	-Ø
Locative	-i, -u, -ov'i	-i	-i	-i	-i	-Ø
Vocative	-e, -u	-o	-e	-o	-a	-Ø
Examples	*stil* 'table'	*noga* 'leg'	*sil'* 'salt'	*slovo* 'word'	*telja* 'calf'	*pjure* 'purée'

How many declensions can be established on the basis of the table in (3)? Many cases involve considerable syncretism. For instance, in the locative, the ending *–i* is found in five of the six columns. Nevertheless, each column represents a declension. Consider first the instrumental, where we have five different endings. This enables us to establish five declensions. What remains to be shown is whether columns 1 and 4 represent different declensions even though they display the same ending in the instrumental case (and some other cases). At least two arguments suggest that we are dealing with two different declensions. First, columns 1 and 4 involve different endings in the accusative and the vocative. Secondly, while column 1 involves two or three endings in several cases, no such variation is found in column 4. Since the two columns contain different sets of endings, the definition in (2) enables us to establish a total of six declensions for Ukrainian.

Against this line of reasoning one might object that some of the differences are predictable on independent grounds if gender is taken into consideration (cf. Andersen 1994 for an analysis along these lines). For instance, nouns with the endings in column 4 are neuter, while nouns with endings from column 1 belong to the masculine gender. Hence, it might be argued, the two columns represent one declension since the differences are predictable from gender. However, Corbett (1982, see also Corbett 1991 and Corbett and Fraser 2000a) has shown that an approach where declension is predicted on the basis of gender is problematic for Russian, and his argument seems to hold for Ukrainian as well. Consider the relationship between declension and gender, which is spelt out below.[2]

(4) The declension-gender interface



As can be seen from the figure, gender is predictable from declension since a unique path takes us from each declension to one and only one gender. However, if we take gender to be the basis for predicting declension, we get into trouble. For instance, feminine gender is compatible with classes 2 and 3, so if the lexical representation of a noun includes reference to feminine gender, there is no way to infer from this how the noun is inflected. In order to save the gender-to-declension approach, one would have to rely on extensive lexical marking of declension. For instance, one might have to mark all the nouns of class 3 as lexical exceptions. The declension-to-gender approach, on the other hand, does not lead to such problems. In the following discussion, therefore, I shall adopt the latter approach. I shall not conflate any classes even if the differences between them are predictable from gender. Accordingly, I shall assume each of the six columns in the table in (3) to be separate declensions.

On the basis of the figure in (4), I propose the following gender assignment constraints:

[2] The figure is somewhat simplified insofar as there are some masculine nouns in declension 2 (e.g. *djadja* 'uncle') and several non-neuters in declension 6 (e.g. the masculine *proteže* 'protégé' and the feminine *ledi* 'lady'). As will become clear in section 2 below, these nouns will be accounted for by means of semantic constraints, which I assume take precedence over the relevant morphological constraints. The nouns in question are therefore not relevant for the present discussion of morphological assignment constraints.

(5) Morphological constraints (declension to gender)
a. Declension 2 → F
b. Declension 3 → F
c. Declension 4 → N
d. Declension 5 → N
e. Declension 6 → N

The constraints are labeled according to the nature of the information to the left of the arrows. Since the declensions are aspects of the morphology of the relevant lexemes, the constraints in (5) are referred to as "morphological". The information to the right of the arrows represents the genders, which I abbreviate as M (masculine), F (feminine) and N (neuter). The arrows stand for implicational relationships between two pieces of information, in this case declension and gender. Notice that the arrows do not represent procedural rewrite rules.

Under (5) I have not included a constraint for the masculine gender. As can be seen from (4), however, there is a one-to-one relationship between declension 1 and the masculine gender. Accordingly, it is possible to state a constraint capturing a bi-implicational relation between declension 1 and the masculine gender. However, while such a constraint may be realistic in that speakers in this case may establish the gender from the declension and vice versa, this constraint is superfluous in the formal analysis of gender assignment in Ukrainian. On the basis of numerical preponderance and the assimilation of borrowings, Corbett and Fraser (2000b:68) argue that masculine is the default gender for nouns in Russian (and declension 1 the default declension class). Their arguments seem to carry over to Ukrainian as well, and I therefore propose the constraint in (6) assigning masculine gender by default. The suspension points to the left of the arrow indicate that no particular information is required in order to motivate the selection of the masculine. This gender is assigned to all the nouns to which other constraints do not apply:

(6) Default constraint
… → M

2. Semantic Constraints

While the constraints proposed in section 1 suffice to predict the correct gender of the majority of Ukrainian nouns, additional constraints are required in some cases. Ukrainian nouns denoting male persons or animals belong to the masculine gender, while nouns denoting female persons or animals are feminine. Thus *syn* 'son', *djadja* 'uncle' and *žerebec'* 'stallion' are masculine, while *dočka* 'daughter', *titka* 'aunt' and *kobyla* 'mare' are feminine:

(7) Semantic constraints (biological sex to gender)
a. Biological male → M
b. Biological female → F

Very often, these constraints predict the same gender as the constraints introduced in the previous section. For instance, *dočka* 'daughter', *titka* 'aunt' and *kobyla* 'mare' belong to declension 2, and would therefore be feminine according to (5a), while *syn* 'son' and *žerebec'* 'stallion' belong to declension 1, and would be masculine according to the default constraint in (6). Nevertheless the semantic constraint in (7a) cannot be dispensed with, as demonstrated by a group of second declension nouns denoting male persons, e.g. *djadja* 'uncle'. While constraint (5a) suggests feminine gender, nouns of this type are consistently masculine in Ukrainian. A similar assignment conflict arises for declension 6 nouns (indeclinable nouns) denoting females, e.g. *ledi* 'lady' and names like *Esfir* (Pugh and Press 1999:51). Nouns of this type are feminine as predicted by (7b), not neuter as (5e) would suggest. If we assume the semantic constraints in (7) to outrank the competing constraints proposed in the previous section, we are in a position to assign the right gender to nouns denoting persons or animals of a particular biological sex. This is illustrated by the tableaux in (8) and (9). (For simplicity, irrelevant constraints are omitted.)

(8) Assignment of masculine gender to *djadja* 'uncle'

	(7a) Male → M	(5a) Decl 2 → F
☞ a. *djadja*$_M$		*
b. *djadja*$_F$	*!	
c. *djadja*$_N$	*!	*

(9) Assignment of feminine gender to *ledi* 'lady'

	(7b) Female → F	(5e) Decl 6 → N
a. *ledi*$_M$	*!	*
☞ b. *ledi*$_F$		*
c. *ledi*$_N$	*!	

Animacy plays an important part in the gender systems of many languages (Corbett 1991, Dahl 2000), and Ukrainian is no exception in this respect. While constraint (5e) predicts neuter gender for declension 6 nouns, animate nouns in this declension tends to be masculine unless they refer to females, in which case they are feminine (cf. Pugh and Press 1999:56ff.). Examples include the masculine words *kakadu* 'cockatoo', *parvenju* 'parvenue', *flaminho* 'flamingo' and *proteže* 'protégé', and feminines like *ledi* 'lady'. While the possibility of feminine agreement for females can be accounted for in terms of the sex-based constraint (7b) as shown in (9), we need a constraint assigning masculine gender to animate nouns:

(10) Semantic constraint (animacy to gender)
Animate → M

It is important to notice that (10) only applies to nouns in declension 6; other animate nouns receive gender according to their declension class. Thus, nouns like *antylopa* 'antelope', *zebra* 'zebra', *mavpa* 'monkey', *ryba* 'fish' and *persona* 'person' are feminine because they belong to declension 2.[3] Likewise, declension 3 nouns like *rys'* 'lynx' and *postat'* 'figure' are feminine, while declension 4 nouns like *stvorinnja* 'creature' and declension 5 nouns like *telja* 'calf' are neuter. We can account for this if we assume that the animacy constraint (10) is ranked *above* (5e), but *below* the remaining morphological constraints in (5). An alternative approach will be discussed in section 3 below. The proposed analysis is illustrated in the following tableaux:

(11) Assignment of masculine gender to *kakadu* 'cockatoo'

	(5a) Decl 2→ F	(10) Animate → M	(5e) Decl 6 → N
☞ a. *kakadu*$_M$			*
b. *kakadu*$_F$		*!	*
c. *kakadu*$_N$		*!	

(12) Assignment of feminine gender to *zebra* 'zebra'

	(5a) Decl 2→ F	(10) Animate → M	(5e) Decl 6 → N
a. *zebra*$_M$	*!		*
☞ b. *zebra*$_F$		*	*
c. *zebra*$_N$	*!	*	

The animacy constraint is also ranked below the competing (7b) assigning feminine gender to biological females, since e.g. *ledi* 'lady' is feminine:

(13) Assignment of feminine gender to *ledi* 'lady' (second version)

	(7b) Female → F	(10) Animate → M	(5e) Decl 6 → N
a. *ledi*$_M$	*!		*
☞ b. *ledi*$_F$		*	*
c. *ledi*$_N$	*!	*	

The list of obligatory or optional semantic constraints may certainly be extended. For instance, indeclinable nouns denoting languages, e.g. *urdu* 'Urdu', *hindi* 'Hindi' and *esperanto* 'Esperanto', are reported to be compatible with femi-

[3] An interesting exception is *suddja* 'judge', which is reported to be masculine although it belongs to declension 2 and may refer to both male and female persons (cf. Bilodid (ed.) 1970-80; for discussion of the Russian cognate *sudja*, see Dahl 2000:108ff.). A conceivable analysis would involve an additional semantic constraint assigning masculine gender to nouns denoting certain professions that have traditionally been dominated by men.

nine agreement (Pugh and Press 1999:57). It is possible to account for facts like these if we assume that an additional semantic constraint for these nouns outranks the morphological (5e) in the same way as the animacy constraint in (10) takes precedence over (5e). However, I shall not attempt to explicate further constraints. The main purpose of the present paper is to explore constraint interaction and meta-constraints, and the constraints advanced so far constitute a sufficient basis for a discussion of these issues, to which we turn in the following section.

3. Constraint Interaction and Meta-Constraints

The ranking arguments from section 2 are summarized in (14):

(14)	a.	Female→F (7b)	>>	Animate→M (10)	(cf. *ledi*$_F$ 'lady')
	b.	Male→M (7a)	>>	Decl 2→F (5a)	(cf. *djadja*$_M$ 'uncle')
	c.	Female→F (7b)	>>	Decl 6→N (5e)	(cf. *ledi*$_F$ 'lady')
	d.	Animate→M (10)	>>	Decl 6→N (5e)	(cf. *kakadu*$_M$ 'cockatoo')
	e.	Decl. 2→F (5a)	>>	Animate→M (10)	(cf. *zebra*$_F$ 'zebra')
	f.	Decl. 3→F (5b)	>>	Animate→M (10)	(cf. *rys'*$_F$ 'lynx')
	g.	Decl. 4→N (5c)	>>	Animate→M (10)	(cf. *stvorinnja*$_N$ 'creature')
	h.	Decl. 5→N (5d)	>>	Animate→M (10)	(cf. *telja*$_N$ 'calf')

It seems to be a growing concern in OT that attested phonological systems are less diverse than predicted by a model where constraints are allowed to interact freely. For instance, de Lacy (2003) addresses this problem by advancing what he calls Prosodic Primacy Fixed Rankings, while Steriade (2001) attempts at eliminating overgeneralization by means of so-called P-maps reflecting perceptibility differences among phonological elements. Against this background, the question arises as to whether the rankings in (14) must be stipulated or whether they follow from independent principles. In the following, we shall consider two strategies for reducing the impact of language specific, free ranking of constraints.

The first strategy involves Panini's Theorem (Prince and Smolensky 1993).[4] According to this widely accepted principle, constraint A outranks constraint B if A refers to a proper subset of the nouns referred to by constraint B. The ranking in (14a) illustrates this. Since nouns denoting females constitute a proper subset of animate nouns, constraint (7b) automatically outranks (10). Furthermore, the default constraint (6) is automatically ranked below all competing constraints, since it refers to nouns in general, while the remaining constraints specify particular subsets of nouns.

Insofar as Panini's Theorem is a universal constraint on constraint ranking, I suggest referring to it as a "meta-constraint". While the examples discussed above testify to the relevance of Panini's Theorem, it seems clear that this meta-

[4] The generalization that specific information takes precedence is also known as "Proper Inclusion Precedence" (Koutsoudas et al. 1974), "Elsewhere Condition" (Kiparsky 1982) and "Wilensky's law" (Lakoff 1987).

constraint cannot provide a principled account for all the rankings in (14). However, instead of assuming all the remaining rankings in (14) to result from language specific stipulation, I suggest supplementing Panini's Theorem with a second meta-constraint:

(15) The Core Semantic Override Principle:
In gender assignment, constraints referring to biological sex outrank other constraints.

I refer to (15) as the "Core Semantic Override Principle" because biological sex is of fundamental importance for the category of gender. The Core Semantic Override Principle bears on rankings (14b-c); it predicts that the sex-based constraints (7a-b) take precedence, a prediction that is borne out by the facts.

There is ample typological evidence in favor of the claim that the Core Semantic Override Principle is part of universal grammar. According to Dahl (2000:101f.), who has investigated a large language sample including all languages discussed in Corbett (1991), sex is the "major criterion" for the assignment of gender in languages with more than one gender for animates. While Dahl's term "major criterion" may seem opaque, it is clear from his discussion that it implies that sex-based gender assignment tends to take precedence. Notice that the provision "tends to" does not indicate that we are dealing with a mere statistical generalization. Rather, the set of cases where sex-based constraints are overridden is limited and well defined. Dahl (2000:103) isolates three cases:[5]

(16) a. Special morphological rules may take precedence for augmentative and diminutive derivations.
b. Special semantic rules may take precedence for nouns denoting young or small animates.
c. Special semantic rules may take precedence for certain kinds of animals.

German diminutives in *–chen* and *–lein* are well known examples of (16a). As an illustration of special treatment for nouns denoting young or small animates in (16b), Dahl (2000:103) mentions the assignment of neuter gender to unmarried women in certain Polish dialects (see also Corbett 1991:100). As for (16c), in the Australian language Ngangikurrunggurr nouns denoting animals hunted for meat are relegated to a special gender (Corbett 1991:140, Dahl 2000:105). A detailed discussion of cases of these types is beyond the scope of the present study. Suffice it to say that the typological evidence strongly suggests that sex-based constraints take precedence universally in gender assignment, with the exception of the well-defined cases in (16).

[5] In addition, Dahl (2000) mentions the pragmatic effects of "downgrading" and "upgrading" obtained by using the "wrong gender" in certain speech situations. This phenomenon is not included in (16) as it is arguably not part of grammar proper.

The Core Semantic Override Principle resembles Corbett and Fraser's observation in (17) (see also Corbett 1991:68f.):

(17) "As is universally the case, the formal gender assignment rules [...] are dominated by the semantic gender assignment rules." (Corbett and Fraser 2000a:321)

However, (17) represents a somewhat stronger claim than the Core Semantic Override Principle, since the former pertains to *all* semantic constraints, while the latter only concerns those semantic constraints that invoke biological sex. Notice that (17) is incompatible with the analysis of Ukrainian presented above. While (17) would predict the animacy constraint in (10) to outrank all morphological constraints, it was shown in section 2 that (10) is crucially dominated by the morphological constraints (5a-d). In order to maintain (17), one would have to replace (10) by (18):

(18) Animate, declension 6 → M

As this constraint applies to animate nouns in declension 6 only, it does not conflict with (5a-d), which invoke other declensions. Therefore, (18) and (5a-d) need not be ranked with regard to each other.

A statement like (18) is part of Corbett's (1982, 1991) seminal analysis of Russian, which was adapted for Ukrainian in Nesset (2003). There are, however, reasons to believe that (10) should be preferred to (18). Restricting (18) to declension 6 is in fact tantamount to saying that the animacy constraint dominates (5e), but not (5a-d). In other words, the ranking statements in (14d-h) have been incorporated in the constraint itself. This is at variance with a fundamental idea in OT where language specific properties of a grammar are expressed in terms of a certain ranking of the relevant constraints. More importantly, however, adopting (18) instead of (10) seems to undermine the falsifiability of (17). If we do away with a counterexample to the hypothesis about ranking in (17) by incorporating the ranking in the problematic constraint itself, we empty the hypothesis of its empirical content. It becomes impossible to falsify (17) if all potential counterexamples can be avoided by smuggling in the ranking information in the constraint itself. In view of this, I suggest adopting the animacy constraint in (10) instead of the one in (18). Accordingly, the Core Semantic Override Principle seems preferable to the statement in (17).

4. Conclusion

In this article, I have discussed nine constraints bearing on the assignment of gender to Ukrainian nouns. Summarizing the contribution of the paper, I would like to focus on two aspects of the analysis. First, we have seen that the constraints yield correct predictions provided that a certain ranking is adopted. Secondly, I have suggested that the ranking in part follows from universal

principles that I have referred to as "meta-constraints". In addition to the widely accepted Panini's Theorem, I have advanced another meta-constraint that I have labeled the "Core Semantic Override Principle".

The present study has several implications for future research. While the proposed analysis suggests that OT is a valuable tool for the investigation of gender assignment, it should be borne in mind that this paper does not offer a complete analysis of the Ukrainian gender system; due to considerations of space some smaller groups of nouns have not been discussed. In particular, it would be interesting to see how OT would handle affective derivatives (augmentatives and diminutives), which are known to involve complexities with regard to gender assignment in Slavic (cf. e.g. Hippisley 1996).

An implication that goes beyond Slavic and the study of gender assignment relates to the growing concern in OT that phonological systems display less variation than predicted by freely ranked constraints. As mentioned in section 3, various attempts have been made to reduce overgeneration by imposing principled restrictions on constraint ranking. The present study lends further support to such a meta-constraint approach, suggesting that meta-constraints are important not only in phonology since gender assignment constraints are subject to universal restrictions on constraint interaction.

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Tore Nesset
Dept. of Linguistics/CASTL
University of Tromsø
N-9037 Tromsø
Norway

tore.nesset@hum.uit.no

Negation and Negative Polarity Items in Berber

HAMID OUALI
University of Michigan

0. Introduction

The main goals of this paper are: (a) to provide an analysis of sentential negation that captures the variation in the strategies used to express it across Berber dialects; (b) to provide evidence that the Negation head *ur* (Neg1) is generated as a head of NegP higher than TP and that *sha* (Neg2) is adjoined to VP, therefore *sha-ur* is a derived order as opposed to French *pas-ne* which was argued to be a basic order; (c) to show that *sha* (Neg2) is licensed via Spec-Head only and so are higher NPI adverbs like *never*—NPI's like *no one* and *nothing* are licensed via c-command; and (d) to argue that NPI licensing is done under strict locality conditions.

This paper offers an analysis that captures the micro-variation in the strategies used to express negation across Berber dialects. I argue that the "optional" negation markers *sha* (Tamazight)/ *ara* (Taqbaylit)/ *kra* (Tarifit) should not be ignored in any syntactic analysis of Berber negation and show that they have serious implications concerning the structure of this language.

There are two types of dialects with regard to how negation is expressed. Type 1 uses one negation marker; these dialects are Tachelhit and Touareg (see section 1). Type 2 uses the negation markers Neg1 and Neg2 and there two subgroups within this type. In the first group, which includes Tarifit, Taqbaylit, and Chaoui, Neg1 is always pre-verbal and Neg2 is always post-verbal. In the second group, which consists only of one dialect, namely Tamazight, Neg1 behaves in the same way as in the other dialects but Neg2 behaves differently in the sense that it can either be post-verbal or pre-verbal. This is schematized in (1).

(1) Type 1: One Neg
Type 2: Two Negs: Type2a. (Neg1…Verb (Neg2))
Type2b. ((Neg2)-Neg1…Verb (Neg2))

Tamazight has two different strategies to express sentential negation. Sentential negation is expressed by means of a pre-verbal negative marker.

(2) ur iddi wrba gher-skeela.
neg 3s.went boy to-school
'The kid didn't go to school.'

(3) ur iswi wmush lhlib.
neg 3s-drink cat milk
'The cat didn't drink milk.'

In this dialect sentential negation is also expressed by means of two negative markers.

(4) ur ughax sha lkthaab.
neg1 1s-bought-1s neg2 book
'I did not buy the book.'

Taqbaylit, Chaoui, and Tarifit behave like Tamazight as illustrated in (5–7).

(5) ur kcimegh ara. (Taqbaylit)
neg1 enter.past.1s neg2
'I didn't enter.' Nait-Zerrad (1994:32)

(6) ud yusi-ca. (Chaoui)
neg1 come.3sm-neg2
'He didn't come.' Nait-Zerrad (1994:34)

(7) ur izri shi imams (Tarifit)
neg1 see.past.3s neg2 mother-his
'He didn't see his mother'

The negation element *ur* cannot occur post-verbally, as shown in (8) and (9).

(8) *thdda ur yemma gher souq. (Tamazight)
go.past.3sf neg mother-my to market
'My mother didn't go to the market.'

(9) *thdda shaur yemma gher souq. (Tamazight)
go.past.1sf neg2-neg1 mother-my to market

Let us look at each Negation element in turn. We will start with the pre-verbal negation, i.e., Neg, and how it is distributed across the Berber dialects and then look at the second negation, i.e., Neg2.

1. First Negation Elements

In all the Berber dialects the first negation element is obligatory and must be pre-verbal as shown in (10–13).

(10) ur th- lix (*ur) assa. (Tamazight)
neg see.past.1s (*neg) day-this
'I haven't seen him today.'

(11) ur iʕlim (*ur). (Taqbaylit)
neg know.past.3s (*neg)
'He didn't know.'

(12) ur isha (*ur) imkli wehdu. (Tashelhit)
neg eat.past.3s (*neg) lunch alone
'He didn't have lunch alone.'

(13) war inwi (*war) sha. (Tarifit)
neg think.past.3s (*neg) neg
'He didn't think.'

In each of these examples, putting Neg1 in a post-verbal position causes ungrammaticality. Let us see how Neg2 behaves across these dialects.

2. Second Negation Elements

When it comes to the second negation element, these dialects show some variation. In Touareg, as reported in Nait-Zerrad (1994), as well as in Tashelhit, it is nonexistent, as shown in (14) and (15). In Tamazight, Taqbaylit, and Tarifit, it is used optionally and has to appear after the verb, as shown in (16–18).

(14) ur tdda tfruxt s tgmmi. (Tashelhit)
neg go-Perf-3sf to house
'The girl did not go home.'

(15) wer tusa tabarart ehan. (Touareg)
neg go-Perf-3sf to-house
'The girl did not go home.'

(16) ur ssex (sha). (Tamazight)
neg drink-Perf.1s (neg)
'I don't drink.'

(17) ur kshimegh (ara). (Taqbaylit)
neg entered.past.1s (neg)
'I didn't enter.'

(18) u-sn twshi (sha) arbii. (Tarifit)
neg-them give.Past.3s (neg) grass
'She didn't give them grass.'

Unlike in Taqbaylit and Tarifit, in Tamazight the second negation element appears pre-verbally as shown in (19) below:

(19) shaur dix gher-s. (Tamazight)
neg-neg go.past.1s to-him
'I didn't go to him. / I didn't visit him.'

The distribution of Neg1 and Neg2 across Berber dialects is summarized in (20).

(20) Summary

Tashelhit/Touareg	Taqbaylit, Tarifit, Chaoui	Tamazight
ur…verb	**ur**…verb(**sha**)	**ur**…verb(**sha**)
		(**sha**)**ur**…verb(**sha**)

3. *Ur* (Neg1) and Other Negative Polarity Items

Ur (Neg1) co-occurs with NPI's like 'nothing' (21) and 'no one' (22). *Walu* 'nothing' in (21a), which is the direct object, appears after the verb and can also be topicalized and hence precede both *ur* and the verb as in (21b). The same thing can be said about *agidge* 'no one', which is a pre-verbal subject in (22a) and topicalized in (22b).

(21) a. *ur* as-wshi.x walu. (Tamazight)
neg him-give.Per.3s nothing
'I didn't give him anything.'

b. walu ur-as-wshix.
nothing Neg1-him-gave
'I gave him nothing.'

(22) a. ur iddi agidge gher skuella.
neg go.Perf.3s no one school
'Nobody went to school.'

b. agidge ur iddin gher skuella.
no one neg go.Perf.3s school
'Nobody went to school.'

I will argue below that these NPI's are licensed in their basic position via c-command, a standard licensing configuration. This becomes clear when we look at their interaction with the second negation elements Neg2. Before we do that let us look at the negative adverbs.

urgin 'never' type of NPI's can only occur in a position preceding both Neg1 and the verb as in (23).

(23) *urgin* ur dix gher Frans.
never neg go.Per.1s to France
'I've never been to France.'

(24) ursar ur t-ughex.
never neg it-buy.Per.1s
'I will never buy it.'

Examples (25) and (26) below show that the negative adverbs *urdgin* and *usar* cannot occur in a post-verbal position:

(25) *ur dix urdgin gher frans.
neg go.Perf.1s never to France
'I've never been to France. / I never went to France.'

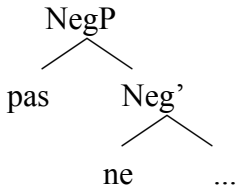
(26) *ur t-ughex usar.
neg it-buy.Pef.1s never
'I will never buy it.'

Given these examples, I argue that these adverbs are not licensed via c-command but via Spec-Head relation with the negative head *ur* by being externally merged in that position. I will come back to this point in detail in section 5 but first let us sketch the analysis I will use in this paper.

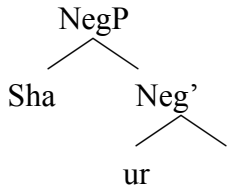
4. Analysis

I follow the standard assumption that Neg heads its own maximal projection, NegP. This assumption has been made for English and Romance (Pollock 1989, Chomsky 1989, Laka 1990, Zanuttini 1994) and for Berber (Ouhalla 1990, 1991; Ouali 1999, 2003).

(27) a.



b.



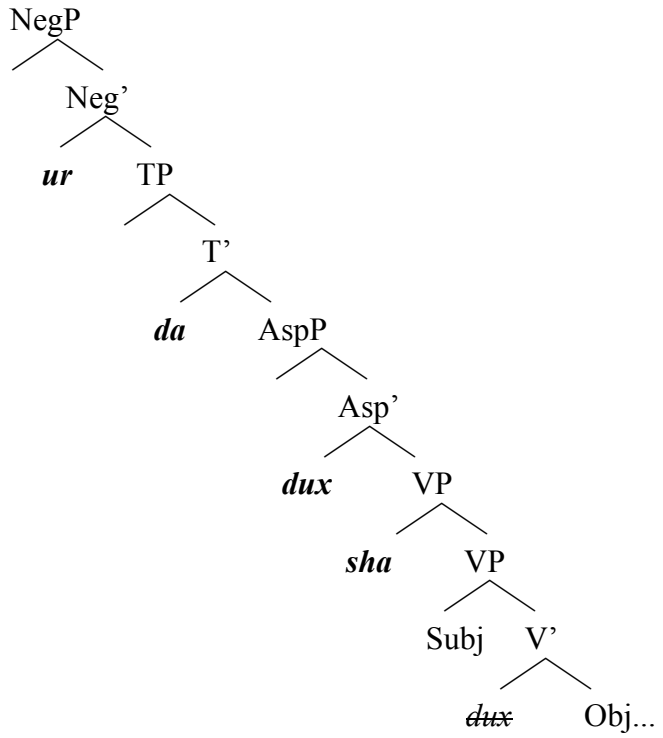
There are a number of arguments for Neg as head of NegP. First, it has been shown that Neg interacts with the verb by blocking V movement to T in English (Pollock 1989, Chomsky 1995). Second, it has been shown that Neg interacts with Tense and Agreement: Neg inflects for tense in Standard Arabic (Fassi-Fehri 1993) and for Agreement in Finnish. Third, it has been argued that Neg blocks

clitic movement or the so-called clitic climbing in Italian (Kayne 1989), and in Berber Neg is one of the different head elements that can host object pronominal clitics (Ouhalla 1988; Ouali 1999, 2003a,b).

Pollock (1989) has proposed that French *ne* originates in a functional projection lower than Infl and then raises and adjoins to a higher functional head, whereas Laka (1990) and Zanuttini (1990, 1991), among others, have proposed that the pre-verbal negative markers of Italian and Spanish are the head of a functional projection higher than Infl. I will adopt the latter view and assume, following Ouhalla (1991), that Neg in Berber is higher than IP/TP. I will also assume that *sha* (Neg2) is adjoined to VP as illustrated in (28b) and later on moves to Spec-Neg, at LF presumably.

(28) a. **ur**-da-dux **sha**.
Neg1-Aux- go.1ps Neg2
'He will not go.'

b.



Given these assumptions, it follows that in Berber *sha-ur* (Neg2-Neg1) is a derived order, unlike in French where it is assumed that *pas-ne* (Neg2-Neg1) is the basic order (27a). This leads us to the following cross-linguistic comparison in (29), which basically shows that some Berber dialects, namely Touareg and Tashelhit, behave like some Romance languages, namely Italian, in having one Neg marker which is pre-verbal (29a). Others are like French in having two Neg markers and these are Tarifit, Taqbaylit, Chaoui, and Tamazight (29d). Also, it is

known that in colloquial French *ne* (Neg1) can be dropped but *pas* (Neg2) cannot (29b). Tamazight is the mirror image of French, where *sha* (Neg2; the counterpart of *pas*) can be dropped whereas *ur*, the Neg head, cannot (29c). And finally Tamazight seems to be the only dialect where Neg2 can precede Neg1 (29e). The examples in (29a-c) are from Haegeman and Zanuttini (1996).

(29) Cross-linguistic comparison**:**

a.	***Non*** mangia	Neg + finite V	Italian, Touareg, Tashelhit
b.	Il (**ne**) mange *(**pas**)	(Neg) + finite V + *(Neg)	French
c.	A mengia **nen**	Finite V + Neg	Piedmontese
d.	**ur** la ytet (**sha**) 'He doesn't eat.'	*(Neg1) + finite V + (Neg2)	Tarifit, Taqbaylit, Chaoui, Tamazight
e.	**sha ur** la ytet 'He doesn't eat.'	(Neg2) + *(Neg1) + finite V	Tamazight

5. Negative Polarity Items

In section 2 I claimed that NPI's like *agidge* 'no one' in (30) are licensed in situ by virtue of being c-commanded by Neg. In (31) *agidge* is licensed prior to undergoing topicalization.

(30) ur iddi agidge. (Tamazight)
neg go-Perf-3s no one
'No one left.'

(31) agidge ur iddi-**n**.
no one neg go-Perf-**NEU**
'No one left.'

The evidence for *agidge* being topicalized comes from the agreement morphology on the verb. Any subject A′-extraction in Berber triggers what is called the Anti-Agreement Effect, which is a neutral form of agreement (31) (see Ouhalla 1993). This shows that this NPI is not in Spec-Neg but presumably in Spec-CP. However, one might argue that it has moved through Spec-NegP on the way to Spec-CP or even stayed in Spec-NegP since this is also an A′ position. The evidence for the in situ licensing of these NPI's is that they can co-occur with *sha*, which can move to Spec-NegP overtly as seen in (32). *Agidge* 'no one' as shown in (33) can not be extracted regardless of whether *sha* stays in situ or precedes Neg1 *ur*, an extraction that is possible if *sha* is not present in the sentence as illustrated in (22) above.

(32) [$_{NegP}$ sha [$_{Neg}$ ur [.. iddi [$_{VP}$ agidge
Neg2 Neg1 went.3ps no one
'No one left.'

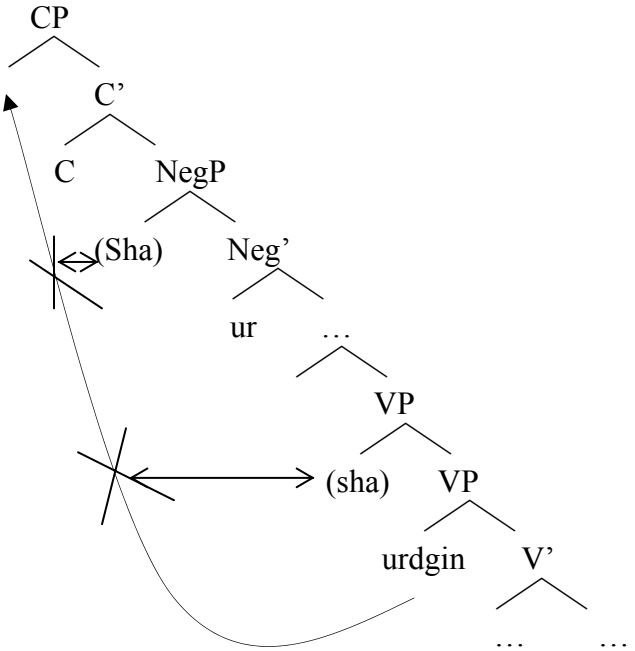
(33) *agidge (sha) ur iddin (sha)
No one (*Neg2) Neg1 went (*Neg2)

(34) sha-ur 3lix walu.
Neg2-Neg1 see-Pef-1s nothing
'I didn't see anything.'

(35) walu ur 3lix (*sha).
nothing neg see-Perf-1s
'Nothing did I see.'

This, I believe, is strong evidence for Locality conditions on NPI movement. NPI's like *agidge* 'no one' and *walu* 'nothing' in (34) and (35) cannot be extracted across any other intervening negation phrase as illustrated in the structure in (36).

(36)



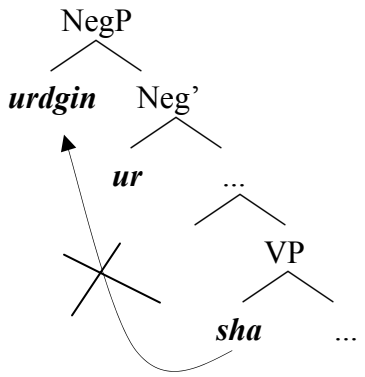
Adverbs like *urdgin* and *ursar* 'never', on the other hand, are licensed by being (externally) merged in Spec-Neg. The use of *urdgin* or *ursar* depends on whether the verb conveys past or present information. *Urdgin* is used only with verbs in the imperfective form as in (37) and *ursar* is used with verbs in the perfective form to convey the future as in (38). *Sha* (Neg2) cannot co-occur with these NPI adverbs as shown in these two previous examples (37-38).

(37) urdgin (*sha) ur dix (*sha) gher frans.
never (*Neg2) Neg1 went-Perf-3s (Neg2) to France
'I have never been to France.'

(38) ursar (*sha) ur i-th3lith (*sha).
never (*Neg2) Neg1 me see-Imp-3s (Neg2)
'You will never see me.'

This fact follows from the assumption made above about the position these adverbs occupy, i.e., Spec-Neg. *Sha* can only be licensed via Spec-Head with Neg^0, but if this position is occupied the licensing cannot take place and consequently the derivation crashes. This is illustrated in the structure in (39).

(39)



6. Conclusion

In this paper I have shown that there are two types of Berber dialects, those with negative concord and those that use one negation element. By discussing the interaction of Neg2 *sha* with NPI's, I argued that NPI's which are arguments of the verb are licensed in situ by virtue of being c-commanded by Neg^0, whereas NPI adverbs like *urdgin* 'never' are licensed by a Spec-Head relation with Neg^0, by being merged in Spec-Neg. Licensing of both types of NPI's has to respect locality conditions.

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4080 Frieze BL
105 South State Street
Ann Arbor, MI 48109-1285

houali@umich.edu

A Psycholinguistic Theory of Loanword Adaptations

SHARON PEPERKAMP
Laboratoire de Sciences Cognitives et Psycholinguistique, EHESS–ENS–CNRS, and Université de Paris 8

0. Introduction

Phonologists have long held an interest in loanword adaptations, that is in the transformations that apply to words when they are borrowed into a foreign language. Starting with Hyman (1970), it is generally assumed in generative grammar that the input to loanword adaptations is constituted by the surface form of the source language, and that the adaptations are computed by the phonological grammar of the borrowing language. In rule-based phonology, loanword adaptations present one oddity: given that foreign words often contain illegal structures that are absent from underlying forms in the native phonology, novel rules should be added to the grammar to deal with their adaptations. This undesirable feature is absent from constraint-based phonology, in which the transformations in loanwords are driven by constraints that are already part of the grammar. The rise of constraint-based theories has thus given a particularly strong impetus to the study of loanword adaptations, and a steady flow of articles has appeared that analyze loanword adaptations within such output-oriented frameworks (see, among others, Yip 1993; Paradis & LaCharité 1997; Ulrich 1997; Broselow 2000, in press; Rose 1999; Golston & Yang 2001; Jacobs & Gussenhoven 2000; Kenstowicz 2001).

Within constraint-based frameworks, it has been argued that loanword adaptations are in conformity with the native phonology (Yip 1993; Paradis 1995; Broselow 2000; Jacobs & Gussenhoven 2000), and even that they provide insight into it, revealing the relative ranking of faithfulness constraints that would otherwise remain 'hidden' (see, for instance, Jacobs & Gussenhoven (2000)). Against the current view, I argue that loanword adaptations are not computed by the phonological grammar of the borrowing language. First, I show that not all loanword adaptations are in accordance with the native phonology. Second, I argue that separating these problematic cases from the remaining loanword adaptations and treating them differently, by making appeal to phonetic and/or perceptual arguments, yields an *ad hoc* distinction between phonological and non-phonological adaptations. Finally, I propose that a principled solution lies with the hypothesis that **all** loanword adaptations are phonetically minimal transformations

that apply during speech perception. This hypothesis is motivated independently by psycholinguistic data concerning the perception of non-native sound structures.

Before going into the arguments, it is useful to distinguish two types of loanwords. First, *integrated loanwords*, i.e. words that have entered the lexicon of the borrowing language, have been studied most often. Monolingual speakers who use these loanwords never hear their source forms, and there is thus no reason to postulate an underlying form that differs from the surface form in their grammar. In other words, a phonological analysis of the modifications these words have undergone when entering the borrowing language has no direct psychological reality. Rather, it receives a diachronic interpretation, in that it accounts for the adaptations applied by those speakers who have originally introduced the loans. The second type of loanwords are *on-line adaptations*, i.e. foreign words that are borrowed 'here-and-now' (see, for instance, Shinohara 1997, 2000 and Kenstowicz & Sohn 2001). In this paper, I tentatively treat integrated loanwords and on-line adaptations on a par, assuming that the former reflect on-line adaptations by those speakers who once introduced these words.[1]

1. Loanword adaptations versus native phonology

Loanword adaptations are typically transformations that, although absent from the native phonology, do not conflict with it. Counterexamples, however, do exist. In the cases discussed here, the context for the transformations is also present in native underlying forms, but native and foreign forms are not treated alike. Below, I distinguish two types, one in which native and foreign forms undergo different transformations, and one in which native underlying forms – as opposed to loanwords – do not undergo any modification at all.

1.1. Conflicts between native alternations and loanword adaptations

Three examples can illustrate the existence of loanword adaptations that are in conflict with some native phonological alternations.

First, consider the following data from Lama, as discussed by Ulrich (1997). In this language, the palatal nasal consonant [ɲ] is allowed in onsets only (1a). In syllable codas, underlying /ɲ/ undergoes fronting. The context for fronting is created by a general process of word-final schwa deletion after sonorant consonants, accompanied by compensatory lengthening; this is exemplified in (1b). Fronting is shown in (1c), where the sonorant preceding final schwa is /ɲ/.

(1)	a.	/ɲə̠/	→	[ɲə̠̀]	'they'
	b.	/mi̠-rə̠/	→	[mí̠:r]	'nose'
	c.	/ti-ɲə̠/	→	[tî:n]	'elephants'

[1] One caveat is in order, though. Since the introduction of the loans, both the source and the borrowing language might have undergone changes. Hualde (2000) nicely illustrates this point.

In loanwords, however, forms with [ɲ] in a syllable coda undergo vowel epenthesis rather than fronting of the nasal (2).

(2)	a.	[fiɲə̞]	<	Fr. *vigne*	[viɲ]	'vineyard'
	b.	[e̞sə̞paɲə̞]	<	Fr. *Espagne*	[ɛspaɲ]	'Spain'

Next, consider Korean. In this language, [s] is not allowed in syllable codas. In the native phonology, an underlying /s/ is realized as [t] when it occurs in coda position (3), but in loanwords from English, words with [s] in coda position systematically undergo epenthesis (3b) (Kenstowicz & Sohn 2001).

(3)	a.	/nas/	[nat]		'sickle-NOM'
		/nas + ɨl/	[nasɨl]		'sickle-ACC'
	b.	[posɨ]	<	'boss'	
		[kɨrasɨ]	<	'glass'	
		[mausɨ]	<	'mouse'	
		[k^{h}arisɨma]	<	'charisma'	

The third example is provided by Fula. In this language, neither onset nor coda clusters are allowed. In loanwords from French, an epenthetic vowel is added after the second consonant in liquid+obstruent clusters (4a), but between the consonants of obstruent+liquid clusters (4b) (Paradis and LaCharité 1997).

(4)	a.	[karda]	<	Fr. *carde*	[kard]	'card (comb)'
		[fɔrsɔ]	<	Fr. *force*	[fɔrs]	'force'
	b.	[ta:bal]	<	Fr. *table*	[tabl]	'table'
		[kala:s]	<	Fr. *classe*	[klas]	'flag'

In the native phonology, however, the epenthetic vowel is always inserted after the second consonant, both in the case of liquid+obstruent clusters (5a) and in the (much rarer) case of obstruent+liquid clusters (5b) (data from Paradis 1992).

(5)	a.	/talk+ru/	→	[talkuru]	'amulet'
	b.	/sokl+ka/	→	[soklaka]	'need'

Within a phonological analysis of the different strategies in native and foreign words in Lama, Korean, and Fula, foreign words should be tagged as such in the lexicon, thus allowing the introduction of rules or constraints that refer to loanwords only. This, then, goes counter to the insight that loanword adaptations either fall out directly of the native phonological grammar or show aspects of this grammar that remain hidden in the absence of loanwords.

1.2. 'Unnecessary' adaptations

Loanword adaptations are mainly transformations that apply to foreign forms that would be ill-formed if they were borrowed without modification. There are, however, several cases of loanword adaptations that appear to be unnecessary, in the sense that they do not repair some ill-formed phonotactic structure.

For instance, in Korean, loanwords from English that end in a voiceless stop are often adapted with an aspirated stop followed by an epenthetic vowel. This occurs especially, though not exclusively, when the preceding vowel is tense (Kang 2003).

(6)	a.	[pæt^{h}ɨ]	<	'bat'
	b.	[tɛk^{h}ɨ]	<	'deck'
	c.	[hip^{h}ɨ]	<	'hip'

As noted by Kang, these transformations are unexpected, since native words can end in a voiceless stop (7):

(7)	a.	[pat]	'field'
	b.	[kæk]	'guest'
	c.	[tʃip]	'house'

Likewise, in Japanese, on-line adaptations of French words ending in [n] show gemination of the nasal consonant and the appearance of an epenthetic vowel (Shinohara 1997).

(8)	a.	[duanːɯ]	<	Fr. *douane*	[dwan]	'customs'
	b.	[pisinːɯ]	<	Fr. *piscine*	[pisin]	'swimming pool'
	c.	[pɯroɕenːɯ]	<	Fr. *prochaine*	[proʃɛn]	'next-FEM'

Again, these transformations are unexpected, since native words can end in a moraic nasal consonant, as shown in (9).

(9)	a.	[teN]	'point'
	b.	[hoN]	'book'
	c.	[nipːoN]	'Japan'

Moreover, loanwords from English conform to this native pattern and are adapted with a final moraic nasal.

(10)	a.	[sɯkɯriiN]	<	'screen'
	b.	[napɯkiN]	<	'napkin'
	c.	[kotoN]	<	'cotton'

Recently, some other cases of 'unnecessary' adaptations have been studied that might be called generalizations, since they apply to foreign forms that are well-formed in the borrowing language but do not conform to some default pattern. Examples are regularizations of pitch accent patterns in loanwords in Japanese (Shinohara 2000) and Korean (Kenstowicz & Sohn 2001). It is argued that these languages, which have lexical pitch accent systems, contain default accentuations that emerge in loanword adaptations. The cases concerning vowel epenthesis discussed above, by contrast, cannot be considered generalizations to some default pattern. On the contrary: Korean has no native nouns at all that end in [ɨ] (Yoonjung Kang, personal communication), and Japanese words ending in [n(:)ɯ] are very rare, whereas words ending in a moraic nasal are extremely common (Kimihiro Nakamura, personal communication).

Hence, as before, a phonological account would require a special loanword module in order to accommodate the loanword adaptations in Korean and Japanese.[2] For the Japanese case, it should even be specified that this module applies to loanwords from French but not to those from English.

2. Phonetic and perceptual minimality in loanword adaptations

The cases discussed above all show that loanword adaptations are not necessarily in accordance with the native phonology. It should be noted that introducing one or more special loanword modules is not a viable solution for dealing with these problematic cases. Indeed, loanword adaptations do not involve synchronic alternations, but rather consist of transformations that are applied only during the introduction of the loanword. Once they have made their way into the borrowing language, there is no reason to keep the corresponding forms in the source language as the underlying forms in the lexicon of the borrowing language. It therefore makes no sense to postulate rules or constraints that apply to loanwords only. Alternatively, a solution might be sought in the intuition that loanword adaptations are minimal from a phonetic and/or a perceptual point of view and thus differ from native phonological alternations. Several researchers have indeed argued that either phonetic distance, speech perception, or both play a role in certain loanword adaptations.

Let us first consider the role of phonetics. Loanword adaptations are generally interpreted as being phonologically minimal transformations that yield a legal surface form in the borrowing language. Most often, more than one such transformation is available for a given source word. For several of these cases, it has been argued that phonetic distance might play a role. In particular, the chosen transformation would be the one that is phonetically minimal. Examples include the choice between deletion and epenthesis in languages with a simple syllable structure (Silverman 1992), the absence versus presence of epenthesis (Kang 2003), the quality of epenthetic vowels (Shinohara 1997; Kenstowicz 2001), and

[2] Kang (2003) proposes a phonological analysis of the Korean data without such a special loanword module. I will return to this analysis and the problems it raises in section 3.

the choice between two or more segmental adaptations to repair ill-formed segments (Silverman 1992).

Concerning the role of perception, it has long been known that the way in which we perceive speech depends upon phonological properties of our native language (see, for instance, Polivanov 1931). Accordingly, it has been argued that certain loanword adaptations take place during perception, due to the difficulties that listeners have in perceiving non-native sound patterns (Silverman 1992; Yip 1993; Rose 1999; Gbéto 2000; Kenstowicz 2001; Broselow, in press). According to these authors, adaptations that take place during perception precede the remaining adaptations, and are either pre-grammatical (for instance, Yip 1993) or part of a perception grammar (for instance, Kenstowicz 2001). A slightly different stance is taken by Kang (2003), who distinguishes only a single grammar. This grammar, which is responsible for all loanword adaptations as well as all native alternations, crucially contains correspondence constraints that demand perceptual similarity between input and output forms, as proposed by Steriade (2001).

Various authors have made a connection between speech perception and the role of phonetics (Silverman 1992; Takagi and Mann 1994; Rose 1999; Kenstowicz 2001; Kim and Curtis 2002; Kang 2003). Specifically, defining phonetic distance as auditory distance, they propose that adaptations for which perception plays a role depend upon phonetic minimality. Might it be the case, then, that there are two types of loanword adaptations, those that apply during perception and that are phonetic in nature and those that apply during production and that are phonological in nature? Among the proponents of a two-stage model, only Rose (1999) adheres explicitly to this view. He points out that arguments from perception provide an *a priori* means to distinguish between phonetic and phonological adaptations. Rose would be right if there were independent evidence as to which part of the adaptations takes place in perception and which part applies in production. However, neither he nor any of the other authors who view a role for perception provides such evidence, and so far, no serious attempt has been made in the loanword literature to interpret psycholinguistic models of speech perception. Rather, it appears that arguments in favor of perceptual transformations are sought for adaptations such as those in section 1, which cannot be accommodated within the native (production) grammar. The distinction between perception and production in loanword adaptations is, therefore, *ad hoc*.

3. Loanword adaptations as perceptual assimilations

Peperkamp & Dupoux (2003) review psycholinguistic evidence that all aspects of non-native phonological structure, including segments, suprasegments, and syllable phonotactics, are systematically distorted during speech perception. That is, non-native sound structures are assimilated to ones that are well-formed in the native language, both by monolinguals and by bilinguals. Comparing loanword adaptations to experimental speech perception data, they point to a number of striking correspondences. For instance, Korean listeners find it hard to distinguish between the English consonants [ɹ] and [l] in CV-stimuli (Ingram & See-Gyoon

1998), and in loanwords from English, word-initial [l] is adapted as [r] (Kenstowicz & Sohn 2001). In a similar vein, French listeners have severe difficulties perceiving stress contrasts (Dupoux *et al*. 1997) and in loanwords, stress is systematically word-final, regardless of the position of stress in the source word. Finally, Japanese listeners perceive an illusory vowel within consonant clusters (Dupoux *et al.* 1999), and in loanwords, such clusters are broken up by vowel epenthesis (Lovins 1975). The latter case is especially revealing, for the following reason. As far as I am aware, within grammatical analyses of loanword adaptations it has never been proposed that the appearance of an epenthetic vowel is due to perception, despite the arguments that the choice of the epenthetic vowel is determined by phonetic minimality. Given that the cases of epenthesis studied in the loanword literature can be derived within the phonology of the borrowing language, perception arguments have simply never been called upon. The robust perception of an illusory vowel by Japanese listeners, however, shows that the presence of vowel epenthesis in Japanese loanwords originates in speech perception. This, then, is evidence that perception can play a role even in adaptations that are in accordance with the native phonological grammar of the borrowing language.

Given the overall similarity between speech perception data and loanword adaptations, Peperkamp & Dupoux (2003) propose that all loanword adaptations are phonetically minimal transformations that apply in perception.[3] In psycholinguistic models of perceptual assimilation, non-native segments are assimilated to the closest available phonetic category by a phonetic decoding module that is part of the speech perception system (Best 1994). Peperkamp & Dupoux (2003) propose that the input to the phonetic decoder is constituted by complete word forms rather than individual segments, thus accounting for perceptual assimilation of non-native suprasegmental and syllabic structures as well. Hence, complete word forms are mapped onto the phonetically closest ones that are well-formed in the native phonology. Cross-linguistic differences in loanword adaptations, then, are predicted to be the result of fine-grained differences in the surface phonetic structure of individual languages. Indeed, language-specific effects in speech perception are entirely due to such differences. For instance, the Japanese subjects in Dupoux *et al*. (1999) perceive French non-words of the form [VCCV] as [VCɯCV], because all other phonotactically legal forms in Japanese, in particular [VCiCV], [VCeCV], [VCoCV], [VCaCV] and [VCV], are phonetically more distant from French [VCCV]. Speakers of other languages with a simple syllable structure might perceive French consonant clusters differently, not because their phonetic decoder uses a different algorithm to compute the closest legal form, but because the forms that are legal in their language are not located at the same place within the (universal) acoustic space as the corresponding Japanese forms.

[3] An exception is made for those adaptations that represent a regularization to some default pattern (see Shinohara 2000; Kenstowicz & Sohn 2001).

Importantly, the hypothesis that all loanword adaptations directly reflect perceptual assimilations accommodates the otherwise problematic data introduced in section 1. First, it naturally accounts for the existence of adaptations that conflict with some native phonological alternation, since loanword adaptations and native alternations are computed by distinct systems. In particular, whereas loanword adaptations represent phonetically minimal transformations, native phonological alternations are not necessarily minimal from a phonetic point of view. Second, it provides an explanation for the presence of 'unnecessary' adaptations, which do not repair some ill-formed phonotactic structure. That is, a phonological surface form in a given source language that has a faithful surface correspondent in a borrowing language can be phonetically closer to a different surface form in the borrowing language, depending upon phonetic details in the realization of the surface forms in both the source and the borrowing language. For instance, in her careful phonetic study, Kang (2003) shows that this is the case for the Korean adaptation of word-final stops in loanwords from English, as illustrated in (6) above. Word-finally, Korean allows for voiceless stops, but they are strictly unreleased. English word-final stops that tend to be released, such as those that are preceded by a tense vowel, are therefore most often adapted as a sequence of stop plus vowel.

Of course, much more research is needed to empirically test the correspondence between loanword adaptations and perceptual assimilations. So far, not many speech perception experiments that specifically aim at comparing loanword data to the perception of non-native sound patterns have been carried out, but some encouraging results are already available (Takagi & Mann 1994; Vendelin & Peperkamp, in press). For instance, Vendelin & Peperkamp (in press) study the asymmetry between French and English loanwords in Japanese, where the former but not the latter have a phonotactically unnecessary epenthetic vowel if the source word ends in [n] (see (8) and (10) above). They show that this asymmetry mirrors the way in which Japanese speakers perceive French and English stimuli ending in [n]. That is, in a speech perception experiment with non-words produced by French and American English speakers and a forced choice identification task, Japanese subjects perceived an epenthetic vowel in 96% of the French stimuli and in only 59% of the English stimuli. Moreover, the perception of an epenthetic vowel is shown to depend upon the length of the nasal consonant and the presence of a release with vocalic formants (rather than an aspirated release or no release at all); specifically, the percentage of responses with epenthesis positively correlated with the duration of the nasal consonant – including its release – multiplied by its intensity.

Finally, what are the consequences of the hypothesis that loanword adaptations reflect perceptual assimilations for a formal grammatical analysis of these adaptations? Recently, it was argued that the phonological grammar contains correspondence constraints that demand perceptual similarity between input and output forms (Steriade 2001). We have seen that Kang (2003) accordingly proposes to account for loanword adaptations within the native phonological

grammar that is thus enriched with these constraints. Note, however, that the problem of conflicts between native alternations and loanword adaptations remains. For instance, recall the Korean data in (3) above, showing that loanwords with a coda [s] undergo vowel epenthesis, while coda /s/ in native underlying forms turns into [t]. Clearly, perceptual minimality is achieved in either the native alternation or the loanword adaptation, but not both. Given the fact that word-final stops are strictly unreleased in Korean, it seems likely that it is the loanword adaptation, and not the native alternation, that constitutes a perceptually minimal change; that is, [s] is probably closer to [sɨ] than it is to [t̚] from a perceptual point of view. Similarly, we have seen that Lama and Fula apply different transformations to coda [ɲ] and consonant clusters, respectively, when they occur in a native underlying form and in a foreign form. Hence, even a grammar that contains correspondence constraints demanding perceptual similarity cannot uniformly account for the derivation of both native words and loanwords. In other words, attempts to deal with native alternations and loanword adaptations within a single phonological grammar appear to be in vain. This of course leaves open the possibility to model loanword adaptations in a separate perception grammar that makes reference to fine-phonetic detail. Whether such a grammar fares better than psycholinguistic accounts of perceptual assimilation is an open question.

4. Conclusion

Most loanword adaptations seemingly change the shape of foreign words in order to make them comply with the surface phonological structure of the borrowing language. Within output-oriented phonological theories, the same pressure is held responsible for the transformations of underlying forms during the mapping onto surface forms in the native phonology. Given that there are not that many ways to transform an illegal form into a legal one in an economical way, loanword adaptations thus exhibit a global resemblance to native alternations. Upon closer inspection, however, the correspondence between the two phenomena simply does not hold, as shown by the examples in section 1. Fortunately, there is a third phenomenon that is driven by the requirement to respect native phonological structure: during speech perception, the process of phonetic decoding maps non-native forms onto forms that are in accordance with the native phonology. This process is thus influenced by but not identical to the phonology of the listener's native language. The perceptual assimilations that result from it are completely automatic and apply beyond the listener's awareness. Moreover, they are based upon phonetic rather than phonological distance, and in the cases studied so far they correspond to the transformations that take place in loanword adaptations.

The hypothesis that loanword adaptations are not part of the phonological grammar but reflect the psycholinguistic process of phonetic decoding is a strong one that might be overly simplistic. Other factors, yet to be determined, can equally be at stake. For instance, orthography can be expected to play a role in adaptations that are either based on written input or established by speakers who

know the spelling of the loanwords in the source language. Given the metalinguistic character of orthography, adaptations that are (partly) based on spelling correspondences are of course of little interest to linguistic analyses. Whereas in the case of integrated loanwords the influence of orthography is not always easy to establish, in on-line adaptations that are gathered experimentally, orthography is a factor that can be controlled for. In particular, contemporary loanword data can be collected by presenting oral renderings of non-words in the source language to speakers of the borrowing language and ask them how they would introduce these forms into their own language. Likewise, in the case of massive borrowing from a single source language, there might be some standardization of adaptations that initially show a certain amount of variability. This variability, which can also be studied with on-line adaptations, is predicted to depend upon the phonetic proximity of competing well-formed structures in the borrowing language. For instance, a non-native sound that is almost equidistant to two different native sounds is likely to show more variability in its adaptation than one that is phonetically much closer to one of the native sounds than to all others. Note that there is an obvious parallel in speech perception experiments, where certain perceptual assimilation effects show more intra- and inter-subject variability than others.

To conclude, adaptations that are in conflict with some native alternation of the borrowing language and phonotactically 'unnecessary' adaptations are highly problematic for analyses of loanwords that derive the adaptations within the phonological grammar of the borrowing language. In contrast, their presence is expected under the hypothesis that loanword adaptations are basically phonetic rather than phonological in nature, and originate in the process of phonetic decoding during speech perception. This hypothesis is motivated independently by experimental data on the perception of non-native sound structures. Studying loanword adaptations within a psycholinguistic framework of speech perception therefore appears a promising avenue.

Acknowledgments
For comments and discussion, I would like to thank Nick Clements, Abigail Cohn, Emmanuel Dupoux, Yoonjung Kang, Michael Kenstowicz, and participants at the 30th Berkeley Linguistics Society meeting. Financial support from the CNRS ('Cognition et Traitement de l'Information') is gratefully acknowledged.

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Sharon Peperkamp
Laboratoire de Sciences Cognitives et Psycholinguistique
46, Rue d'Ulm
75005 Paris
France

Sharon.Peperkamp@ens.fr

High and Low Applicatives: Evidence from Lai

DAVID A. PETERSON
Dartmouth College

0. Introduction

Applicative constructions indicate that a semantically peripheral object has a more central morphosyntactic (and sometimes discourse) status than would otherwise be expected for it; i.e., they involve treating an oblique more like a direct object. The object associated with an applicative construction's morphology is referred to as the *applicative object*; an object associated with the non-derived verb (a patient/theme) is referred to as the *base object*. More conservative approaches to defining applicative constructions require that there be an overt *marker* of the construction occurring in the construction's verb; less conservative approaches are willing to countenance abstract, silent applicative elements. For further details, see Peterson, forthcoming.

Depictive secondary predicates, or simply *depictives*, are syntactically dependent predicates occurring in conjunction with a main predicate which predicate something of one of the participants involved in the main predicate, the *controller*. They are non-finite adjuncts and do not function as a modifier to their controller; e.g. *Bob$_i$ left the party drunk$_i$*, in which *drunk* is the depictive secondary predicate and *Bob* is its controller, as indicated by the subscript indexing (based on Schultze-Berndt and Himmelmann 2004).

In this paper, I will first discuss applicative constructions in Lai (Tibeto-Burman, Western Burma) and establish their essentially asymmetrical character (in the sense of Bresnan and Moshi 1990).[1] Next, I will outline Pylkkänen's recent high/low applicative typology (2001, 2002) and extensions of it proposed by McGinnis (2001a and b); this typology is motivated in part by possible interpretations for depictive secondary predicates in conjunction with applicative constructions. I will then consider evidence, focusing on the interpretation of depictive secondary predicates in Lai applicative constructions, which bears on the issue of the high/low applicative typology. From this evidence, I will urge

[1] Many thanks go to Ken VanBik (and other speakers of Lai consulted by him) for providing and discussing the data used here. Lai's applicative constructions are treated in significantly more detail by Peterson (1998).

caution in the extension of this typology to account for more widely cited applicative construction asymmetries.

1. The Lai family of applicatives

Lai has the family of applicative constructions illustrated in (1)-(7).

(1) -piak: benefactive/malefactive (/substitutive) applicative
làw ʔa-ka-thloʔ-piak
field 3sS-1sO-weed$_2$-BEN
'He weeded the field for me.'

(2) -tseʔm: additional benefactive applicative
làw ʔa-ka-thloʔ-tseʔm
field 3sS-1sO-weed$_2$-ADD BEN
'He weeded the field for my benefit (in addition to his own benefit).'

(3) -pii: comitative applicative
làw ʔa-ka-thloʔ-pìi
field 3sS-1sO-weed$_2$-COM
'He weeded the field along with me.'

(4) -hnoʔ: allative/malefactive applicative
làw ʔa-ka-thloʔ-hnoʔ
field 3sS-1sO-weed$_2$-ALL/MAL
'He weeded the field to my detriment.'

(5) -kaʔn: prioritive applicative
làw ʔa-ka-thloʔ-kaʔn
field 3sS-1sO-weed$_2$-PRIOR
'He weeded the field ahead of/before me.'

(6) -taak: source applicative
làw ʔa-ka-thloʔ-taak
field 3sS-1sO-weed$_2$-SOURCE
'He left me and weeded the field.'

(7) -naak: instrumental applicative
tuhmùy làw ʔa-thloʔ-naak
hoe field 3sS-weed$_2$-INST
'He weeded the field with a hoe.'

Some other noteworthy typological features of the language include split-ergative marking of grammatical relations and generally verb-final syntax.[2]

[2] Peterson 2003 provides a grammatical sketch of Lai covering these and other features.

2. Lai applicative constructions as asymmetrical

Below are several diagnostics used to typologize applicative constructions:

- order of objects with respect to the verb
- coding of objects by verbal pronominal morphology or agreement
- case marking of objects
- availability of object participants for other valence-affecting constructions (e.g. passive)
- interpretation of object participants in reflexivization/reciprocalization
- availability of objects for relativization
- availability of objects to act as controllers in cross-clausal coreference relationships
- potential for objects' quantifiers to float
- potential for objects to act as controllers for depictive secondary predicates

In Lai, with the exception of the instrumental applicative, which is the only applicative construction that usually does not have an animate applicative object, applicative constructions are essentially asymmetrical in their treatment of multiple objects. Criteria for judging the relative status of objects involve either a categorical or a gradient distinction between the objects—in some cases only the applicative object has access to a property, to the exclusion of a cooccurring patient, and in other cases the unmarked interpretation is that the applicative object exhibits the property, though an alternative reading in which the patient object instead exhibits the property cannot strictly be ruled out.

For the remainder of the paper, I will concentrate on the behavior of just one of these constructions, the comitative applicative. Comitatives either involve use of the comitative applicative construction, marked by *–pii* (as in (8)), or an oblique marker *=hee* (seen in (9)).

(8) comitative applicative object:

làwthlawpaa=niʔ	hŋaaktsiapaa	ʔa-kál-pìi
farmer=ERG	boy	3SS-go$_2$-COM

'The farmer left with the boy.'

(9) oblique comitative object:

làwthlawpaa	hŋaaktsiapaa=hée	ʔa-kàl
farmer	boy=COM	3SS-go$_1$

'The farmer left with the boy.'

2.1. Properties exhibiting strict asymmetry

Several properties exhibit a strict asymmetry between the objects in applicative constructions like the one in 8. That is, for these properties, only the comitative applicative argument can exhibit the property.

2.1.1. Object agreement

Lai verbs bear agreement prefixes for subject and object and, if relevant, a suffix which marks object plurality.

(10) ʔa-maʔ ʔa-ń-zuʔl-pìi
3S-PRON 3S SUBJ-2S OBJ-follow$_2$-COM
'He followed him with you.'

(11) ʔa-maʔ ʔa-ka-zuʔl-pìi
3S-PRON 3S SUBJ-1S OBJ-follow$_2$-COM
'He followed him with me.'

(12) naŋ-maʔ ʔa-ka-zuʔl-pìi
2S-PRON 3S SUBJ-1S OBJ-follow$_2$-COM
'He followed you with me.'

(13) ? kay-maʔ ʔa-ń-zuʔl-pìi
1S-PRON 3S SUBJ-2S OBJ-follow$_2$-COM
'He followed me with you.'

(14) * naŋ-maʔ ʔa-ø-zuʔl-pìi
2S-PRON 3S SUBJ-3S OBJ-follow$_2$-COM
'He followed you with him.'

(15) * kay-maʔ ʔa-ø-zuʔl-pìi
1S-PRON 3S SUBJ-3S OBJ-follow$_2$-COM
'He followed me with him.'

As may be seen in (10)-(15), any preverbal object marking refers to the applicative object in applicative constructions; there are limitations on this according to the relative person status of the two objects (in this language's applicative constructions the base object must not be first or second person if the applicative object is third person).

It is in fact possible to have marginal marking for base object number, but only if it is clear from context or from morphological considerations that the number marking does *not* refer to the applicative object (e.g., a verb with a first person applicative object would never have postverbal object marking that refers to first person, as in 16).

(16) ka-làw ʔàn-ka-thloʔ-pìi-hnaa
1S POSS-field 3P SUBJ-1S OBJ-weed$_2$-COM-PL OBJ
'They weeded my fields with me.'

This sort of marginal base object marking occurs elsewhere in languages which have an otherwise asymmetrical treatment of objects in applicative constructions, e.g., Huichol number-based verbal stem suppletion (discussed in Comrie 1982).

2.1.2. Reciprocalization/reflexivization

Next, reciprocalization or reflexivization in Lai involves reflexive object markers appearing in the prefixal object marker position.

(17) sayàapaa ʔàn-ʔii-puak-pii
teacher 3P SUBJ-RECIP/REFL-carry$_2$-COM
'They carried the teacher with each other (i.e., both worked to carry him).'
but *'They carried each other with the teacher (i.e., the teacher worked with each of them in order for them to carry each other in turn).'

Considering the possible interpretation of (17), reciprocalization/reflexivization in applicative constructions always involves coreference between an agent and the applicative object; the base object may never be understood to be coreferential with the agent.

2.1.3. Purposive clause control

In addition, control in one type of purposive clause construction involves coreference between the subject of the purposive clause and either the subject or an object of the main clause.

(18) ʔa-traʔ-law-naak tsaa díŋ=ʔaʔ
3S SUBJ-cry$_2$-NEG-NOMLZR sake PURP=LOC

sayàapaa=niʔ sakaappaa làwthlawpaa ʔa-zuʔl-pii
teacher=ERG hunter farmer 3S SUBJ-follow$_2$-COM

'The teacher followed the farmer with the hunter$_i$ so that he$_i$ wouldn't cry.'
or 'The teacher followed the hunter with the farmer$_i$ so that he$_i$ wouldn't cry.'

Given the possible interpretations of (18), the controller of the 3sS pronominal prefix in the dependent clause verb of this purposive clause construction must be the applicative object; it cannot be the base object.

2.2. Gradient object properties

Some object properties are not categorical, though the unmarked interpretations of sentences with the relevant features are nevertheless ones in which the property is exhibited by an applicative object rather than a base object; given appropriate circumstances, however, the base object may also exhibit the properties in question.

2.2.1. Occurrence with discourse deictics

For instance, Lai has several postnominal modifiers with complex discourse status semantics, similar in many respects to articles, though by no means coterminous with them, as seen in (19).

(19) sayàapaa=niʔ làwtlawpaa kháa sakaappaa ʔa-zuʔl-pii
teacher=ERG farmer DEIC hunter 3S SUBJ-follow$_2$-COM
unmarked: 'The teacher followed the hunter with the farmer.'
marked: 'The teacher followed the farmer with the hunter.'

In view of judgments concerning the interpretation of sentences like (19), although it is not categorical, speakers' most natural interpretation is that a discourse deictic occurring with one of the objects in an applicative construction is associated with the applicative object rather than the base object.

2.2.2. Left-dislocation

Also, Lai may left-dislocate (usually phonologically heavy) participants in a construction which otherwise has elusive motivations, seen in (21), for a basic sentence like (20), along with their possible interpretations.

(20) sayàapaa =niʔ làwthlawpaa sakaappaa ʔa- zuʔl-pii
teacher=ERG farmer hunter 3S SUBJ-follow$_2$-COM
'The teacher followed the farmer with the hunter / the hunter with the farmer.'

(21) làwthlawpaa sayàapaa=niʔ sakaappaa ʔa- zuʔl-pii
farmer teacher=ERG hunter 3S SUBJ-follow$_2$-COM
unmarked: 'The teacher followed the hunter with the farmer.'
marked: 'The teacher followed the farmer with the hunter.'

The second interpretation of (21) is more likely if the undislocated object is associated with a discourse deictic, thereby causing it to be preferentially interpreted as the applicative object. The point to be drawn from this example is that the unmarked interpretation of a left dislocated NP in a sentence involving an applicative construction is that it is the applicative object, though a reading on which the left dislocated entity is the base object is not entirely ruled out.

2.2.3. Wh-questions

Finally, wh-questions in Lai either involve fronting of a wh-word or leave the wh-word in situ (both of these possibilities pattern the same way), as in (22) and (23).

(22) ʔahaw=daʔ sayàapaa=niʔ làwthlawpaa ʔa-zuʔl-pii
who-INTERR teacher=ERG farmer 3SS-follow$_2$-COM
unmarked: 'Who did the teacher follow the farmer with?'
marked: 'Who did the teacher follow with the farmer?'

(23) ʔazày sakaappaa=daʔ sayàapaa=niʔ làwthlawpaa ʔa-zuʔl-pii
which hunter=INTERR teacher=ERG farmer 3SS-follow$_2$-COM
unmarked: 'Which hunter did the teacher follow the farmer with?'
marked: 'Which hunter did the teacher follow with the farmer?'

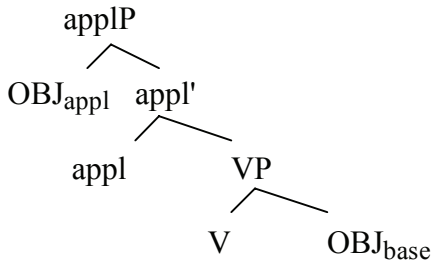
Given these interpretations, it is more natural for a wh-question word relating to one of the object participants in an applicative construction to refer to the applicative object, although a question word actually can also refer to the base object.

3. The high and low approach to applicatives

3.1. The basic high/low account

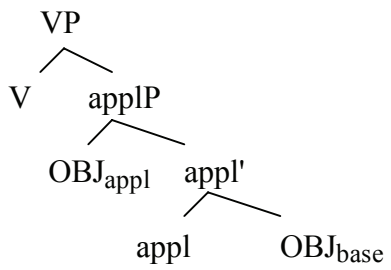
Pylkkänen (2001, 2002) proposes a new structural typology of applicatives, primarily to account for a number of aspects of their semantics, including the possibility of an applicative object controlling a secondary depictive predicate and the potential for certain predicate types (unergative and static) to applicativize. The typology distinguishes high vs. low applicatives depending on where an applicative head merges, as indicated in (24) and (25).[3]

(24) <u>High applicative:</u> the applicative head merges above the verb



[3] (24) and (25) are based on McGinnis's (2001b) depiction of the relevant structures.

(25) Low applicative: the applicative head merges below the verb



In (26a) a depictive may be controlled by the applicative object; in (26b) the applicative object cannot control the depictive. Based on this diagnostic, the Luganda construction is taken to involve a high applicative and the Japanese one is taken to involve a low applicative.

(26) a. Luganda (Pylkkänen 2002:34)

mustafa	ya-ko-le-dde	katonga	nga	mulwadde
Mutstafa	3SG.PAST-work-APPL-PAST	Katonga	DEP	sick

'Mustafa worked for Katonga$_i$ sick$_i$.'

b. Japanese (Pylkkänen 2002:32)

taroo=ga	hanako=ni	hadaka=de	hon=o	yon-da
Taro=NOM	Hanako=DAT	naked	book=ACC	read-PAST

'Taro$_i$ read Hanako$_j$ a book naked$_{i/*j}$.'

Languages for which the applicative object can be a depictive controller furthermore appear to allow applicativization of unergative and static predicates, while those in which it cannot be a controller do not allow applicativization of unergative and static predicates.

3.2. Extensions of the basic account

McGinnis (2001a, b) recasts the notion of high vs. low applicatives in terms of a theory of phases (specifically, high applicatives define a phase; low applicatives do not). Within this general approach, McGinnis claims to derive a number of more widely recognized applicative object asymmetries. Applicative constructions which exhibit a symmetrical treatment of their objects in terms of object agreement and access to passivization are deemed to be high applicatives (2001b:8-9, 13); applicative constructions which exhibit an asymmetrical treatment of their objects in terms of object agreement and access to passivization are deemed to be low applicatives (2001b:9-10, 13-14).

These attempts to extend the high/low typology to account for additional asymmetries thus yield the impression that there is a correlation between a symmetrical treatment of objects in applicative constructions and high applicative

properties on the one hand, and between an asymmetrical treatment of such objects and low applicative properties on the other.

4. The status of Lai

As seen above, Lai is a language with an essentially asymmetrical treatment of applicative and base objects; it therefore should be expected to pattern as a low-applicative language if there is a correlation between asymmetrical object treatment and low applicative status. However, Lai's applicatives pattern as high. Lai can freely applicativize unergative and static predicates, including, for instance, the verbs *run* and *hold*, which Pylkkänen (2002) uses to illustrate this diagnostic for the languages she surveys. Essentially any verb in Lai may appear in the applicative constructions.

The facts concerning the patterning of depictives with applicatives are somewhat more involved. A representative example is (28).

(27) sayàapaa=ni? làwtlawpaa kháa sakaappaa ?a-zu?l-pii
teacher=ERG farmer DEIC hunter 3SS-follow$_2$-COM
'The teacher followed the hunter with the farmer.'

(28) sayàapaa=ni? làwtlawpaa kháa sakaappaa zuriitbuu?in ?a-zu?l-pii
teacher=ERG farmer DEIC hunter drunk 3SS-follow$_2$-COM
'The teacher$_i$ followed the hunter$_j$ with the farmer$_k$ drunk$_{i/j/k}$.'

It turns out that the depictive can be controlled by any participant. In fact, we can be more explicit about speaker judgments than this: if the depictive occurs immediately after a particular NP, the unmarked interpretation is for it to be controlled by that NP; if it occurs after the ergatively marked teacher ((29a)), it must refer to that participant, if it occurs after the farmer ((29b)) it may refer either to the farmer or the teacher; and if it occurs after all three NPs ((28)), it may refer to any one of them.

(29) a. sayàapaa=ni? zuriitbuu?in lawtlaàwpaa khaa sakaappaa ?a-zu?l-pii
teacher=ERG drunk farmer DEIC hunter 3SS-follow$_2$-COM
'The teacher$_i$ followed the hunter$_j$ with the farmer$_k$ drunk$_{i/*j/*k}$.'

b. sayàapaa=ni? lawtlaàwpaa khaa zuriitbu?in sakaappaa ?a-zu?l-pii
teacher=ERG farmer DEIC drunk hunter 3SS-follow$_2$-COM
'The teacher$_i$ followed the hunter$_j$ with the farmer$_k$ drunk$_{i/*j/k}$.'

The examples in (30) show the same possibilities for interpretation with all other applicative constructions.

(30) a. benefactive

sayàapaa=ni? ka-nùpii khaá làwtlawpaa zuriitbuu?in ?a-laak-piak
teacher=ERG 1S POSS-wife DEIC farmer drunk 3SS-fetch$_2$-BEN
'The teacher$_i$ fetched the farmer$_j$ for my wife$_k$ drunk$_{i/j/k}$.'

b. additional benefactive

sayàapaa=ni? ka-nùpii khaá làwtlawpaa zuriitbuu?in ?a-laak-tse?m
teacher=ERG 1S POSS-wife DEIC farmer drunk 3SS-fetch$_2$-ADDBEN
'The teacher$_i$ fetched the farmer$_j$ for my wife$_k$ and himself drunk$_{i/j/k}$.'

c. allative/malefactive

sayàapaa=ni? làwtlawpaa kháa sakaappaa zuriitbuu?in ?a-zu?l-hno?
teacher=ERG farmer DEIC hunter drunk 3SS-follow$_2$-MAL
'The teacher$_i$ followed the hunter$_j$ to the detriment of the farmer$_k$ drunk$_{i/j/k}$.'

d. prioritive

sayàapaa=ni? làwtlawpaa kháa sakaappaa zuriitbuu?in ?a-zu?l-ka?n
teacher=ERG farmer DEIC hunter drunk 3SS-follow$_2$-PRIOR
'The teacher$_i$ followed the hunter$_j$ ahead of the farmer$_k$ drunk$_{i/j/k}$.'

e. source

sayàapaa=ni? làwtlawpaa kháa sakaappaa zuriitbuu?in ?a-zu?l-taak
teacher=ERG farmer DEIC hunter drunk 3SS-follow$_2$-SOURCE
'The teacher$_i$ followed the hunter$_j$ leaving the farmer$_k$ drunk$_{i/j/k}$.'

f. instrumental

sayàapaa=ni? làwtlawpaa kháa sakaappaa zuriitbuu?in ?a-hlen-naak
teacher=ERG farmer DEIC hunter drunk 3SS-deceive$_2$-INST
'The teacher$_i$ deceived the hunter$_j$ by means of the farmer$_k$ drunk$_{i/j/k}$.'

It should be further noted, however, if the applicative object is first or second person, as in (31a) and (32a), interpretations in which the controller is the applicative object are highly dispreferred. Instead, there is an alternative in which the depictive predicate is expanded into a full-fledged subordinate clause, as seen in (31b) and (32b):

(31) a. sayàapaa=ni? làwtlawpaa zuriitbuu?in ?a-ka-zu?l-pii
teacher=ERG farmer drunk 3SS-1SS-follow$_2$-COM
'The teacher$_i$ followed the farmer$_j$ with me$_k$ drunk$_{i/j/?k}$'

b. zùu ka-riit-buuʔin
alcohol 1SS-drunk-SIMULT

sayàapaa=niʔ làwtlawpaa ʔa-ka-zuʔl-pii
teacher=ERG farmer 3SS-1SS-follow$_2$-COM

'While I was drunk, the teacher followed the farmer with me.'

(32) a. sayàapaa=niʔ làwtlawpaa zuriitbuuʔin ʔa-ń-zuʔl-pii
teacher=ERG farmer drunk 3SS-2SS-follow$_2$-COM
'The teacher$_i$ followed the farmer$_j$ with you$_k$ drunk$_{i/j/ʔk}$'

b. zùu na-riit-buuʔin
alcohol 2SS-drunk- SIMULT

sayàapaa=niʔ làwtlawpaa ʔa-ń-zuʔl-pii
teacher=ERG farmer 3SS-2SS- follow$_2$-COM

'While you were drunk, the teacher followed the farmer with you.'

In sum, Lai's applicatives have the distributional status of Pylkännen's high applicatives (given their ability to occur freely with predicates of all types and for their objects to be depictive controllers[4]). However, their status is clearly asymmetrical from the standpoint of the more traditional typological classification.

5. Concluding remarks

The evidence from Lai applicative constructions minimally indicates that the high/low applicative typology is not necessarily equivalent to the symmetrical/asymmetrical typology. Attempts to make such an equation should be subject to further scrutiny.

This outcome is something we should perhaps already expect given McGinnis' (2001b) treatment of Chichewa. In some respects (in terms of some semantic considerations and also phonological phrasing of the two objects associated with applicative constructions), Chichewa appears to have a high benefactive applicative construction, but this is also the prototype asymmetrical applicative construction following Bresnan and Moshi's (1990) account, a mismatch which has yet to be fully accounted for.

[4] At the conference presentation of this paper Alec Marantz rightly pointed out that if in a sentence like (9) a depictive could be controlled by the oblique, it would potentially make the diagnostic irrelevant for Lai due to a restriction Pylkkänen places on its application. In fact, it turns out that the depictive cannot be controlled by an oblique in such sentences.

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David A. Peterson
Program in Linguistics and Cognitive Science
307 Reed Hall, HB 6220
Dartmouth College
Hanover, NH 03755

david.a.peterson@dartmouth.edu

Malagasy Control and Its Theoretical Implications*

MARIA POLINSKY and ERIC POTSDAM
University of California, San Diego and *University of Florida*

0. Introduction

Few syntactic phenomena have attracted as much attention as Control: a structure in which the overt subject of a dominating clause (the *controller*) determines the referential properties of an unpronounced subject of its complement clause (the *controllee*). More than thirty years of research, starting with Rosenbaum (1967), Postal (1970), and Bresnan (1972), have produced several interesting theories of Control and Raising (for a good summary of approaches, see Davies and Dubinsky 2004). At the same time, most studies of Control have built heavily on the facts of English and a small number of other well-studied languages. The goal of this paper is to investigate Control in Malagasy, an Austronesian language spoken in Madagascar that is significantly different from English. We will present and analyze three Subject Control constructions in Malagasy which may provide an argument in favor of a syntactic analysis of Control as movement (Hornstein 1999, 2003). The paper is structured as follows. Section 1 introduces basic facts of Malagasy grammar. Section 2 briefly surveys the contrasting syntactic approaches of Control that we consider. Sections 3 through 6 describe and analyze three different patterns of Control in Malagasy, using two of the patterns to argue for the movement analysis. Section 7 summarizes the results of this work.

1. Malagasy

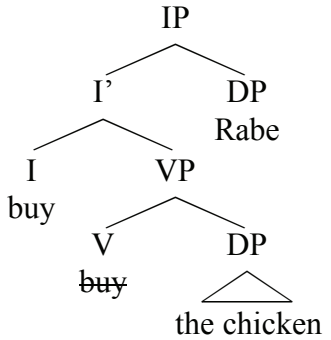
Malagasy has basic VOS word order and an articulated voice system. For our purposes, it is sufficient to recognize three voices shown in (1a-c): active or agent-topic, passive or theme-topic, and circumstantial (passivized applicative) which serves to promote an element other than agent or theme. In (1c), it is a beneficiary.

* This research was supported by NSF grants BCS-0131946 and BCS-0131993 and by a University of California Academic Senate grant. We are very grateful to our language consultants, Tina Boltz, Noro Brady, Solange Green, Cecile Manorohanta, Landy Rahelison, Charlotte Abel-Ratovo, Hasina Randriamihamina, and Annie Rasoanaivo. We have benefited from discussions with Gabriella Hermon, Ed Keenan, Matt Pearson, Roger-Bruno Rabenilaina, Lisa Travis and the audience at BLS 30. All errors are our sole responsibility.

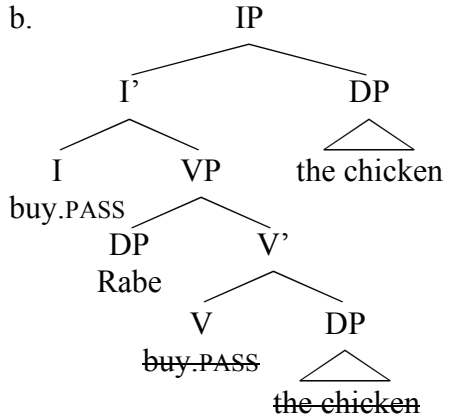
(1) a. n-i-vidy ny akoho (hoan-dRasoa) Rabe ACTIVE
PAST-ACT(IVE)-buy the chicken for-Rasoa Rabe
'Rabe bought a chicken (for Rasoa).'
b. no-vidi-n-dRabe (hoan-dRasoa) ny akoho PASSIVE
PAST-buy-PASS(IVE)-Rabe for-Rasoa the chicken
'The chicken was bought (for Rasoa) by Rabe.'
c. n-i-vidi-anan-dRabe ny akoho Rasoa CIRCUMSTANTIAL
PAST-ACT-buy-CIRC-Rabe the chicken Rasoa
'Rasoa was bought a chicken by Rabe.'

There are several proposals concerning the structure of such clauses and we will adopt structures from Guilfoyle, Hung, and Travis (1992), shown in (2). The clause-final subject occupies the specifier of IP and non-subject agents occur post-verbally in the specifier of VP.

(2) a.



b.



The voice system has an important syntactic function. As pointed out by many researchers, only the subject can be extracted for purposes of relativization, wh-questioning, or topicalization (Keenan 1972, 1976, 1995, MacLaughlin 1995, Paul 1999, 2002, Pearson 2001, Sabel 2002, and many others). This is illustrated briefly in (3), which shows that only subject wh-questions are grammatical.

(3) a. iza no nividy ny akoho ~~iza~~?
who FOCUS buy.ACT the chicken
'Who bought the chicken?'
b. *inona no nividy ~~inona~~ i Rabe?
what FOCUS buy.ACT Rabe
('What did Rabe buy?')

2. Syntactic Approaches to Control

With section 1 as background, we turn to the syntax of Control and Control in Malagasy. While we cannot do justice to the richness of various approaches to

Control here, we will introduce two competing analyses: a base-generation approach and the more recent Minimalist-oriented movement account.

Within the Principles and Parameters theory (Chomsky and Lasnik 1993), the controllee in a Control structure is the null element PRO and it is co-indexed with the controller, as shown in (4).

(4) The farmer$_i$ tried PRO$_i$ to sell the cow

The PRO-based account rests on the theoretical assumptions in (5), among others. The Theta Criterion in (5a) forces the existence of PRO. (5b) restricts PRO's distribution to the subject of non-finite clauses and (5c) helps to determine PRO's interpretation.

(5) a. an NP chain may receive at most one θ-role (part of the Theta Criterion)
b. PRO is assigned Null Case
c. PRO must be bound for a referential interpretation

Each of these assumptions has been questioned in the literature. Hornstein's (1999, 2003) Minimalist analysis of Control replaces them with the following:

(6) a. an NP chain may receive multiple θ-roles
b. PRO does not exist
c. the controllee is a trace of NP-movement

Adopting these arguably Minimalist assumptions leads to a unification of Raising and Control. Both are derived via A-movement and they differ minimally in whether or not the higher predicate assigns a θ-role to the raised NP. On Hornstein's analysis, a Control structure has the following derivation:

(7) The farmer tried ~~the farmer~~ to sell the cow

Hornstein 1999 discusses a number of conceptual advantages to the movement analysis. In what follows, we introduce three Malagasy control structures in an effort to provide new empirical data which might contribute to this theoretical debate.[1]

3. Active Control

ACTIVE CONTROL, in (8), is the Malagasy construction that most closely resembles English Control. The control predicate appears in the active voice, while the voice of the embedded predicate is not restricted.

[1] Previous research on Malagasy Control constructions include Keenan (1976, 1995), Law (1995), Paul and Ranaivoson (1998), Pearson (2001), and Polinsky and Potsdam (2002a, 2003).

(8) a. n-an-andrana n-a-mono ny akoho Rabe
PAST-ACT-try PAST-ACT-kill the chicken Rabe
'Rabe tried to kill the chicken.'
b. m-an-aiky ho-sas-ana ny zaza
PRES-ACT-agree FUT(URE)-wash-PASS the child
'The child agrees to be washed.'

This construction is accepted by all speakers and has properties typical of a Subject Control structure. The matrix verb imposes selectional restrictions on its subject and there is an obligatory control interpretation with the embedded subject position, which must remain unexpressed. In brief, the Active Control construction is unsurprising in resembling English and other well-known languages and, as a consequence, it does not shed light on the theoretical debate between base-generation and movement analyses of the phenomenon.

4. Backward Control

BACKWARD CONTROL is the apparently similar construction illustrated in (9). It seems limited to three verbs (*mahavita* 'accomplish', *mitsahatra* 'stop', and *manomboka* 'begin') and is subject to unpredictable idiolectal variation.

(9) a. n-a-havita namono ny akoho Rabe
PAST-ACT-accomplish kill.ACT the chicken Rabe
'Rabe finished killing the chicken.'
b. m-an-omboka mitondra ny fiara Rabe
PRES-ACT-begin drive.ACT the car Rabe
'Rabe is beginning to drive the car'

As with Active Control, the control predicate is in the active voice and it imposes selectional restrictions on the overt subject. For example, these verbs do not allow non-volitional subjects, (10), and they form an imperative, (11) (Perlmutter 1970).

(10) *nahavita navy ny orana
accomplish come the rain
('It stopped raining.')

(11) mahavità manoratra ny taratasy (ianao)
accomplish.IMPERATIVE write the letter you
'Finish/complete your letter writing!'

There is also an obligatory control interpretation between the two subject arguments and (9) cannot mean 'Rabe finished having someone kill the chicken'. Similarly, the two subject positions cannot be simultaneously expressed, (12).

(12) a. *n-a-havita namono ny akoho izy/azy Rabe
PAST-ACT-accomplish kill.ACT the chicken 3SG.NOM/3SG.ACC Rabe
('Rabe finished killing the chicken.')

In contrast to Active Control, however, the construction has the unusual constituency shown in (13) in which the overt subject is in the embedded clause. It is not the subject of the matrix control predicate.

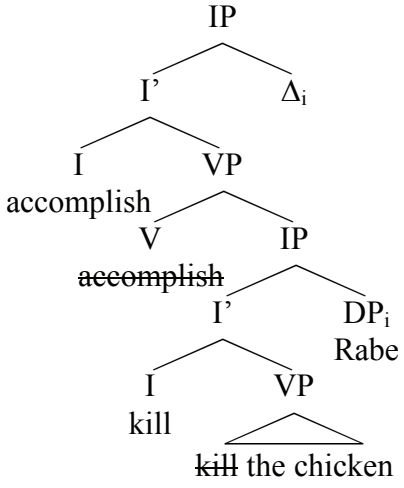
(13) n-a-havita [namono ny akoho Rabe]
PAST-ACT-accomplish kill.ACT the chicken Rabe
'Rabe finished killing the chicken.'

Evidence for this constituency comes from coordination (see Polinsky and Potsdam 2002a for more detailed argumentation). The matrix verb and embedded predicate cannot coordinate to the exclusion of the subject, (14a). Instead, the embedded subject must be repeated, (14b). This is expected given the constituency in (13). If the overt subject were outside the embedded clause, (14a) should be possible.

(14) a. *nanomboka namaky ny taratasy sy menatra ny mpianatra
began read the letter and embarrassed the student
('The student began to read the letter and was embarrassed.')
b. nanomboka namaky ny taratasy ny mpianatra ka menahatra izy
began read the letter the student and embarrassed 3SG
'The student began to read the letter and he was embarrassed.'

Given that the overt subject is in the embedded clause but the matrix predicate imposes selectional restrictions, there must be a non-overt subject in the higher clause coindexed with the lower subject. We represent this controllee atheoretically as Δ in (15).

(15)



Additional evidence for this null controllee comes from quantifier float. Floated *daholo* 'all' is licensed under c-command in the same clause as its binder (Keenan 1976, 1995), (16a). (16b) shows that *daholo* 'all' may also appear in the matrix clause in Backward Control constructions. This is unexpected unless there is a null controllee in the matrix clause.

(16) a. nanomboka omaly [mihomehy **daholo** ny ankizy]
began yesterday laugh all the children
'Yesterday the children began to laugh all.'
b. ?nanomboka **daholo** omaly [mihomehy ny ankizy]
began all yesterday laugh the children
'Yesterday the children all began to laugh.'

In summary, as we have argued in more detail elsewhere (Polinsky and Potsdam 2002a), this construction instantiates Backward Subject Control, a control construction in which the structural positions of the controller and controllee are reversed. It is also found in Tsez (Polinsky and Potsdam 2002b), Tsaxur (Kibrik 1999), and possibly Kabardian (Kumaxov and Vamling 1998) and Adyghe (Say 2004).

Turning now to the syntactic analysis of Backward Control, it clearly presents a problem for the base-generation analysis:

(17) [accomplish [kill the chicken Rabe_i] Δ_i]

If the matrix subject is PRO, it is not bound and the sentence should, instead, receive an arbitrary interpretation, contrary to fact. At the same time, with coindexing, the structure is a violation of Binding Theory Condition C, since the R-expression *Rabe* is not free. This should rule out the structure on a control interpretation.

There are similar problems if the matrix subject is the null pronominal *pro*. First, Malagasy is not a pro-drop language. Second, even if *pro* were exceptionally present in this particular configuration, the obligatory control interpretation is unexpected. Third, the presence of *pro* would again lead to condition C violation. Finally, it is surprising to find a null pronominal that never alternates with an overt NP, (12).

The conclusion that the controllee is not a base-generated empty category suggests that we consider Hornstein's movement analysis of control discussed in section 2. In Polinsky and Potsdam (2002a,b) we propose in more detail that Backward Control differs from Forward Control only in that the raising of the controller takes place in the covert syntax:

(18) derivation of Backward Control
a. $[_{IP}$ $[_{VP}$ accomplish $[_{IP}$ Rabe $[_{VP}$ kill chicken]]]] SS
b. $[_{IP}$ Rabe $[_{VP}$ accomplish $[_{IP}$ ~~Rabe~~ $[_{VP}$ kill chicken]]]] LF

This approach correctly derives the relevant Malagasy construction and avoids the analytical problems that accompany the empty category analysis. If this approach can be maintained, the Backward Control construction offers support for a derivational view of Control. In the next section, we turn to a construction that seems to pose a challenge to this conclusion.

5. Passive Control

The third control construction that we discuss is PASSIVE CONTROL, as in (19). It involves a passive control predicate and a passive or circumstantial verb in the embedded clause. Both the controller and controllee are passive agents.

(19) a. n-andram-an-dRabe no-vono-ina ny akoho
PAST-try-PASS-Rabe PAST-kill-PASS the chicken
(lit.: the chicken was tried by Rabe to be killed)
'Rabe tried to kill the chicken.'

b. kasa-in-dRasoa ho-sas-ana ny zaza
intend-PASS-Rasoa FUT-wash-PASS the child
(lit.: the child is intended by Rasoa to be washed)
'Rasoa intends to wash the child.'

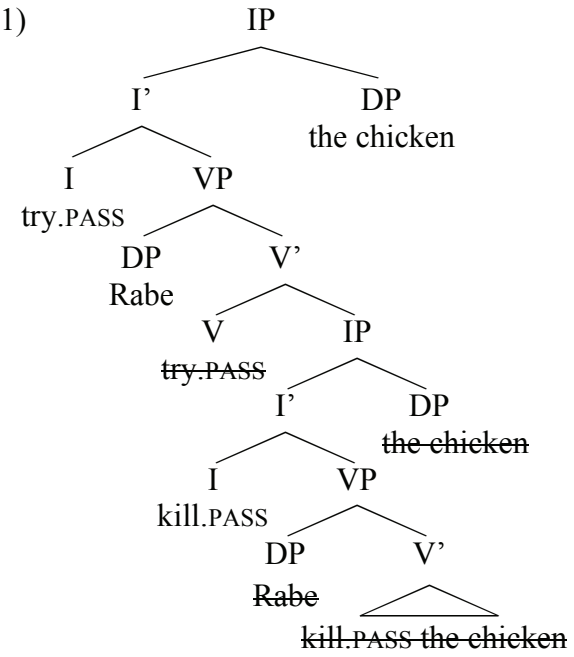
As before, the control predicate imposes selectional restrictions on its agent and the controllee cannot be expressed, (20).

(20) *n-andram-an-dRabe$_i$ no-vono-i-ny$_i$ ny akoho
PAST-try-PASS-Rabe PAST-kill-PASS-3SG the chicken
('Rabe tried to kill the chicken.')

The structure we posit for passive control is in (21) below. The matrix subject cyclically raises from the embedded clause, first undergoing passive and then subject-to-subject raising into the matrix subject position. The control relationship is established by movement from the lower spec,V to the higher.

This derivation however violates Relativized Minimality because it contains two overlapping A-chains. This challenges the analysis of Control as movement. At this juncture we can entertain three analytical possibilities: (i) the PRO-based analysis should be revived, (ii) the construction is Non-Obligatory Control and, as such, it is not analyzed as movement under Hornstein's (1999) theory, or (iii) there is a different analysis in terms of movement compatible with Relativized Minimality. The phenomenon of Backward Control forces us to reject (i). In the section to follow, we explore (ii) in more detail and ultimately reject it. We sketch a solution along the lines of (iii) based on work in progress.

(21)



6. Obligatory and Non-Obligatory Control

Many researchers have recognized and investigated the difference between Obligatory Control (OC) and Non-obligatory Control (NOC) illustrated in (22) (see Jackendoff and Culicover 2003 for a discussion). The controller in OC must be very local while the choice of controller in NOC is more open.

(22) a. Pat_i expects $\Delta_{i/*k}$ to sing — OBLIGATORY

b. Pat_i thinks that $\Delta_{i+k/k}$ to sing would be fun — NON-OBLIGATORY

Hornstein (1999) proposes that the two constructions have different syntactic structures. Only OC involves movement; NOC is a base-generated structure. If Malagasy passive control were NOC, it would not pose a problem for the movement analysis of control—it would be simply irrelevant to it.

OC and NOC differ in a number of documented ways (Hornstein 1999, 2003, Jackendoff and Culicover 2003, and references therein):

(23)	properties of OC versus NOC	OC	NOC
a.	no controller (PRO_{arb} reading)	x	√
b.	permits strict reading under ellipsis	x	√
c.	paraphrasable with a pronoun	x	√
d.	allows a non-local antecedent	x	√
e.	allows a non-c-commanding antecedent	x	√

We will now apply these diagnostics to Malagasy Passive Control. For comparison, we also present data on Active Control, an uncontroversial OC construction.

What the data below show is that all properties identify Passive Control as OC, no different from Active Control.[2]

(24) no controller, PRO_{arb} reading

a. nanaiky hividy ity trano ity Rabe ACTIVE
agree.ACT buy.ACT this house this Rabe

b. neken' i Rabe hovidina ity trano ity PASSIVE
agree.PASS' Rabe buy.PASS this house this
*'Rabe agreed for someone to buy this house.'
'Rabe agreed to buy this house.'

(25) sloppy vs. strict reading under ellipsis:

a. nanaiky hividy ny trano ny mpitsara.Ilay mpampiasa koa. ACTIVE
agree buy the house the judge this employer too

b. neken'ny mpitsara hovidina ny trano. Ilay mpampiasa koa PASSIVE
agree.PASS'the judge buy.PASS the house this employer too
'The judge agreed to buy the house. The employer (agreed to buy it) too.' SLOPPY
*'The judge agreed to buy the house. The employer (agreed for the judge to buy it) too.' *STRICT

(26) paraphrasable with a pronoun

a. %nanaiky azy hividy ilay trano ny mpitsara ACTIVE
agree.ACT 3SG buy.ACT this house the judge

b. neken' ny mpitsara hovidi-ny ilay trano PASSIVE
agree.PASS' the judge buy.PASS-3SG this house
*'The judge agreed to buy this house.'
'The judge agreed for him (someone else) to buy this house.'

(27) non-local antecedent

a. mihevitra Rabe fa nanaiky hividy ny fiara Rasoa ACTIVE
think Rabe that agree.ACT buy.ACT the car Rasoa

b. mihevitra Rabe fa neken-dRasoa hovidina ny fiara PASSIVE
think Rabe that agree.PASS-Rasoa buy.PASS the car
'Rabe thinks that Rasoa agreed to buy the car.'
*'Rabe thinks that Rasoa agreed for him (Rabe) to buy the car.'

[2] In earlier work (Polinsky and Potsdam 2003) and in the presentation of this paper, we claimed that Passive Control was NOC. That claim was based on data from a smaller number of speakers and showed variability among speakers and graded judgments. The current conclusion is based on more extensive fieldwork in Madagascar with a larger set of consultants, who seem to be more in agreement with each other and rarely show graded judgments. At the same time, there does seem to be variation in judgments with different predicates which we have not pursued. For illustration, we have used the predicate *manaiky* 'agree', which shows clear OC behavior.

(28) non-c-commanding antecedent:

a. nanaiky hividy ny kadoa ny zanak' i Rasoa ACTIVE
agree.ACT buy.ACT the gift the children' Rasoa

b. neken' ny zanak' i Rasoa hovidina ny kadoa PASSIVE
agree.PASS' the children' Rasoa buy.PASS the gift
'Rasoa's children agreed to buy a gift.'
*'Rasoa's children agreed for her (Rasoa) to buy a gift.'

Given that Passive Control is OC, the analysis according to which passive control is base-generated as NOC is untenable. This leaves us with the need to re-evaluate the movement analysis.

In ongoing work, we are pursuing the idea that the overlapping chains of movement in (21) are allowed because they instantiate different kinds of chains. The movement of the controller from spec,V to spec,V is A-movement but the movement of the theme from spec,I to spec,I is in fact A'-movement. This proposal relies on a particular view of Malagasy clause structure stated in (29).

(29) a. the post-verbal NP is the subject
b. the clause-final NP is an obligatory topic in an A'-position

That the clause-final NP must be specific (i.e. a topic) in Malagasy is well-known (see for example Keenan 1976, Pearson 1996, 2001, and Paul 2000). This view of Malagasy grammar is most recently and forcefully defended in Pearson (to appear) and the existence of passive control may further support this position.

7. Conclusions

In this paper, we have considered three control constructions in Malagasy: Active Control, Backward Control, and Passive Control. Examination of these constructions shows that the range of variation in Malagasy Control is richer than would be predicted on the basis of English and similar languages.

While expanding the empirical database of control structures available cross-linguistically, Malagasy Control constructions also validate fundamental properties of Control structures proposed on the basis of more familiar languages. In particular, the seemingly unusual Passive Control construction shows all the standard properties that identify Obligatory Control.

The Active Forward construction does not differ from well-known Subject Control in English and as such does not inform the ongoing theoretical debate concerning the optimal model for Control structures. The other two constructions discussed in this paper offer new empirical evidence for the derivational analysis of Control. This evidence crucially relies on internal facts of Malagasy grammar.

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Maria Polinsky
Linguistics Department
University of California, San Diego
La Jolla, CA 92093-0108

polinsky@ling.ucsd.edu

Eric Potsdam
Linguistics Program
University of Florida
Gainesville, FL 32611-5454

potsdam@ufl.edu

Assamese Verb Serialization in Functional, Areal-Typological and Diachronic Perspective*

MARK POST
Research Center for Linguistic Typology

0. Introduction

In Southeast Asian and West African linguistics, clauses containing multiple chained verbs are typically referred to as "serial verb constructions". In the South Asian linguistic tradition, the closest analogue to the serial verb construction is often labeled a "compound" or "explicator compound" verb (Brown 1997; Burton-Page 1957; Hacker 1961; Hook 1974; Kachru and Pandharipande 1980; Nespital 1989), to some a subtype of "converb" construction or "conjunctive participial" (Bisang 1995 and references therein). Qualified use of the term "serialization" has occasionally been introduced (Kachru 1979; Kachru 1993; Pandharipande 1993; Steever 1989). However, a detailed comparative study of multi-verb constructions in e.g. South and Southeast Asian languages remains to be conducted.[1]

While our data at present remain insufficient to conduct this larger study, I argue in this paper that verb chains in at least Assamese are in fact direct analogues to the serial verb constructions of West Africa and Southeast Asia. Structurally, their surface syntax is comparable in the crucial respects, and they exhibit analogous properties with respect to argument structure, scope of tense-aspect marking and polarity. More tellingly, however, they share a precisely analogous diachronic origin and functional motivation for their development, as well as serve as a primary channel for the recruitment of new grammatical morphemes. Although in terms of frequency distribution, as well as sheer number of functions handled, verb-serialization appears far *deeper* in more prototypical

* This work is based on research initially conducted at the University of Oregon. Data in this paper were elicited by the author from native speaker consultants except where cited and/or marked by a text reference of the form XX:#. I thank my Assamese consultants, Tanusri Borgohain and Priyanka Roy, my Thai consultant Duangkamol Sutthiwari, my Chinese consultant Kun Yue, and my Japanese consultant Naomi Hasebe. Eric Pederson commented helpfully on an earlier version of this work; all errors remain mine.

[1] A good introduction to the more general problem of the relationship between converbs and serial verbs may be found in Bisang (1995).

verb-serializing languages such as Lahu or Akan, these differences should probably be understood in terms of typological constraints on their development rather than as differences of kind *per se*.

The paper has the following structure: Section 1 briefly discusses some typological features of Assamese with reference to contact in the Northeast Indian linguistic area. Sections 2 and 3 review the synchronic and diachronic characteristics respectively of serial verb constructions in languages commonly identified as having them. Section 4 then reviews the major structural and semantic features of the Assamese serial verb construction. Section 5 concludes the presentation.

1. Typology and the contact situation of Assamese

As the Easternmost Indo-Aryan language, situated in the sub-Himalayan Brahmaputra plain, Assamese has enjoyed prolonged contact with Southeast Asian languages of Tai, Tibeto-Burman, and Mon-Khmer stock (Kakati 1995). An important regional lingua franca, Assamese has been creolized at least once on a large scale by southern Nagas and Bodo-Kacharis (Bhattacharjya 2001). Perhaps unsurprisingly given these available influences, Assamese has shed some stereotypically Indic traits. The modern language lacks retroflex stops and continuants, has lost verbal cross-referencing of gender and number, and has a relatively reduced and highly pragmatically-sensitive set of case-forms (Edwards 2004; Goswami and Tamuli 2003). At the same time, it has gained young but evidently robust systems of numeral classifiers and relator nouns (Benom MS), and can in general be said to have shifted towards a relatively more isolating morphological profile than its ancestors and Indic neighbors.[2] At the same time, the perseverance of at least some morphological markers of tense-aspect and argument cross-referencing on the verb, as well as an overall tendency towards polysyllabism, sets Assamese clearly apart from the monosyllabic, extreme isolating languages of Southeast Asia, in which verb-serializations are found *par excellence*. These typological facts may be kept in mind as the constructions I will analyze as verb serializations in these different types of languages are compared.[3]

2. Verb serialization - synchrony

"Verb-serialization" is widely understood in the sense(s) developed through the study of West African languages on the one hand (Givón 1975; Lord 1993, and

[2] There are even some reports of tonogenesis in consort with the simplification of rhymes in certain western dialects of Assamese (Stephen Morey, p.c.), however the subject remains to be fully investigated.

[3] Transcriptions: Assamese data are given in a practical orthography, following IPA except where *O* = [ɔ], *r* = [ɹ], *z* = [ʒ], *h* = [ʰ] / T_ and [ɦ] / D_ , #_; since my transcriptions reflect the actual speech of my consultants, who are each of relatively diverse dialect backgrounds (but correspond in most details to Goswami and Tamuli's (2003) "Western Assamese"), they may differ somewhat from transcriptions found elsewhere in the literature. Thai data follows Haas (1964), with the exception that Haas' syllable-final voiced stops are transcribed here as voiceless. Japanese data follow IPA except where *sh* = [ɕ]. Chinese data are in *pinyin*. All other data follow the transcription system used by the author of the work cited.

many others; Sebba 1987) and Southeast Asian languages on the other (Li and Thompson 1973; Schiller 1990, and many others). Representative examples from Akan and Thai are given in (1-2).

(1) *mi a fa sekan e twa* Akan
1 PF **take** knife PF **cut**
'I have cut with a knife.'
(Akan data from Byrne (1990))

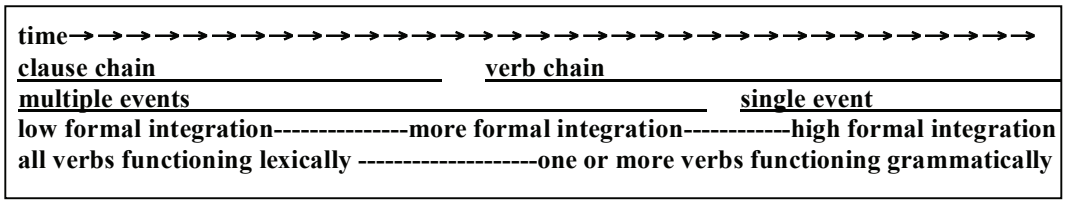
(2) *phŏm dâj ʔaw mîit paj hàn* Thai
1 **can take** knife **go cut**
'I was/am able to go cut with a/the knife.'

All of the terms glossed above in **bold** are capable of standing alone as the single verb of a simplex predicate, with the semantic values given. No overt marking confers a special status on any individual or subset of the verbs, i.e. as subordinated to or coordinate with a main verb, and they share the **same subject**, **same TAM** specification, and the **same polarity**; these are all strong tendencies of serial verb constructions cross-linguistically. Verb serializations also tend strongly to code a **single event**, or a tightly-bound sequence of temporally or analytically distinct events (often entailing causality or result), and are frequently found to fall under the same **intonation contour**. A concise review of these *prototypical* characteristics of serial verb constructions may be found in Seuren (1990).

Difficulties emerge due to the fact that certain verbs in a series will tend to exhibit **more or less lexical** characteristics, forming the semantic core of the predicate (e.g. 'cut' in 1-2 above), while others exhibit **more or less functional** properties, and appear to modify the semantic core with aspectual, directional or some other type of information. Disagreements have accordingly developed in synchronic analysis of the **categorical status** of serialized verbs, on the one hand, and the **underlying structure** of the clause in which they appear, on the other. However, taken from a diachronic perspective, the salient properties of serial verb constructions as well as their utility as a primary channel for the recruitment of new grammatical structures have a ready interpretation; the problem of categorical intermediacy can be accordingly re-cast as a problem of extent or degree of grammaticalization.

3. Serial verb constructions - diachrony

As demonstrated by Givón (1991; 1995), serial verb constructions arise diachronically through **clause-integration**. This is a functionally well-motivated operation maximizing efficiency in presentation when consequent clauses share much in common, e.g. subject, TAM and polarity. Speakers can omit overt reference of common elements, and, particularly in isolating and/or primarily dependent-



marking languages without much finite verb morphology, place two verb phrases under the same intonation contour.

From this point, integration of relatively unmarked lexemes under the same intonation contour creates prosodic and adjacency conditions which are ideal to grammaticalization; and, as may be expected, frequently-occurring and semantically general serial verbs are invariably recruited by verb-serializing languages as markers of aspect, modality and noun case, in addition to performing innumerable types of adverbial modification. Detailed, diachronically-informed case studies are widely available in the literature (Li and Thompson 1974; Lord 1993; Matisoff 1991; Post 2003, and others; Sun and Givón 1985).

To summarize this perspective (schematized in Figure 1): over time we find a relatively less well-formally-integrated **clause chain** coding temporally or analytically **distinct events** becomes gradually more well-formally-integrated as a **verb chain**, i.e. a serial verb construction.[4] The more compact construction that results is accordingly available to interpretation as a **single event**; in the extreme case, one or more of the verbs is semantically bleached and may be found performing some **grammatical function**.

time→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→
clause chain **verb chain**
multiple events **single event**
low formal integration---------------more formal integration------------high formal integration
all verbs functioning lexically --------------------one or more verbs functioning grammatically

Fig. 1 – Rise of verb serializations from clause chains

With this scenario in mind, we'll turn now to the so-called (explicator) compound verb construction in Assamese, and see that it may be similarly characterized, from both a synchronic and a diachronic perspective.

4. Verb Serialization in Assamese

The immediate source of the Assamese serial verb construction is a **conjunctive participial** construction, found widely in the SOV languages of South, Central and East Asia. As shown in example (3) from Marathi, an Indo-Aryan language spoken in and around Bombay, and in (4) from Japanese, we find a suffixed participial form of an initial or medial verb, followed by a finite final verb, giving us events in a temporal sequence.

(3) *Madhū he bol-**ūn** ghar -ī ge-lā* Marathi
Madhu this say-**CONJ** house-LOC go-PST.3.SG.M
'Having said this, Madhu went home.'
(data from Pandharipande (1993), adjusted MP)

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[4] I use the term "clause chain" here roughly in the sense of DeLancey (1991).

(4) *watashi-wa yut* ***-te*** *ie -ni kaet -ta* Japanese
1 -TOP say-**CONJ** house-LOC return-PFV
'I spoke and went home.'

Likewise in Assamese, when two semantically particular verbs occur in this construction, the resulting interpretation is a pair of events in temporal sequence (5). However, as shown in (6), when a more semantically general verb finishes the construction, the resulting interpretation is often not of an event sequence, but rather a single event. In this case, the first verb "write" forms the semantic core of the predication, and the second verb modifies it aspectually.

(5) *mOi likh -i kha-l -u* Assamese
1.NOM write-NF eat -PST-1.SUB
'I wrote (and then) ate.'

(6) *mOi likh -i as -il -u* Assamese
1.NOM write-NF have/exist-PST-1.SUB
'I was writing.'

Thus, while the verbal suffix *-i* seems clearly to derive from a conjunctive suffix alike to those found in e.g. Marathi and Japanese, its functional load in Assamese remains subject to question. Unlike in many so-called 'clause-chaining' languages, Assamese has an independent marker of conjunction *aru* 'and', which is often used in consort with a conjunctive participial form. In any case, whether or not the *-i* suffix is functioning to conjoin two predicates in (5), it clearly no longer has this function in a sentence like (6). I therefore gloss it here as a *non-finite marker*.[5]

4.1. Structure

The first condition of verb serialization is certainly that more than one verb be involved, and, perhaps, the more the better. In deep serializing languages like Thai or Lahu, it is by no means uncommon to find sequences of four to six verbs or more in a single clause (Matisoff 1969). Although comparative statistics are not yet available, it appears that the vast majority of Assamese serializations involve only two or three verbs; more extended chains may be elicited, but in texts chains greater than three verbs typically occur only as the result of stereotyped reduplications, as in (7).

[5] There are other reasons for believing the *-i* suffix is no longer analyzed by speakers as a conjunction *per se* - for example, all tense-aspect suffixes in Assamese carry an initial *i* (deleted when following vowel-final stems), viz. Perfect *-is*, Past *-il*, Subjunctive and Third person future *-ibO*, and First person future *-im*. It is possible that the *-i* suffix was long ago generalized as a predicate marker.

(7) *ta-i ula -i dza -i ula -i go -i pela -i bhab -e…*
3 -F **emerge**-NF **go**[a] -NF **emerge**-NF **go**[b]-NF **throw**-NF **think**-3.SUB
'She goes ahead on out and thinks…'
(Data from Joana Jansen, BP:4; gloss adjusted MP)

4.1.1. Argument structure

As already noted, serial verb constructions cross-linguistically tend to take a single subject.[6] True conjunctive participial constructions tend to be somewhat looser; for example, in Japanese, either a different (8) or a same subject (9) may intervene between the conjoined predicates.

(8) *watashi-ga kai -te kare-ga tabe-ta* Japanese
1 **-SUB** write-CONJ **3.M -SUB** eat -PFV
'I wrote (it) and he ate (it).'

(9) *watashi-ga kai-te (watashi-ga) tabe-ta* Japanese
'I wrote it and (I) ate it.'

By contrast, in Assamese, intervention of different (10) or same subjects (11) is rejected by my consultants, who prefer to coordinate two finite clauses instead (not shown).

(10) * *mOi likh -i (xi) kha -l -e* Assamese
1.NOM write -NF **(3.M.NOM)** eat -PST-**3.SUB**
~'I wrote and he ate.' (even with pause)

(11) **mOi likhi mOi khalu* Assamese
~'I wrote and I ate.' (even with stress on second *mOi*)

However, as in the Thai example (2) above and in verb-serializing languages generally, serialized verbs in Assamese may take separate object or oblique arguments which may then interrupt the chain (12).

(12) *xOdai ratipua xita-e rokh-i sula -tu -k sa -i thak -e*
every morning Sita-ERG **stop** -NF **garment**-CLF-ACC **watch**-NF **stay** -3.SUB
'Every morning Sita stops and gazes at the coat.'
(Data from Keri Edwards, RC:5; gloss adjusted MP)

4.1.2. TAM

We also noted that verb serializations cross-linguistically tend to take the same TAM specification. Likewise in Assamese, morphological markers of tense and

[6] I use the term "subject" here quite informally to indicate the S/A of an intransitive or transitive verb. A more complete presentation of argument structure in Assamese may be found in Edwards (2004).

aspect are suffixed to the chain-final verb only and have scope over all preceding verbs in the clause; compare examples (13) and (14) with (5) above.

(13) **mOi likh **-il** -i kha -u* Assamese
1.NOM write -PST -NF eat -1.SUB
? 'I wrote and then I eat.'

(14) *mOi likh -i kha -m* Assamese
1.NOM write-NF eat -1.FUT
'I'll write then eat.'

4.1.3 Polarity

While the extent to which serialized verbs must fall under the same polarity specification may vary across languages, it is frequently the case that serialized verbs with a grammatical or other modifying function cannot be independently negated; or, if they are, the erstwhile lexical sense is thereby forced to re-emerge to code a distinct event (Post 2003).[7] Consider the Thai sentence *khǎw khĭən paj léɛw* 's/he write go already,' a so-called "disposal" or "despatch" construction with the rough sense ~'s/he wrote it away' (i.e. wrote it and thereby dispensed with it) (Enfield To appear; Li and Thompson 1981). A negator morpheme preceding the lexical verb 'write' has scope over the clause, viz. "s/he didn't write it away"; however, in the borderline ungrammatical sentence ?*khǎw khĭən* ***màj paj*** *léɛw*, 's/he write **not go** already,' negation has scope over the erstwhile 'go' verb only, thereby forcing a reading of two disjoined events: "s/he wrote (but) didn't **go** yet".

Now consider the Assamese examples (15-17): as illustrated in (15), *di* 'give' in chain-final position indicates "purposeful" or "willful" activity with respect to the chain-initial or medial, semantic main verb. (16) shows that negation of the chain-final (i.e. the grammatically-functioning) verb has scope over all verbs in the clause.[8] However, negation of the semantic main verb as in (17) has narrow scope. This will force a grammatically-functioning chain-final verb like 'give' to revert to its lexical sense. Thus, while the *sites* of clause and narrow-scope negation in Thai and Assamese are effectively reversed, the *effect* of narrow-scope negation on the event structure is analogous.

(15) *mOi por-i di -l -u* Assamese
1.NOM fall-NF give-PST -1.SUB
'I purposefully fell.'

[7] Chinese resultative constructions present an important exception to this (Li and Thompson 1981).

[8] Both suffixal and prefixal negation occur in Assamese, with no semantic difference in simple perfective clauses.

(16) *mOi* *por-i* *di* *-a* ***-nai*** Assamese
1.NOM fall -NF give -CAUS-**SNEG**
'I **didn't** fall-on-purpose.' (i.e. didn't fall at all)

(17) *mOi* *no-* *por-i* *di* *-l* *-u* Assamese
1.NOM **PNEG**-fall-NF give -PST-1.SUB
'I **didn't** fall, then gave.' (* 'I didn't fall-on-purpose.')

4.2. Grammaticalization of chain-final verbs

As discussed in section (4), serial verb constructions have been identified as a primary channel for the recruitment of new functional morphemes in a number of West African and Southeast Asian languages, among others. Assamese has nowhere near the number of grammatically-functioning serial verbs as does e.g. Lahu (Matisoff 1973); those found to date are listed by root in Table 1.[9]

VStem	Meaning as lexeme	Function in chain-final position
as	'have/exist'	Progressive aspect
thak	'stay'	Durative aspect
lo	'take'	Inward-directedness; Diminution
di	'give'	Outward-directedness; Willfulness; Diminution
go	'go'	Motion away from reference point
ah	'come'	Motion towards reference point
pela	'throw'	'Disposal' perfect
pa	'get'	Achievement
sa	'see'	'Tentative'

Table 1 – Summary of Assamese verb stems with grammatical function in chain-final position

As shown, each may form the single verb of a simplex predicate, but in chain-final position will aspectually or otherwise modify the chain-medial semantic main verb. Due to space constraints we cannot review their semantics in any great detail, but the following will at least outline what I believe to be their primary functions. As shown in (18), the stem *as* in a simple predication has the sense 'have/exist', while as a chain-final serial verb, it gives Progressive aspect; interpretation of an event-sequence is impossible (19). Durative aspect is similarly coded by chain-final *thak* 'stay' (20-21).

(18) *radz* ***as*** *-e*
Raj **have/exist** -3.SUB
'Raj **is here**.'

[9] For discussion of some affixes in Assamese which appear to have recently developed from serial verbs, see Post (forthcoming).

(19) *mOi pela-i* ***as*** *-u*
1.NOM drop-NF **PROG**-1.SUB
'I am dropp**ing**/toss**ing**.'
* 'I drop and then am here.'

(20) *mOi* ***thak*** *-il -u*
1.NOM **stay** -PST -1.SUB
'I **stay**ed.'

(21) *mOi likh -i* ***thak*** *-il -u*
1.NOM write-NF **DUR**-PST -1.SUB
'I **kept** writ**ing**.'
?'I wrote and then stayed.'

Chain-final 'take' and 'give' are polyfunctional, according to the semantics of the main verb in probable conjunction with discourse conditions which are not yet well-understood. Respectively, they code Inward and Outward-directness of activity from the referent of the clause subject (22-24). While 'take' can often be interpreted in this sense as a Self-benefactive (for example, 'die-take' is unacceptable), 'give' is only rarely and in transparent cases interpretable as a Benefactive (23). Rather, the typical interpretation is 'Willfulness; Purposefulness' of activity, independent of an affected second or third argument (so, for example, 'see-take' gives the sense 'look despite not being supposed to'). Both 'take' and 'give' can also be employed in Diminution, as in English and many other languages (25-26).

(22) *radz -e siti -khOn porh-i* ***lo*** *-l -e*
Raj -ERG letter -CLF read -NF **take** -PST -3.SUB
'Raj read the letter (**to himself**, NOT to someone else).'

(23) *mOi xOhai kor -i* ***di*** *-l -u*
1.NOM help do -NF **give** -PST -1.SUB
'I helped.'

(24) *ta-i sula -tu dzol -a -i di -l -e*
3 -F garment-CLF burn-CAUS-NF give-PST-3.SUB
'She burned the coat (despite her reluctance).'
(Data from Keri Edwards, RC:27; adjusted MP)

(25) *mOi thak-i* ***lo*** *-l -u*
1.NOM stay-NF **take**-PST-1.SUB
'I stayed/I **took** a rest.'

(26) *mOi gOlpO ko -i* ***di*** *-l -u*
1.NOM story say -NF **give**-PST-1.SUB
'I spun a yarn / told a **little** story.'

More research into the semantics and discourse functions of serialized 'give' and 'take' is clearly warranted.

Chain-final *go* 'go' and *ah* 'come' code Directedness Away from or Towards a reference point in motion predicates. Parallels are found in Thai, Chinese, and numerous other serializing languages (27-28).

(27) *mOi dukan-olOi dor-i* ***go****-l -u*
1.NOM store -ALL run -NF **go**-PST -1.SUB
'I ran (**away** from initial position) to the store.'

(28) *xi tOl -Ot nam -i* ***ah*** *-il -e*
3.M.NOM bottom -LOC descend-NF **come**-PST-3.SUB
'He descended / he **came** down.' (PF:15)[10]

Chain-final *pa* 'get' and *pela* 'throw' are frequent in texts in their capacity as markers of the partially overlapping functions 'Achievement/Completion' and 'Disposal Perfect' respectively (29-30, also 7 above).

(29) *xi gOs-Or dal -tu -t khund-a kha-i pa -l -e*
3.M.NOM tree-GEN branch-CLF-LOC pound-NZR eat -NF **get**-PST-3.SUB
'He collided with a tree branch.' (lit. ~'he **got** a pound-taking on a tree branch')
(Data from Joana Jansen BDF: 12; adjusted MP)

(30) *mOi kha-i* ***pela*** *-l -u*
1.NOM eat -NF **throw**-PST-1.SUB
'I ate it **up**.'[11]

Finally, chain-final *sa* 'see' gives what Matisoff (1973) has described as 'Tentative' aspect. Similar to English '*x* **and see**', it is used when an actor performs an action cautiously or with a view toward evaluating the result (31); note that an event-sequence is *not* denoted, since the event denoted by the medial verb is in fact not carried to completion.

(31) *xi* ***kha*** *-i* ***sa*** *-l -e*
3.M.NOM **eat** -NF **see**-PST-3.SUB
'He **tasted** it.'[12]

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[10] cf. Chinese *tā xià* ***lái*** *le* 's/he descend **come** PFV' → 's/he descended (**toward** reference point)'
[11] Compare the Thai examples in section 4.1.3 above.
[12] cf. Lahu *qô ni* 'hoe and see (how it goes)' < *ni* 'see' (Matisoff 1991: 409), also Japanese *tabe-te mi-yo* 'Why don't (we/you/I) have a taste.' < *mi* 'see'

It is certainly possible that further research will uncover both more serial verbs in Assamese as well as other functions for the verbs identified here.

5. Conclusion

I have endeavored in this paper to present a view of serial verb constructions as a typologically common formal structure whose salient properties are explainable in terms of their origin as integrated clause chains. I then tried to show that the erstwhile conjunctive participial construction in Assamese is analyzable in the modern language as a serial verb construction, both in terms of its synchronic properties and its evident diachronic origin. However, following the review of serial verbs and their functions found to date (section 4.2), it should be clear that there are nowhere near as many of either as there are in many Southeast Asian languages, and we might well wonder why.

While a full answer to this question lies outside the scope of this paper, it will surely include facts concerning the typological profile of Assamese. As has been seen, a handful of morphological markers of tense and aspect remain to modern Assamese, often giving speakers alternatives between morphological and periphrastic expressions - this is usually not the case in the more isolating languages of Southeast Asia. Furthermore, although we cannot treat the subject in any detail here, we may note that other subordination strategies exist to code predicate-modifying expressions in Assamese which are functionally distinct from its serial verb constructions, but which are probably coded by serializations in other languages. Research into other types of adverbial subordination in Assamese and their discourse functions is very much needed indeed.[13]

Finally, there remains a question of language contact as a possible motivating factor for the rise of verb serialization (among other things) in Assamese. Whether or not contact should be supposed to account for what is in fact a typologically common development across languages remains to be seen;[14] however, until a more detailed analysis of the behavior and discourse distribution of multi-verb constructions in South Asian languages appears, our approach to this question will appear somewhat one-sided. In any case, I hold out hope that the present study will represent a step in that direction.

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[13] Again, a good beginning is provided by Bisang (1995). However, it is not yet entirely clear where a language with both subordinating and serializing strategies would fit into his typology. As more languages from the South/Southeast Asian frontiers are described in detail, we may find a clearer picture will emerge.

[14] While the existence of serial verbs in Indic languages might be attributable to a Dravidian substrate (Tamil, cf. Steever 1989), it is less clear why Assamese in particular should retain this trait to such a degree that typological and/or contact factors should not (perhaps additionally) be taken into account.

Abbreviations

1	First person	NF	Non-finite marker
3	Third person	NOM	Nominative case marker
ALL	Allative case marker	NZR	Nominalizer
ACC	Accusative case marker	PF	Perfect aspect marker
CLF	Classifier	PFV	Perfective aspect marker
CONJ	Conjunctive coordinator	PNEG	Prefixal negator
ERG	Ergative case marker	PST	Past tense marker
GEN	Genitive case marker	SG	Singular number marker
INST	Instrumental case marker	SNEG	Suffixal negator
LOC	Locative case marker	SUB	Subject agreement marker
M	Masculine gender marker	TOP	Topic marker

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Research Centre for Linguistic Typology
La Trobe University
Bundoora, VIC 3086, Australia

m.post@latrobe.edu.au

How Far Likeness Can Go: Grammaticalization of *Kath-* in Korean*

SEONGHA RHEE
Hankuk University of Foreign Studies · Stanford University

0. Introduction

Grammaticalization of linguistic forms denoting 'likeness', e.g. 'similarity', 'resemblance', 'equality', etc. into various grammatical markers has been attested in a number of languages. Such markers include complementizer, comparative marker, epistemic modality marker, concessive marker, etc. (Heine et al. 1993, Heine and Kuteva 2002). The verb *kath-* in Korean primarily denotes 'be identical' as a lexical verb, but it shows on-going grammaticalization into particles, connectives, and sentential endings, which seems to be a process that began recently. These new grammatical forms mark various kinds of the 'likeness' concept. This paper describes from a grammaticalization perspective the emergence of such grammatical forms and some related changes as a consequence of the grammaticalization of the verb *kath-*.

1. Semantics of *kath-*

Since *kath-* in contemporary Korean denotes 'identicalness' and 'similarity', we shall first need to establish that the original semantics of the verb is 'identicalness' in order to show that all the semantics of the grammaticalized markers is derived from this original sense.

In historical data, the use of the verb *kath-* is attested in both the 'identicalness' sense and the 'similarity' sense. There have been about ten different forms, such as *kAthA-, kAt-, kAtthA-, kAsthu-, kAshu-, kAthu-, kethu-,* and *kath-*. These forms were mostly typographical free variations without semantic differences, but their formal differences are also due to diachronic sound change, largely occurring in the order given above and the last one being the only form used in contemporary Korean. A large number of available historical sources are Buddhist and Confucian scripture commentaries and translations, and if we compare them with Chinese versions, we see that the corresponding Chinese characters were those signifying identicalness (*tong* or *tung*) and similarity (*ye*, *sa* or *ilpan*).

* This work was supported by a 2004 Hankuk University of Foreign Studies Research Fund.

In the contemporary data, when *kath-* is used lexically, both the 'identicalness' sense and the 'similarity' sense are attested. However, the typical case is where the verb means identicalness, i.e., it is referring to the same referent, as in (1), even though there are cases whose meaning is ambiguous between identicalness of the referent and similarity between the referents by virtue of their belonging to the same category, as in (2).[1]

(1) kath-un {kohyang, kaps, seng}
same-Adnom hometown, price, surname
'the same hometown/price/surname'

(2) kath-un {umsik, cha, nalssi}
same-Adnom food, car, weather
'the same food/car/weather' or 'similar food/car/weather'

Despite the fact that 'identicalness' and 'similarity' are both attested in the historical and contemporary data, however, there are reasons to believe that the lexical verb *kath-* was originally associated with the 'identicalness' sense. The first comes from the frequency in the historical data, which show that when the verb is used as the main verb its meaning is predominantly 'identicalness'. On the other hand, when it is used as a postpositional particle grammaticalized from the main verb, infrequent as it is in the historical data previous to modern Korean, its meaning is often 'similarity', which suggests the semantic extension from 'identicalness' to 'similarity'. The second reason is that even in contemporary Korean the usage in the 'identicalness' sense shows less syntactic constraints, i.e., it occurs either attributively or predicatively, unlike the usage in the 'similarity' sense, which occurs largely attributively and often renders sentences unnatural if used predicatively. This suggests that the 'similarity' use is new, because it has been widely accepted that syntactically, at the incipient stage of grammaticalization, grammaticalizing forms arise out of very local contexts (Hopper and Traugott 2003[1993]:2). Still another reason is that native speakers intuitively associate the verb *kath-* with the 'identicalness' sense and use different verbs, e.g. *pisusha-*, *yusaha-*, etc., for a true 'similarity' sense.

As will become obvious in the following discussion, the grammaticalized meanings from this verb are basically 'similarity', not 'identicalness'. If we take for granted that 'identicalness' is semantically more specific than 'similarity', i.e., 'similarity' is more general than 'identicalness', in the sense that 'identicalness' is the extreme case of 'similarity', then the semantic development of this verb in the course of grammaticalization is in consonance with the theses that grammaticalizing words undergo semantic generalization (Bybee et al. 1994), and that such

[1] The following abbreviations are used in glosses: Adnom: adnominal; Conjec: conjectural; Dec: declarative; Exclam: exclamative; Fut: future; Hort: hortative; Hypoth: hypothetical; NF: non-finite connective; Nom: nominative; Pcl: particle; Perf: perfective; Q: interrogative; and Retros: retrospective.

semantic generality is often a prerequisite for grammaticalization (see Heine et al. 1991, Hopper and Traugott 2003[1993], inter alia, for discussions on semantic generality with respect to grammaticalization).

2. Grammaticalization of *kath-*

Grammaticalization is a process that often occurs in specific contexts of use. There are diverse syntagmatic configurations in which *kath-* can be used, but grammaticalization occurs only in structures where *kath-* has strong syntagmatic and semantic ties with the adjacent materials, as e.g. in the context where *kath-* occurs close to its argument marked by *-wa* 'with'. Since *kath-* takes two or more noun phrases as objects of comparisons, one of them usually being the sentential subject and the other an oblique argument marked with *-wa*, these two forms *-wa* and *kath-* frequently occur in juxtaposition. However, this is not always the case because the verb *kath-* may predicate of plural subjects, where the subject may be a plural noun or two or more noun phrases combined with *-wa* 'and'. In this case the verb *kath-* does not show any sign of grammaticalization. This reflects the fact that if two or more linguistic forms should be perceived as a single unit, there should be some kind of close relationship between them. In Lehmann's (1995 [1982]) terms, the forms in a construction undergo 'coalescence' and increase the 'bondedness' as the construction grammaticalizes (see also Hopper and Traugott 2003[1993]).

In grammatical uses of *kath-*, there are two formal changes that signal that the form has departed, or is in the process of departing, from its original lexical status. The first change involves compacting of the construction, evidenced by orthographic space deletion by many people, despite the fact that Korean orthographic regulation mandates spacing between word groups, which, in this case, is spacing between *kath-* and its preceding particle *-wa*. This suggests that the word groups are reanalyzed as a single unit (cf. Lord 1973, Traugott 1980, Heine et al. 1991, Hopper and Traugott 2003[1993]). There is no change in terms of linear order but the mental bracketing by the language users becomes different.

The other change involves phonological erosion. The most obvious erosion is the particle deletion from the reanalyzed construction including a particle. This results in a syntagmatic condition where *kath-* and its oblique argument occur without intervention of the oblique marker, thus paving the way for *kath-* to be affixed to the preceding noun phrase directly, a process called particularization (Matisoff 1991). A more subtle reductive process involves a suprasegmental feature, i.e. stress: *kath-*, which could be stressed as a lexical verb, cannot be stressed any longer. Phonological reduction or attrition of integrity has been widely recognized as a common concomitant of grammaticalization (Lehmann 1995[1982], Hopper and Traugott 2003[1993], Bybee et al. 1994, inter alia).

2.1. Particles

Two forms derived from *kath-* develop into particles denoting various concepts of 'likeness'. One is the particle *-(wa)kathun* 'like, such as, resembling, etc.' derived

from -*wa kathun*, whose morphological make-up can be broken down into -*wa kath-un*, where the final morpheme -*un* is an adnominal marker. This construction becomes an adjectivizer, i.e., it affixes to a noun phrase and modifies another noun phrase. What makes the form an adjectivizer is the final particle -*un* at the end of the original construction. In grammaticalizing constructions in Korean, and probably in other typologically similar languages as well, the participating particles play important roles in determining the grammatical status of the final product (Rhee 2003). It is so because, despite phonological erosion and its consequent formal opacity, the morphosyntactic configuration and function are preserved. The adjectivizing particle -*(wa)kathun* signifies various 'likeness' concepts such as MEMBERSHIP, for listing exemplars; SIMILARITY, for presenting an object with similar properties; and QUALIFICATION, for naming a category to which the object concerned rightfully belongs, as shown in the examples in (3).

(3) a. MEMBERSHIP
mantwu-na kwukswu-(wa)kathun umsik
dumpling-or noodle-Pcl food
'the food, for example, dumplings and noodles'

b. SIMILARITY
yong-kathun pawi
dragon-Pcl rock
'a rock resembling a dragon, a dragon-shaped rock'

c. QUALIFICATION
mal-kathun mal
saying-Pcl saying
'a saying that may be called as a saying, a noteworthy remark'

Since 'likeness' is inherently a gradient notion, the senses can be plotted along the continuum from SAME to DIFFERENT as in (4).

(4) SAME----------SIMILAR----------DIFFERENT
identical >> of same kind (member) >> similar >> qualified for inclusion

The movement of senses from the left to the right of the continuum can be characterized as semantic generalization, where the last sense 'qualified for inclusion' can be said to border on the sense DIFFERENT because, even though in a sense all likeness should be based on the contrast with difference, the contrast should be more focused in this case. Figuratively, as sameness gradually fades, it takes on difference.

One thing to note here is that there still exists fluidity among these newly created 'likeness' senses. For example, MEMBERSHIP and QUALIFICATION can be encoded by -*(wa)kathun*, as is illustrated in (5).

(5) MEMBERSHIP/QUALIFICATION ambiguity
mantwu-na kwukswu-(wa)kathun umsik
dumpling-or noodle-Pcl food
MEMBERSHIP: 'the food, for example, dumplings and noodles'
QUALIFICATION: 'such food as dumplings or noodles'

Despite the fluidity allowing for ambiguity, there is a tendency of correlation between MEMBERSHIP and -*wakathun*, and QUALIFICATION and -*kathun*. Since the MEMBERSHIP sense, in contrast with the QUALIFICATION sense, resembles parenthetical use of the modifier phrase, it can be said that the syntagmatic tie with MEMBERSHIP use is weaker than that with the QUALIFICATION use. This is in line with the observation that grammaticalization largely accompanies morpho-syntactic tightening.

The other particle developed from *kath*- is -*(wa)kathi* 'with, as, etc.', derived from -*wa kath-i*, where the last particle -*i* is the adverbializer. As is the case with the previously discussed adjectivizer -*(wa)kathun*, the final particle in the original construct plays a crucial role in determining the grammatical status of this newly developed marker, i.e., the new form carries the adverbializing function, as shown in (6).

(6) a. -*wa kathi* COMITATIVE
b. -*(wa) kathi* NON-DISSIMILARITY
c. -*kathi* SIMILARITY
d. -*kathi* EMPHATIC

The comitative marker -*wa kathi* has a variant form, -*hako kathi*. The particles -*wa* and -*hako* are connective particles (equivalent to 'and') for nominal connection in enumeration. The newly emerging adverbial meanings are shown again on the likeness continuum in (7), and in the examples in (8).

(7) SAME----------SIMILAR----------DIFFERENT
identical >> of same location/appearance/quality >> non-dissimilar

(8) a. COMITATIVE
acessi-wakathi kongwen-ey ka-ss-ta
uncle-Pcl park-to go-Past-Dec
'(I) went to the park with (my) uncle.'

b. SIMILARITY
sinsa-kathi yeyuypalukey hayngtonghay-la
gentleman-Pcl courteously behave-Imp
'Act courteously like a gentleman.'

c. EMPHATIC
saypyek-kathi talli-e o-ass-ta
dawn-Pcl run-NF come-Past-Dec
'(He) came very early in the morning.'

d. NON-DISSIMILARITY
kwayen yeysanghay-ss-te-n kes-kathi
indeed expect-Past-Retros-Adnom thing-Pcl
'as (we) expected indeed'

The semantics of COMITATIVE is based on similarity by virtue of being in the same location. This marker seems to be one of the earliest forms that developed from *kath*-, but it has undergone the least formal change in the sense that the intervening particle -*wa* cannot be omitted. Interestingly, the connective particle can function as a COMITATIVE marker, and therefore, -kathi is semantically redundant. This suggests that -*kathi* is semantically bleached without creating much redundancy. The SIMILARITY sense in (8b) usually refers to likeness in appearance, whereas the EMPHATIC sense in (8c) refers to likeness in quality, usually associated with time expressions and some other highly fossilized expressions. The NON-DISSIMILARITY sense in (8d), which may seem extraordinary for separate semantic designation, is recognized as such by lexicographers and is listed in major dictionaries. This sense is formed with reference to the opposing pole of DIFFERENT, and therefore, goes well with adverbs *kwayen* 'indeed' and *yeksi* 'indeed'.

2.2. Sentential Endings

The structure -*wa kath*- develops into two sentential endings -*keskath*- and -*kathuni*-: the former is a CONJECTURAL which marks estimated identicalness; whereas the latter is an EXCLAMATIVE which marks 'likeness' in exclamation. These two markers share the same function of sentential endings, but their source structures and syntactic behavior are vastly different.

The CONJECTURAL marker -*keskath*- contains *kes* 'thing', a semantically-bleached defective noun modified by a preceding relative clause. Through reanalysis, however, this embedded clause becomes the main clause, and the main verb *kath*- becomes a sentential modal ending, which marks the speaker's modal attitude toward the proposition. One consequence of this syntagmatic reanalysis is that this newly emerged grammatical marker has variant forms for more fine-grained semantic designations depending on differences in tense and aspect of the proposition, such as -*l-keskath* for future, -*un-keskath* for perfective, and -*nun-keskath* for present/progressive, with different functions of the prefixed adnominal markers. These modal marking sentential endings attenuate the assertive force of propositions by making a statement a mere conjecture, as shown in the examples in (9).

(9) CONJECTURAL

a. pi-ka o-l-keskath-ta
rain-Nom come-Fut.Adnom-Conjec-Dec
'It looks like rain. It seems that it will rain.'

b. ku-ka cwuk-un-keskath-ta
he-Nom die-Perf.Adnom-Conjec-Dec
'He seems to have died. It seems that he died.'

c. cencayng-i na-nun-keskath-ta
war-Nom come.out-Pres.Adnom-Conj-Dec
'A war seems to be breaking out. It seems that a war is breaking out.'

On the other hand, the EXCLAMATIVE marker -*kathuni* has a different source structure. It is directly affixed to a noun like a particle. Unlike particles, however, it marks the sentential ending, an odd behavior from a syntactic point of view. It does not inflect for tense-aspect-modality or formality-honorification level designation, another odd behavior for a sentential ending in Korean. All these oddities are due to the process it underwent in the course of grammaticalization. This EXCLAMATIVE marker *kath*- has a longer variant form, -*kathunilakwu*, which contains a constellation of connectives including -*uni*. In fact, -*uni* 'as, since, because' is a clausal connective now appearing utterance-finally due to ellipsis of the main clause. With this structural reanalysis, these connectives become sentential endings. Korean seems to use ellipsis extensively for creation of sentential endings out of connectives, because the elided structures actively engage the addressee and invite pragmatic inferences (Rhee 2002). These EXCLAMATIVES are often used to label someone based on his/her behavioral quality with emphasis by claiming his/her qualification for inclusion in the named category, an instance of subjectification (Traugott 1980, 2003), as shown in (10).

(10) EXCLAMATIVE

celen nappu-n nom-kathuni!
Such bad-Adnom fellow-Exclam
'What a wretched fellow (he is)!'

Considering that the example (10) is originally an elliptical structure, it is tantamount to saying, 'Since (he) is so much like wretched fellows like that, how can I {trust him, like him, etc.}?'

2.3. Clausal Connectives

There are some clausal connectives developed from *kath*-, such as -*kathumyen*, -*kath(tel)ato*, -*kathasen(un)*, etc., all marking HYPOTHETICALITY with slightly different shades of meaning. All these forms are products of combination with other connective particles such as CONDITIONAL -*myen* 'if', CAUSAL -*ase*

'because', and CONCESSIVES *-telato* and *-ato* 'even though'. The semantics of *kath-* here is bleached and is similar to a copula, simply establishing a 'likeness' connection between realis and irrealis as a ground for apodosis, as in (11).

(11) HYPOTHETICAL
ne-kathumyen ettehkey ha-keyss-ni?
You-Hypoth how do-Fut-Q
'If you were (me), what would you do?'

2.4. Adverb

Now we turn to the development of an adverb from the verb *kath-*. It has been controversial whether formation of adverbs should be considered a grammaticalization process, because the final product has many characteristics of lexical items rather than of grammatical items. This paper, however, will consider the formation of adverbs from verbs to be instances of grammaticalization, based on the fact that adverbs are more toward the grammatical side of the lexical-grammatical continuum as compared with verbs (see Heine et al. 1993 for a similar position).

The original structure *-wa kathi* develops into an adverb, *kathi* 'together'. This development is due to omission of the contextually implicit *X-wa* 'with X', i.e. from *X-wa kathi* 'together with X' to *kathi* 'together'.

One notable aspect of this process is the directionality. This development is from a complex postpositional particle to an adverb. According to the general directionality involving emergence of adverbs, adverbs develop into adpositions, not the opposite. Likewise, the bondedness that existed between the host noun phrase and the complex postpositional particle is now lost with the development of an adverb, which does not host a noun phrase. An example of *kathi* is (12):

(12) ADVERB
kathi mek-ca
together eat-Hort
'Let's eat together. (Literally: 'Let's eat samely.')'

3. Related Changes

3.1. Derived Lexicalization

Along with the grammaticalization discussed above, there are lexicalization processes involving *kath-* that may have to do with the grammaticalization of *kath-*. There are four verbs that come to our attention as listed in (13).

(13) *ttokkath-* 'be exactly same, be identical'
kkokkath- 'be exactly same, be identical'
kathcanh- 'be insignificant, be unseemly'
kathiha- 'share the situation'

Of the four verbs listed above, *ttokkath-* and *kkokkath-* are derived from a combination of the verb *kath-* with an onomatopoeic prefix *ttok-* and *kkok-* describing a hitting or pointing action with a sharp-pointed object, or a breaking noise of a brittle object. This derivation seems to be a restorative process to reinforce the bleached 'sameness' meaning originally associated with *kath-*. If this is truly the case, it is an interesting phenomenon in that the lexical verb *kath-*, unlike its grammaticalized derivatives, is still mainly denoting 'sameness', and therefore suggests that grammaticalized forms diverged from the source verb can still influence the lexical source verb, since it has been thought that diverged forms usually take independent paths of development.

The third verb, *kathcanh-*, incorporates a negation marker *-an-* and a light verb *ha-* 'do', rendering the combinatory meaning of the original source structure as 'be not same' or literally 'do not be same', which, however, changed to 'be insignificant, be unseemly' (see Lee 2002 for a discussion of a similar process in Korean). In this newly created word, the verb *kath-* participating as a component in it, no longer has its original meaning. In fact, the lexicalization process is so complete that the new word neither takes any oblique-marked argument (despite the presence of the verb *kath-*); nor does it take any accusative-marked argument (despite the presence of the transitive verb *ha-*); nor does it show contrast with a non-negation-marked counterpart, i.e. *kath-*, or co-occur with a negative polarity item (despite the presence of the negative *-an-*).

The last verb, *kathiha-*, was originally a construction containing a light verb *ha-* 'do'. Its compositional meaning 'do in the same manner' or 'do together' has changed into 'to share', such as 'share the same fate/responsibilities/pain/etc.', in the lexicalization process.

3.2. Specialization

Considering that the grammaticalization of the verb *kath-* is rather a recent development, it would be worthwhile to take a look at how these grammaticalized or grammaticalizing forms fare in the grammar of contemporary Korean, i.e., specialization of the new forms and their competitors, or, figuratively, the struggle for survival among the linguistic forms.

For quantitative comparison, two corpora were used: the *Sinsosel* Corpus and the KAIST KORTERM Corpus. *Sinsosel* is a special genre in Korean literature, linking the classical fiction and the modern fiction. They were written between 1906 and 1917, and there are about 30 of them, 21 of which are used in this corpus, by compiling them in a single word-processing document. The statistics relevant to *kath-* are given in Table 1, representing the early 20th century data. The second corpus, the KAIST KORTERM Corpus, contains more than 13 million words from diverse source materials of the late 20th century. Due to its tagging inconsistency, however, the statistics given here are re-calculated based on the percentage of each form in samples, and thus some of the figures have been rounded.

In interpreting the statistics in the tables, it should be borne in mind that the absolute figures cannot be compared across the tables because the two corpora are considerably different in size, and they do not represent the same resource types in terms of genres, registers, etc.

Table 1: Early 20th Century (The *Sinsosel* Corpus: 305,550 words)

Function	Label	Form	Frequency	Competitor	Frequency
particle of similarity	Adjectivizer	*-kathun*	504	ø	
		-wa kathun	10		
particle of similarity	Adverbializer	*-kathi*	703	*-chelem*	110
particle of accompaniment	Comitative	*-wa kathi*	208	*-wa hamkkey*	7
clausal connection	Hypothetical Conditional	*-kathumyen* etc.	155		
sentential ending	Exclamative Ending	*-kathuni*	22		
sentential ending	Attenuative Modal Ending	*-kes kath-*	167	*-tusha-*	440
				-tussiph-	47
adverb		*kathi*	178	*hamkkey*	17
verb		*kathiha-*	0	*hamkkeyha-*	0
verb		*kathcanh-*	0		
verb		*kkokkath-*	0		
verb		*ttokkath-*	12		

Table 2: Contemporary (The KAIST KORTERM Corpus: 13,605,457 words)

Function	Label	Form	Frequency	Competitor	Frequency
particle of similarity	Adjectivizer	*-kathun*	58,000	ø	
		-wa kathun	18,000		
particle of similarity	Adverbializer	*-kathi*	3,000	*-chelem*	14,377
particle of accompaniment	Comitative	*-wa kathi*	16,000	*-wa hamkkey*	33,000
clausal connection	Hypothetical Conditional	*-kathumyen* etc.	1,624		
sentential ending	Exclamative Ending	*-kathuni*	434		
sentential ending	Attenuative Modal Ending	*-kes kath-*	120,000+	*-tusha-*	4,200
				-tussiph-	960
adverb		*kathi*	18,000	*hamkkey*	12,000
verb		*kathiha-*	891	*hamkkeyha-*	415
verb		*kathcanh-*	125		
verb		*kkokkath-*	13		
verb		*ttokkath-*	841		

Comparing grammaticalized markers of *kath*- with their competitors in Tables 1 and 2, we can see the following interesting facts.

Adjectivizer particles of similarity, -*wakathun* and -*kathun*, have no competitors and are used very productively. On the other hand, the adverbializer particle of similarity, -*kathi*, is losing primacy to its competitor –*chelem*, which was developed from –*thyeylo* 'with body', and so is the comitative particle of accompaniment, -*wa kathi*, to its competitor -*wa hamkkey*.

The attenuative modal sentential ending, -*keskath*-, shows explosive growth in use. Considering that its competitors were more frequently used in the early 20th century, the increase in the late 20th century is truly phenomenal.

It is also noteworthy that there are some parallel development patterns between *kath*- and its competitors. For example, *hamkkey* shows some parallelism in recruiting a particle -*wa* for formation of complex particles with an adverbializing function, in developing adverbs by way of particle deletion, and even in coining new verbs by compounding with a light verb.

Still another finding is that lexicalization, some of which is suspected to be a remedial strategy for semantic bleaching, is a recent development.

4. Conclusions

In this paper we have seen how *kath*- 'same, identical', though still retaining the 'identicalness' meaning in lexical uses, grammaticalized into various markers of 'likeness'. The newly emerging markers include particles of diverse functions, e.g. adjectivizer, adverbializer, comitative, etc.; sentential endings, e.g. attenuative modal and exclamative; and clausal connectives marking hypotheticality. New meanings of the grammaticalized forms are varying degrees of similarity in the continuum between the polar concepts of SAME and DIFFERENT. The grammatical status and semantics of each of these markers are crucially dependent on the participating particles. We have also seen that certain forms thrive without competitors, whereas others suffer from competition with other forms of similar function and are losing supremacy to them. Considering that the two corpus sources are less than a century apart, this shows how fast linguistic change can proceed, despite the fact that cross-linguistically there are many grammatical markers whose grammaticalization processes have taken many centuries or often stayed unchanged for an extended length of time.

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Seongha Rhee
Hankuk University of Foreign Studies & Stanford University
Building 260 Room 239
Stanford University
Stanford, CA 94

srhee@hufs.ac.kr, shrhee@stanford.edu

The *That's X is Y* Construction as an Information-Structure Amalgam

SEBASTIAN ROSS-HAGEBAUM
Rice University

0. Introduction

This paper is concerned with the non-standard syntactic construction instantiated by the utterances in (1) through (5). I have collected 230 such utterances, of which half were casually observed across a variety of different speech events and half were gathered from the Switchboard Corpus (SWB) of phone conversations (Godfrey et al. 1992).[1]

(1) Well that's the reason why I like both of those programs is because they're kind of based on books. (SWB)
(2) That's my dream I guess is to have my own darkroom. (SWB)
(3) And that's my big area of interest in linguistics is discourse.
(4) That's what I was about to say is that everyone needs to be tested. (SWB)
(5) That's what I'm trying to do is go back to blonde.

The non-standard character of these sentences stems from the fact that the speaker seems to change syntactic direction halfway through the utterance. As a consequence, each of the sentences contains a constituent that is simultaneously part of two sentential structures. In (3), for instance, the NP *my big area of interest in linguistics* relates both to the preceding *that's* to yield a complete sentence, as well as to the following *is discourse*, which renders another complete sentence. With traditional rhetoric, such structures can be categorized as *apo koinou* constructions.

Instead of characterizing these utterances as the result of a speaker's mid-sentence change of mind, however, I do not regard them as performance errors. Rather, I view them as instantiations of a syntactic construction in its own right,

[1] Earlier versions of this paper were presented at the *Empirical Methods in Cognitive Linguistics Workshop*, Cornell University, May 2-4, 2003 and the Rice University Linguistics Colloquium, September 25, 2003. I am grateful to Knud Lambrecht for discussion of various aspects of this work. Needless to say, I bare sole responsibility for the analysis presented here.

which I call the *that's X is Y* construction. The construction label is derived from actual utterance tokens as follows.

(6) And *that's*$_{\text{be-1}}$ [my big area of interest in linguistics]$_{\text{X}}$ *is*$_{\text{be-2}}$ [discourse]$_{\text{Y}}$.
(7) *That's*$_{\text{be-1}}$ [what I'm trying to do]$_{\text{X}}$ *is*$_{\text{be-2}}$ [go back to blonde]$_{\text{Y}}$.

This construction has been noted in the literature, if only in passing, as a phenomenon of some sort related to the primary point of interest of a given work. Examples can be found in work on the presentational amalgam construction (Lambrecht 1988:337), the double *be* construction (McConvell 1988:302, Tuggy 1996:733, Massam 1999:345), and in studies of *wh*-cleft and reverse *wh*-cleft constructions (Hopper 2000:8, Oberlander and Delin 1996:193). Beyond such occasional mentions, the *that's X is Y* construction has until now not received a detailed analysis.

The structure of this paper is as follows. Section 1 contains a brief overview of how the X- and Y-slots of the construction are syntactically realized. In addition, it is shown that neither the initial demonstrative, nor the forms of the two copulas are completely lexically specified as the construction label might suggest. In Section 2, an analysis of the *that's X is Y* construction in terms of an amalgam of two independently existing construction types of English is presented. Section 3 describes the more salient discourse functions of the construction.

1. Syntactic realizations of the X- and Y-slots

The X-slot of the *that's X is Y* construction is instantiated in one of two ways: either as an NP or as a headless relative clause (RC). In more than half of the example tokens, X takes the form of an NP. This NP is either headed lexically as in (1), (2) and (3), or headed by a quantifier followed by an *of*-PP as in (8). In the other examples, the X-slot is filled with a headless RC that contains either a *wh*-relative pronoun as in (4) and (5), or the quantifier *all* as in (9). This explains why the construction was noticed previously in works on (reverse) *wh*-clefts.

(8) That's one of the symptoms of sunstroke is you stop sweating.
(9) And in Arizona that's all they have too is man-made lakes. (SWB)

The range of syntactic categories instantiating the Y-slot is somewhat more diverse. In a little over two fifths of the examples, Y takes the form of a finite clause (see (4) and (8)), including subordinate clauses (see (1)). This finite structure can itself be complex, as can be seen in (34) below.

(10) That's about the most unglamorous job you can have is being a student DJ at a local radio station.
(11) That's where I started looking is on the 2006 World Cup website.

Realizations of the Y-slot as NPs are shown in (3) and (9); they make up about a quarter of the example tokens. In another quarter, Y takes the form of a non-finite clause, headed either by an infinitive (see (2) and (5)), or by a gerund as in (10). In relatively few cases, a PP occurs in the Y-slot as in (11). Occasionally, other elements such as numerals or adverbs fill this slot. The distributional patterns are summarized in Table 1.

	NP		RC		Total	
	N	%	N	%	N	%
Finite clause	67	29.1	30	13.1	97	42.2
Non-finite clause	34	14.8	24	10.4	58	25.2
NP	26	11.3	35	15.2	61	26.5
PP	2	0.9	9	3.9	11	4.8
Other	1	0.4	2	0.9	3	1.3
Total	130	56.5	100	43.5	230	100.0

Table 1: *Syntactic realizations of the X-slot (columns) and Y-slot (rows).*

The present study is limited to tokens of the *that's X is Y* construction that begin with initial *that's* or *that is*. In the vast majority of examples (N = 207; 90.0%), be-2 agrees with the present tense form of be-1. Only in a few instances (N = 21; 9.1%) do the two copulas not agree in tense, with be-2 occurring in the past tense form *was*, as shown in (12). In all such cases, the X-slot is realized either as a headless RC with a verb in the past tense or as an NP containing an RC in which the verb is in the past tense. In two examples (0.9%), the two copulas do not agree in number (*is – are*).

(12) That's what I noticed when I was there was the ice storms you got around February. (SWB)
(13) I think that must be the worst job in the world is being a vet.

While *that's* is clearly the most frequent initial element, it is not a fixed part of the construction either. The non-contracted variant *that is* is attested, and so are other forms of be-1, including its combination with modal verbs as in (13). Furthermore, the initial demonstrative may be *this* instead of *that*. A maximally abstract construction label would thus be *DEM BE-1 X BE-2 Y*. However, the one used here represents the most frequent realizations of the demonstrative and copula positions of the construction.

2. *That's X is Y* as an information-structure amalgam

As was already mentioned, I consider the *that's X is Y* construction a fully conventionalized sentence pattern, not the result of performance errors. While it is a syntactic construction in its own right, it is at the same time related to other independently existing constructions of English. This view is consistent with a Construction Grammar approach to linguistic organization (see, e.g., Fillmore and Kay 1993, Lambrecht 1994, Goldberg 1995, among others), in which grammar

consists of a structured inventory of constructions. One way to motivate the form and function of a given construction is to relate it to other constructions that need to be posited in the grammar for independent reasons. In the case of the *that's X is Y* construction, two independently existing construction types come together in an unusual way to give rise to a constructional amalgam.

Let me introduce the two components of the *that's X is Y* construction. Throughout this section, the attested *that's X is Y* tokens in (3) and (5) will serve as paradigm examples. From these can be derived the two sentences in (14) and (15). These sentences have a non-predicating semantic structure, that is, rather than predicating a property of a topic referent, they are used either to establish an identity relation between two referents, the identified and the identifier (see (14)), or to specify a value for a given variable (see (15)). Small capitals indicate the locations of the main sentence accents, which fall here on the sentence-final focus phrases expressing the identifier/value.

(14) My big area of interest in linguistics is DISCOURSE.
(15) What I'm trying to do is go back to BLONDE.

A well-known property of such sentences is their reversibility, that is, the constituents containing the identified/variable and the identifier/value can be inverted, so that the focal identifier/value constituents occur sentence-initially:

(16) DISCOURSE is my big area of interest in linguistics.
(17) Go back to BLONDE is what I'm trying to do.

In parallel to the established terms *wh*-cleft and reverse *wh*-cleft constructions for (15) and (17), respectively, I will categorize sentences like (14) as equative and those like (16) as reverse equative constructions. The reverse constructions are frequently used with the demonstrative *that* as initial constituent:

(18) THAT's my big area of interest in linguistics.
(19) THAT's what I'm trying to do.

What *wh*-cleft and equative constructions have in common is their identificational function.

Thus, two types of identificational constructions, the reverse and the non-reverse type, provide the two amalgam components for the *that's X is Y* construction. And it is from these components that the construction inherits certain formal and functional properties, which therefore do not need to be stipulated for the amalgam. The *that's X is Y* construction inherits the non-predicating semantics of its components, the sentence-initial focus phrase in the form of the demonstrative pronoun *that*, and the sentence-final focus phrase in a variety of forms. Moreover, it inherits the topical constituent in the X-slot, either in the form of an NP or a headless RC. But it also displays idiosyncratic

properties, in particular, the presence of two focus phrases and its referent-specifying discourse function. While the amalgam is related to its components, it is not reducible to them. Its syntactic form can be motivated by appealing to its pragmatic, that is, information-structural properties, as well as to those of its component constructions. We are dealing here, then, with an information-structure amalgam (see also Lambrecht 1988). This analysis is spelled out in more detail in the remainder of this section.

Those tokens of the *that's X is Y* construction in which the X-slot is realized as a headless RC are analyzed as amalgams of the *wh*-cleft and the reverse *wh*-cleft constructions. I will take as uncontroversial the observation that cleft constructions (see, e.g., Prince 1978, Lambrecht 2001) express the same logical proposition as their corresponding canonical sentences, but impose a pragmatic structuring on that proposition in terms of a "backgrounded" or presupposed and "foregrounded" or focused part. To characterize the *that's X is Y* construction and its components more precisely, I will adopt the information-structure framework developed in Lambrecht (1994), and elaborated, *inter alia*, in Lambrecht and Michaelis (1998) and Lambrecht (2001). I will introduce the relevant information-structural categories as we proceed.

Consider again sentence (15). By employing this *wh*-cleft, the speaker lends expression to her assumption that, at the time of utterance, "the hearer already knows or believes or is ready to take for granted" (Lambrecht 2001:474) that she is trying to do something. The open proposition 'speaker is trying to do x' is pragmatically presupposed or "old information", coded by the headless RC *what I'm trying to do*. At the same time, the speaker asserts that the intended activity consists in changing her hair color back to blonde. The pragmatic assertion or "new information" conveyed by using the given *wh*-cleft consists in the specification of a value for the variable in the presupposed open proposition. It is this identity relation between variable and value that "the speaker expects the hearer to know or believe or take for granted as a result of hearing the utterance" (Lambrecht 2001:474). The assertion is achieved by substituting the focus denotatum 'go back to blonde' for the variable in the open proposition, where focus is defined as "that component of a pragmatically structured proposition whereby the assertion differs from the presupposition" (Lambrecht 2001:474). The presence of the focus denotatum makes the utterance into a pragmatic assertion, that is, makes it possible for the sentence to convey a piece of new information to the hearer.

As argued in Lambrecht (2001), the felicitous use of *wh*-clefts requires the speaker to make further assumptions about the hearer's state of mind. The kind of pragmatic presupposition introduced in the preceding paragraph pertains to the assumed knowledge state of the hearer at the time of utterance. It is referred to as *knowledge* or *K-presupposition*. Thus, the open proposition 'speaker is trying to do x' is K-presupposed. In the adopted framework, to know a proposition means to have a mental representation of its denotatum, not to know its truth or falsehood. In addition, the adequate use of (15) requires that the state of affairs expressed by the K-presupposed proposition is also assumed by the speaker to be

"of present concern in the discourse, so that her assertion can be interpreted as expressing *relevant information* with respect to this state of affairs" (Lambrecht 2001:476; emphasis in the original). Such speaker assumptions regarding the status of denotata as centers of current interest in the discourse at utterance time are called *topicality* or *T-presupposition*. The information structure of sentence (15) can now be represented as follows.[2]

(20)	K-Presupposition:	'speaker is trying to do x'
	T-Presupposition:	the K-presupposition is of current interest
	Focus:	'go back to blonde'
	Assertion:	x = 'go back to blonde'

Turning to reverse *wh*-clefts, it is well-known that they tend to occur in spoken discourse with a demonstrative pronoun as focus phrase, most frequently *that*, less often *this* (see, e.g., Collins 1991, Oberlander and Delin 1996, among others). It is this type of reverse *wh*-cleft that serves as a component of the *that's X is Y* amalgam. The information structure of reverse *wh*-clefts parallels the one of *wh*-clefts; the analysis of sentence (19) is given in (21).

(21)	K-Presupposition:	'speaker is trying to do x'
	T-Presupposition:	the K-presupposition is of current interest
	Focus:	'that'
	Assertion:	x = 'that'

Now, sentence (5), repeated here as (22), is an amalgam based on the *wh*-cleft in (15) and the reverse *wh*-cleft in (19). Its information-structure analysis is given in (23).

(22) [THAT]'s (what I'm trying to do) is [go back to BLONDE].

(23)	K-Presupposition:	'speaker is trying to do x'
	T-Presupposition:	the K-presupposition is of current interest
	Focus 1:	'that'
	Assertion 1:	x = 'that'
	Focus 2:	'go back to blonde'
	Assertion 2:	x = 'go back to blonde'

Notice that (22) has two focus phrases, that is, it expresses two assertions. (Focus phrases are indicated by square brackets, topical constituents are marked by parentheses.) Moreover, the construction has a referent-specifying discourse

[2] A third kind of presupposition is the so-called *consciousness* or *C-presupposition*, which has to do with the speaker's assumptions about the activation states of mental representations of denotata in the hearer's long-term and short-term memory (Lambrecht 2001:475). Since C-presuppositions are entailed by T-presuppositions, I will not represent them in the analyses.

function (see Section 3). The initial demonstrative pronoun always refers back to a referent already established in the prior discourse, but this antecedent tends strongly to remain referentially vague. The second focus denotatum is referentially more specific and resolves this vagueness. It is the second assertion that carries the communicatively most important new information by rendering the anaphorically vague referent more specific.

That's X is Y tokens in which the X-slot is realized as an NP are analyzed as amalgams of the equative and reverse equative constructions. It is important to note that in equative constructions such as (14), no K-presupposition in the form of an open proposition is attached to the subject NP. However, by uttering the sentence in (14), the speaker assumes the denotatum of *my big area of interest in linguistics* to be a center of current interest, that is, to be T-presupposed. This referent serves as the topic of the sentence, and the remainder of the sentence supplies relevant information with respect to it.[3] Recall that equative constructions do not predicate a property of a topic referent, but identify that referent with the focus referent coded in the complement of the copula. The information-structure analysis of (14) is as follows.

(24)	T-Presupposition:	'my big area ... in linguistics' is topic for focus x
	Focus:	'discourse'
	Assertion:	x = 'discourse'

Reverse equative constructions require a slightly different information-structure analysis. As in the case of reverse *wh*-clefts, it involves a K-presupposed open proposition. This presupposed open proposition is syntactically marked by the inversion structure of the sentence with its sentence-initial focus phrase. Thus, in uttering sentence (18), the speaker gives expression to her assumption that the hearer already knows that she has a big area of interest in linguistics. Moreover, she also assumes that the denotatum of this proposition is of current concern, that is, T-presupposed. The referent of *that* is the focus denotatum, and it is its substitution for the variable in the open proposition that constitutes the pragmatic assertion. This is spelled out in (25).

(25)	K-Presupposition:	'speaker's big area of interest in linguistics is x'
	T-Presupposition:	the K-presupposition is of current interest
	Focus:	'that'
	Assertion:	x = 'that'

Now, sentence (3), repeated here as (26), is an amalgam based on the equative construction in (14) and the reverse equative construction in (18). As the information-structure analysis in (27) shows, the *that's X is Y* construction here

[3] See Lambrecht (1994:131) for a definition of topic in terms of relevance and aboutness.

inherits the presupposed open proposition from its reverse equative amalgam component.

(26) [THAT]'s (my big area of interest in linguistics) is [DISCOURSE].

(27)

K-Presupposition:	'speaker's big area of interest in linguistics is x'
T-Presupposition:	the K-presupposition is of current interest
Focus 1:	'that'
Assertion 1:	x = 'that'
Focus 2:	'discourse'
Assertion 2:	x = 'discourse'

Adding the notation for information-structural properties to the construction label, we thus get: *[that]'s (X) is [Y]*.

The analysis presented so far contains one oversimplification: it has ignored the fact that the constituent in the X-slot usually contains one or more peaks of prosodic prominence, in addition to the focus accents on the initial demonstrative and the focus phrase in the Y-slot. Consider the more accurate renderings of examples (3) and (5) in (28) and (29), respectively.

(28) [THAT]'s (MY big area of interest in linguistics) is [DISCOURSE].
(29) [THAT]'s (what I'm trying to DO) is [go back to BLONDE].

Despite the fact that the X-slot expresses a topical denotatum, which by definition is a relatively predictable element in a proposition, it is nevertheless accented. This is in contradiction to the widely-held belief that sentence accents signal "new information" (see, e.g., Selkirk 1984, among others). In the information-structure framework adopted here, however, sentence accentuation is not seen as exclusively marking foci or new information. Rather, the discourse function of sentence accents is to symbolize "an instruction from the speaker to the hearer to establish a pragmatic relation between a denotatum and a proposition" (Lambrecht and Michaelis 1998: 498). The pragmatic relation that is signaled by a sentence accent may be either a focus relation or a topic relation, so that we need to distinguish focus accents from topic accents.

Constituents with focal denotata, whose relation to the proposition is by definition unpredictable, must be accented.[4] A topical constituent, on the other hand, is assigned an accent only if the topic relation between its denotatum and the proposition "has not yet been ratified at the level of the utterance" (Lambrecht and Michaelis 1998:499). A ratified, or established, topic denotatum is one whose presence in the proposition the speaker takes to be predictable for the hearer at utterance time to the point that it can be taken for granted.

[4] See Lambrecht and Michaelis (1998) for a few principled exceptions.

With the categories of topic accent and ratified topic in place, the earlier representations of the information structure of our paradigm sentences can be revised as follows.

(30) Information structure of (5) (= (29); replaces (23)):

K-presupposition:	'speaker is trying to do x'
T-presupposition:	the referent 'speaker' is ratified
Focus 1:	'that'
Assertion 1:	x = 'that'
Focus 2:	'go back to blonde'
Assertion 2:	x = 'go back to blonde'

(31) Information structure of (3) (= (28); replaces (27)):

K-presupposition:	'speaker's big area of interest in linguistics is x'
T-presupposition:	'someone's big ... in linguistics is x' is ratified
Focus 1:	'that'
Assertion 1:	x = 'that'
Focus 2:	'discourse'
Assertion 2:	x = 'discourse'

The accents on the constituents in the X-slots of *that's X is Y* tokens do not mark foci. They are topic accents that are used by the speaker to ratify the current topics. While the open propositions coded in the X-slot are K-presupposed, their topical roles in the larger discourse context are not salient enough for them to be taken for granted on the level of the utterance, that is, they are not yet ratified. Such accents are thus topic ratification accents. They signal that portion of the K-presupposition which is not contained within the T-presupposition (see Lambrecht and Michaelis 1998). Sentence (3) (= (28)), for instance, was uttered in an introductory class to linguistics, at a point when the different sub-disciplines of the field were introduced. For every sub-discipline (a list of which was projected onto a screen), the speaker had pointed out a fellow faculty member who specializes in that area. When turning to the field of discourse analysis, she uttered sentence (3). Thus, the fact that different linguists have different areas of specialization was already established as topical in the discourse. However, that the current topic at the level of the utterance would be the *speaker's* field of interest still needed to be ratified, which was achieved by the topic accent on *my*.

3. Discourse functions of *that's X is Y*

This section describes the more salient discourse functions with which *that's X is Y* tokens are used in context. As was mentioned above, the construction always has a referent-specifying function. The anaphoric referential vagueness of the initial demonstrative pronoun may manifest itself in a number of ways. For example, there may be more than one referent in the prior discourse that in principle can be construed as the antecedent of the demonstrative. In example

(32), *that* can be understood as referring to 'semi-classical music', 'real classical music' or 'everyday type of ordinary music'. Which of these three speaker B has in mind is specified in the Y-slot.[5]

(32) A: I like semi-classical.
... The real classics I'm not ... as familiar with as,
you know,
the .. ordinary sounds that you hear every day .. [type of thing].
B: [Uh-huh].
... Yeah,
that's about --
That's about all I listen to,
is the classical .. stuff.

Referential vagueness may also obtain if a suitable antecedent for the demonstrative has to be inferred from what was said in the prior discourse, or if an antecedent has to be construed from the composite content of an extended discourse stretch. The latter case is illustrated in (33). In the stretch of talk that has been omitted, speaker B dominates the conversation, talking about her cooking preferences. The cumulative content of her contribution constitutes the anaphoric referent of *that*.

(33) A: How about you,
what do you like to ... [to cook]?
B: [Uh] we --
It's funny that,
.. um,
we're talking about this.
(*40 seconds omitted*)
B: **That's what I like to make,**
is just real neat stuff like that,
but.

There are cases where it seems indeed possible to assign the initial demonstrative a non-vague anaphoric referent. In (34), for instance, *that* refers back to 'they're not gonna do it'. However, it remains the content of the Y-slot that elaborates, and hence specifies, this referent in accordance with the speaker's communicative intentions.

[5] The examples in this section come from the SWB; they were re-transcribed using a slightly simplified version of the discourse transcription conventions of Du Bois et al. (1993).

(34) A: You know,
I- I- I have real strong beliefs in capital punishment,
but when it comes right down to it,
... [yeah].
B: [They're] not gonna do it.
A: Uh yeah,
I- [I'm wondering though] --
B: [**That's my biggest**] **problem is,**
... even if you give them the death penalty,
... they appeal it,
and appeal it,
and appeal it.

Furthermore, notice that the X-slot tends strongly to express the larger discourse theme or a particular aspect thereof. A very clear example of this is (33), where *what I like to make* almost literally echoes speaker A's question *What do you like to cook?*, which defines the theme for the following stretch of discourse. These discourse themes are frequently of an evaluative nature and pertain to the interlocutors' opinions and attitudes towards certain phenomena, including the conversational activity itself. In (32), the interlocutors discuss their music tastes, in (33) – their cooking preferences, and in (34) – their views on capital punishment.

Example (34) shows nicely another aspect of the discourse use of the *that's X is Y* construction. Speakers often use it to state concisely a point to which they attach some importance in the discourse. Frequently, this concise mention is a more succinct rephrasing of a point that has already emerged in the preceding discourse. In (34), speaker B uses the *that's X is Y* token to rephrase and thus state more clearly a point that she just made. It is known from the prior discourse that she is a strong supporter of capital punishment and in fact thinks that it is not applied strictly enough. So, one of the problems she has with the current system is that too often *they're not gonna do it*. This view is a point of some importance to speaker B. Using the *that's X is Y* construction, she rephrases it more concisely.

Lastly, in addition to the more thematically oriented functions reviewed so far, *that's X is Y* tokens can also serve discourse-structuring functions. Example (33) is a case in point. Speaker B here ends her lengthy contribution by tying everything she said in response to speaker A's question back to the larger discourse theme and supplying a final succinct summary statement. As we see, different functions may simultaneously underlie the use of any one *that's X is Y* token.

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Sebastian Ross-Hagebaum
Rice University
Department of Linguistics – MS 23
6100 Main Street
Houston, TX 77005

srh@rice.edu

Association between Repair Functions and Interlocutor Relationship

TOMOKO TAKEDA
University of Oregon

0. Introduction

Schegloff and his colleagues (1977) proposed the idea that the operation of repair is a communication phenomenon that facilitates the collaborative construction of conversations. Following this proposal, many studies have revealed various aspects of repair in English and other languages, as well as in crosslinguistic studies (e.g., Drew 1997; Fox et al. 1996; Geluykens 1989; Hayashi 1994; Ito 1991; Jefferson 1987; Schegloff 1987, 1992; Weeks 1985; Zahn 1984).

However, the vast majority of previous studies are not concerned with the relationship difference among the interlocutors, and how that difference may affect the repair use. Moreover, despite their in-depth analysis, their results are not presented with statistical support. This study demonstrates operational and functional aspects of repair in two sets of conversations, which differ in terms of the relationship between the participants.

In the following section (section 1), previous studies on repair and those on the linguistic manifestation of participant relationship differences in conversations are discussed. It is followed by the discussion of the data (section 2) and methodology (section 3) of the present study. The results are discussed in the subsequent section (section 4).

1. Previous Studies

The previous studies discussed in this section are relevant in the sense that they not only provide basic key definitions and features of repair initially proposed by Schegloff et al. (1977), but show new aspects and directions suggested by later studies following Schegloff et al. (1977).

1.1. Repair

Repair is defined as a "communicative phenomenon which helps to sustain social interaction by allowing conversants to mutually handle problems which arise as they communicate" (Schegloff et al. 1977:56). Repair is addressed by conversation analysts in terms of errors and other problems of speaking within

turn-taking system (Sacks et al. 1974). Repair thus includes but not is limited to corrections. The term "correction," however, is not contingent on the replacement of an "error" or "mistake" in contrast with what is "correct" or limited to "replacement" or "correction" as commonly understood. Therefore, repair is sometimes performed where there is no detectable error, mistake, or fault as in the example below:

(1) Bernice: → Dean came up en 'e said I'd like—' 'Bernice?'
→ he said 'I'd like t' take you over tuh Shakey's
en buy you a beer.

(Schegloff et al. 1977:363)

Repair is a sequentially organized process. Its typical organization is summarized as follows: (i) initiation (self/other) → (ii) repair (self/other) → (iii) outcome (success/failure). Schegloff et al. (1977) examine repair in English conversations and propose the following four types of repair in terms of who initiates and who performs the repair: Self-initiated Self-repair, Self-initiated Other-repair, Other-initiated Self-repair, and Other-initiated Other-repair (hereafter S-S, S-O, O-S, and O-O repair, respectively). An example of S-S repair, which is the focus of the present study, is (2) below.

(2) Self-initiated → Self-repair
1 N: She was given me a:ll the people that
2 were go:ne this yea:r I mean this
3 quarter y' //know
4 J: Yearh

Now, how do we identify the actual occurrence of repair? One of the key features for the identification is called a *repairable*. Schegloff et al. (1977) explain that *repairables* are "the trouble sources" that motivate the initiation of repair and identify the three types of trouble sources: word replacement, person references, and next-speaker selections (pp. 370-372). Zahn (1984) proposes three general types of repairable using the term "problem types." The first problem type is *wording*, which refers to mispronunciations, verbal slips, ungrammatical expressions, and partial wordings. They result from the speaker's stumbling over pronunciation, wording, or phrasing. The second is *error*, which is often accompanied by assertions provided by the listener that are not perceived as being correct in terms of their appropriateness, relevance, or truth. Finally, the third type of repairable is *ambiguity*, which includes memory failure, ambiguity of reference, lack of clarity or comprehensibility, and failure to hear or attend "properly."

In sum, the two key properties identified by previous studies of repair are repair types, which are determined by who initiates and who performs the repair, and repairables, which are what motivates the repair initiation. The following

section discusses previous studies on the interactional phenomena associated with different types of participant relationships.

1.2. Participant Relationship and Interactional Phenomena

Previous studies that examine conversations between familiars and strangers discuss their observations from various perspectives. Maynard and Zimmerman (1984) discuss conversations between strangers and those between acquaintances in terms of topic choice and management. They found that the acquaintances often initiated topics through another's biographical information (i.e., friendship, interests) and employed people's names and demonstratives without any introduction of these referents. This shows that their topic initiation relies on mutually assumed knowledge. On the other hand, conversations between strangers opened with *pre-topical* talk to generate typified knowledge of each other's biographical information, and topics in the subsequent sequences tended to be initiated through setting-talk (i.e., participating in the experiment).

Redeker (1990) examined the use of two types of discourse marker, *ideational* and *pragmatic* markers, in conversations between friends and those between strangers through film description experiments. Ideational markers mark ideational relations of two discourse units which "entails the speaker's commitment to the existence of that relation in the world the discourse describes" (p. 369). They include simple connectives (i.e., the simple relative pronouns *that*, *who*, and *which*), semantically rich connectives (i.e., the adversative conjunction *but*, temporal connectives), and other temporal adverbials that specify the event-time referred to in the current utterance in relation to that of the preceding one (i.e., *now*, *then*, *after that*). The pragmatic markers mark rhetorical relations and sequential relations. Two connected discourse units are in a rhetorical relation when the strongest relationship is rather between the utterances themselves. They are in a sequential relation when they "do not have any obvious ideational or rhetorical relation while still being understood as belonging to the same discourse" (p. 369). The pragmatic markers include pragmatically used conjunctions (i.e., (*and*) *so*, *so* (*that*)) and interjections used as connectives (i.e., utterance-initial uses of *oh*, *all right*, utterance-final tags such as *okay?* or *right?*). The results from the experiment reveal that the friends use more pragmatic markers than the strangers while the strangers use more ideational markers than the friends.

Shared views among the studies above are that there is an association between the interlocutors' relationship difference in familiarity and their conversational management and that one of the major factors that influence the conversational management is what is perceived as "shared" or "not shared" among the interlocutors.

As reviewed above, those scholars who have investigated characteristics of conversational management have not looked at repair. In a similar manner, interlocutor relationship differences are not of concern among those who have looked at repair mechanisms. The present study, therefore, aims to explore the

possible interaction between the two phenomena. For both groups of scholars attempting to understand how the conversation participants manage and co-construct their verbal interaction, investigating the relationship between repair and interlocutor relationship would contribute to the further understanding of conversational interaction.

2. Data

The data of this study consists of 12 tape-recorded and transcribed face-to-face dyad spontaneous Japanese conversations. Six are between friends, and the other six between strangers. Fourteen of the participants are female and ten are male, of which 19 are so-called "standard Japanese" speakers and five are Kansai-dialect speakers. The length of each transcribed conversation varies from 12 to 22 minutes, totaling approximately 226 minutes. The data is distributed almost equally in length between the two sets of data.

3. Methodology

The focus of the present study is two types of S-S repair that occur at First-position. That is, it is a type of repair in which the speaker stops the production of the utterance in some way, and repeats or replaces some part or all of it (S-S repair) in the same turn that contains the repairable (First position) (Hayashi 1994, Schegloff et al. 1977).

First, the sequential organizations of all S-S repairs were examined for the operationalization. The classifications below follow those of Hayashi (1994).

Type 1 Replacement repair: Recycle prior phrase, with a **replaced** word
Type 2 Addition repair: Recycle prior phrase, with **addition** of new element(s)

Note that the terms *replaced* and *addition* merely refer to the apparent forms in the sequential structure, without any assertion that the speaker meant them to be a replacement or addition. In all the examples from my data, an asterisk (*) indicates repair initiation and bold-face letters indicate a repaired segment. "STRS" and "FRS" in parentheses at the end of each example refer to "Strangers' conversation" and "Friends' conversation," respectively, and the following number corresponds to the data number.

(3) **Replacement repair**

1 F: .. mukoo de wa-*,	F:... over there-*,
2 .. **nihon** de wa nani o-,	.. in **Japan** what did you-,
3 M:(0.5) a,	M:(0.5)ah,
4 .. nihon de wa,	.. in Japan,
5 .. kookoo sotsugyoo shite-,	.. I graduated a high school and-,
6 F: a sugu kitan desu ka?	F: oh you came right after (that)?
(STRS#4)	

In (3), F formulates a question of what M was doing in Japan presumably before

he came to the United States (lines 1-2). In this question, the initial locative NP marked by double particles *mukoo de wa* 'over there' is recycled with *nihon* 'Japan' replacing the demonstrative place noun *mukoo* 'there'.

(4) **Addition repair**

1 T: ... chuugakkoon toki no,	T: ... those English teachers when we
2 eego no sensee toka ne,	were in the middle school,
3 K: ... shaberenai yo.	K: ... cannot speak (English).
4 T: ... shabe*- --	T: ... cannot spea*- --
5 ***zettai*** shaberenai [yo] ne.	**definitely** cannot speak, right?
(FRS#1)	

In (4), T is making a statement about their middle school English teachers' inability to speak English that is jointly constituted with K. After K's provision of the proposition of the statement, *shabere nai yo* '(they) cannot speak (English)', at line 3, T stops her reproduction of the same verb from K's previous utterance, *shabe-** (line 4), and then continues the reproduction with the addition of an adverb of emphasis, *zettai* 'definitely' (line 5).

In order to discover the nature of these repairs, all Replacement and Addition repairs were further analyzed in terms of the relationship between the repairable and its repaired segment. However, cases in which the identification of repairable-repaired relationship was obscure are excluded in the discussion of the present study. A total of 64 repairs are classified as Replacement repair and 37 as Addition repair. Each type is further examined and classified into subtypes according to their repairable-repaired relationship.

4. Results and Discussion

4.1. Replacement Repair

Sixty-four examples of Replacement repair were observed in the data. The comparison between the repairable (a subject element of repair) and its repairing segment revealed four subtypes of Replacement type repair:

Replacement repair-1: from broad/vague to more concrete term
Replacement repair-2: word search (for more appropriate term)
Replacement repair-3: slight semantic coding change
Replacement repair-4: error correction

Example (3) above is an example of Replacement repair-1. The reference of *mukoo* 'there' in the repairable is vague since there was no anaphoric reference to indicate what *mukoo* refers to in their previous interaction. On the other hand, the reference of the substituted word, *nihon* 'Japan', is much more concrete.

The basic format of Replacement repair-2 consists of "Word 1 + (word search) Hesitation + Word 2," where Word 1 and 2 are semantically similar.[1] Word search hesitation signals that the speaker is looking for a different word that s/he thinks is

[1] The basic format follows Jefferson's (1974) Error Correction Format.

more appropriate or suitable. Clear examples of word search hesitations are *to yuuka* 'I means (it's) rather', *nanteyuun desu ka ne* 'how should I put it', and their variants. Less explicit hesitation signals include incomplete stuttered yet recognizable words. See (5) below for an example of this type.

(5) **Replacement repair-2:** Word search (for more appropriate term)

1	M: .. tobira ni*-,	M: it was hard for me
2	.. tte ka,	to get to the door*-,
3	**iriguchi** ni tadori- tsuku no mo,	I mean, to **the entrance.**
4	.. atashi ni totte	
5	taihen yattana tte [yuu ka=],	

(STRS#1)

In (5), the repairable is an NP marked by the goal marker *ni*, *tobira ni* 'to the door', which is followed by hesitation signal *tte ka* 'I mean'. M then performs a repair, providing the recycled *ni*-marked NP with *iriguchi* 'the entrance' replacing *tobira* 'the door'.

Replacement repair-3 involves a slight semantic coding adjustment. That is, the repairable and the replaced word are almost identical or only slightly different semantically. In some cases, the difference between the two is pragmatic.

(6) **Replacement repair-3:** Slight semantic coding change

1	K:.. kizukana*-	K:.. (we) didn't realize*-
2	**shiranakatta** no,	**didn't know** that
3	kore toraretano.	this (picture) was taken.

(FRS#5)

In (6), K is explaining that she and her father were not aware when the picture they are looking at was taken. Note the semantic similarity between the first incomplete word,[2] *kizukana-** '(we) didn't realize' (line 1), and the second word, *shiranakatta no* '(we) didn't know' (line 2).

The fourth subtype, Replacement repair-4, is the case of error correction. Its basic format consists of "Word 1 + Hesitation + Word 2," where Word 1 is clearly recognized as an error for its being contextually inappropriate, phonologically misarticulated, or semantically distinctive from Word 2.[3]

[2] The incomplete formulation, or cut-off marker, in Jefferson's terms, is also considered a hesitation component (Jefferson 1974)

[3] The basic format follows Jefferson's (1974) Error Correction Format.

(7) **Replacement repair-4:** Error correction

1	M: ji=-*,	M:	gee=-*
2	.. jii aaru ee ka,		is it GRA?
3	.. nan dakke,		what was it,
4	**jii pii ee** ya [@@@].		oh that's GPA [@@]
5	Y: [@@@]	Y:	[@@@]

(STRS#3)

In (7) above, realizing that *jii aaru ee* 'GRA' is not the appropriate word, M interjects a self-question-type hesitation *nan dakke* 'what was it?' (line 3), and finally finds an appropriate word and utters *jii pii ee ya* 'oh, that's GPA'.

Table 1 below shows the distribution of the four subtypes of Replacement repair.

Table 1: Distribution of Four Subtypes of Replacement Repair

	Friends	Strangers
Type 1-1: Broad/vague to Concrete	4	9
Type 1-2: Word Search	2	7
Type 1-3: Slight semantic coding change	5	10
Type 1-4: Error Correction	12	15
Total (64)	23	41

Analyzing these four subtypes in terms of their functions in interactional management, Replacement repair-1 and -3, as well as seven instances of Replacement repair-2 used between strangers, appear to share the same function, namely *elaboration*. By providing a more concrete or more appropriate choice of word, their utterance becomes more precise and rich with information. They are grouped together and collectively termed "Elaboration repair." The distribution of Elaboration repair in all the instances of Replacement repairs between the two sets of data is presented in Table 2 below.

Table 2: Distribution of Elaboration Repair in Type 1

	Friends	Strangers
Elaboration repair in Type 1	9	26

The results in Table 2 indicate a clear distributional difference in Elaboration repair in Type 1 between the two sets of data: the frequency of the use of Elaboration repair among strangers is almost three times higher than that among friends. This indicates that Elaboration repair is clearly strongly associated with the interlocutor relationship of being strangers.

4.2. Addition Repair

Addition repair consists of a recycled prior phrase, with addition of a new element(s). Thirty-seven examples of Addition repair were found in the data. Through comparison of the repairable with its repaired segment, two subtypes of added elements were identified: Elaborative addition and Emphatic addition. Twenty-seven examples of Addition repair were identified as Elaborative addition. See (8) below for an example of this type:

(8) **Addition repair-1:** Elaborative addition

1 M:.. atashi= ga=,	M: when I was in high school
2 .. kookoo n toki= no=,	.. there was a senior student whom
3 .. sugoi*,	I really*,
4 .. **kurabu no** sugoi sukiyatta	..a senior student **of a club** whom I
5 senpai ga=,	really liked,
6 yooko senpai ttette=,	and her name was Yoko and,

(STRS#1)

In (8), M adds *kurabu no* 'of a (school) club' at line 4 before she recycles a previously uttered word, *sugoi* 'really'. By adding *kurabu no* 'of a (school) club', the referent *senpai* 'senior student' and M's relationship with that referent become clearer.

The remaining ten examples of Addition repair involve Emphatic additions. The emphatic added elements include words like *zettai* 'definitely', *mattaku* 'not at all', and *kekkyoku* 'after all'. Example (4) above is one of the examples and reproduced here for convenience as (9).

(9) **Addition repair-2:** Emphatic addition

1 T: ... chuugakkoon toki no,	T: ... those English teachers when we
2 eego no sensee toka ne,	were in the middle school,
3 K: ... shaberenai yo.	K: ... cannot speak (English).
4 T: ... shabe*- --	T: ... cannot spea*- --
5 ***zettai*** shaberenai [yo] ne.	**definitely** cannot speak, right?

(FRS#1)

What the added word *zettai* 'definitely' in (9) at line 5 is doing is to emphasize or strengthen the tone of the speculative statement about junior high school English teachers' inability to speak English.

4.3. Elaboration Repair vs. Emphatic Repair

Between the subtypes of Replacement and Addition repair, there is one shared function: *elaboration*. Therefore, all instances of the elaboration type repair are grouped together. The remaining repair function then is *emphatic*. The distribution of repairs with elaborative and emphatic functions is presented in Table 3 below.

Table 3: Distribution of All Elaboration and Emphatic Repair

	Friends	Strangers
Elaboration repair	15	45
Emphatic repair	7	3

Considering these two functions of repair—elaborative and emphatic—in terms of how they contribute to the way the speaker conveys the message, another aspect of their interactional functions emerges. The Elaboration type repair is oriented toward the facilitation of the listener's comprehension of the message conveyed. In other words, by using S-S repair for elaborative purposes, the speaker facilitates the listener's precise comprehension by creating information-rich and carefully adjusted utterances. On the other hand, the Emphatic type repair is rather affect-oriented. By adding words such as *zettai* 'definitely', the speaker weaves her affective perspective into her message.

In order to confirm the significance of the distributional difference of these two types of repair functions observed in Table 3, a statistical frequency analysis was further applied to the results. The following is the result of the Fisher Exact Probability Test.

(10) Fisher Exact Probability Test

p	One-tailed	0.01283
	Two-tailed	0.01283

The calculated probability values (*p*) indicate that only 1.3% of the results occurred by chance alone. In other words, 98.7% of the frequency of the two functions of S-S repair in the data can be accounted for by the difference in the interlocutor's relationship.

What this result suggests is as follows: as far as the two types of S-S repair under investigation are concerned, one function of the S-S repair is Elaboration, which serves to provide fine-tuned or rich information that facilitates the listener's precise comprehension of the message conveyed by the speaker. Repair with this function is much more frequently observed in conversations between strangers. Another function is to weave the speaker's affective perspective into his/her message in production. Although the number of examples is relatively small, it is statistically supported that repair with this function is observed more in conversations between friends.

Here, recall the findings in Redeker's (1990) experimental study on discourse markers. What she found was that friends use more pragmatic markers than strangers whereas strangers use more ideational markers than friends. These findings are consistent with the findings in the present study. That is, strangers tend to use repairs for ideational (propositional) purposes, namely for elaboration of propositional content, while friends tend to use repairs for a pragmatic (affective) purpose, namely for emphasis. This suggests that the relationship differences play a role in various linguistic choices, including specific types of repair and discourse markers.

5. Conclusion

This paper presents evidence that certain types of S-S repair exhibit a tendency to be used more for one function in conversations between friends and for another in conversations between strangers. The results of this study therefore suggest that there is an association between functions of certain types of repair and the relationship difference among interlocutors. Additionally, the results of the present study show consistency with Redeker's (1990) experimental study on the use of discourse markers by strangers and by familiars. Recall that one common view shared among previous studies of interaction between familiars and between strangers is that the differences they found are associated with the difference of the interlocutor's perceived sharedness of mutual knowledge. In a similar manner, one possible factor for the high frequency of elaborative function-bearing repair in conversations between strangers is associated with the lack of perceived shared knowledge.

The present study also shows a way in which the data demonstrates how the relationship difference among the interlocutors is associated with their interactional management through linguistic devices.

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EALL 308 Friendly Hall
University of Oregon
Eugene, OR 97403

ttakeda@darkwing.uoregon.edu

Comparative Markedness and Opacity in Meskwaki Palatalization*

THOMAS R. WIER
University of Chicago

0. Introduction

Recent debates in phonological theory about the nature of opacity and its formal treatment have largely centered around the adequacy of output-oriented approaches such as Optimality Theory (Prince and Smolensky 1993) to capture the generalizations underlying opaque phenomena and yet at the same time maintain their architectural coherence. In this paper, I will attempt to show with data from Meskwaki (a.k.a. Fox; Algonquian) how one such approach within OT, Comparative Markedness (McCarthy 2002), not only requires certain problematic extensions of constraint ontogeny, but also results in contradictory rankings in handling palatalization and glide deletion processes in Meskwaki.

1. The Data

Meskwaki, also known as Fox, is an Algonquian language spoken by around 700 people on the Mesquakie settlement in Iowa (Grimes 1992). Like many Native American languages, it is characterized by an elaborate and complex system of morphosyntax. When it comes to phonological alternations, most processes seem to be morphologically restricted. Two of the few generalizations that seem to be purely phonologically conditioned can be found in (1).

(1) Palatalization of /t/ before /i/ (Goddard 1994):

a.	/ni·mi-t-i/ dance-3-CONJ	ni·mi**či**	'he dances'
cf.	/ni·mi-t-a/ dance-3-3.ANIM.SG.HEAD	ni·mi**ta**	'(he) who dances'
b.	/e·h-in-et-i/ AOR-speak.thus-X>3-CONJ	e·hine**či**	'one addressed him thus'

* I would like to thank Amy Dahlstrom, Gunnar Hansson, Ives Goddard, John Goldsmith, Alan Yu, Adam Cooper, and Ilya Yakubovich for their discussion and responses to earlier versions of this paper. They are, of course, not to blame for any errors contained herein.

c.	/pye·t-ike·-w-a/ bring-ANTIPASS-3-3.ANIM.SG	pye·**či**ke·wa	'he is bringing (something)'
d.	/a·t-im-o-w-a/ over.again-by.mouth-EP-3-3.ANIM.SG	a·**či**mowa	'he is telling a story'
cf.	/a·t-ot-am-w-a/ over.again-TH-3-3.ANIM.SG	a·**to**tamwa	'he tells of it'
e.	/k-i·pit-i/ 2-tooth-INAN.SG	ki·pi**či**	'your tooth'
cf.	/k-i·pit-ani/ 2-tooth-INAN.PL	ki·pi**ta**ni	'your teeth'

As the data in (1) illustrates, an underlying /t/ palatalizes to [č] before the high front vowel /i/. Thus, underlying /ni·mi-t-i/ 'he dances' surfaces as [ni·miči], in alternation with other related morphological forms like /ni·mi-t-a/ [ni·mita] '(he) who dances' where underlying /t/ remains because the conditioning environment for palatalization is not present. This palatalization occurs not just with derivational suffixes as in (1c-d), but also with various kinds of nominal and verbal inflectional suffixes, as in (1a), (1b), and (1e).

In contrast to this, this process of palatalization does not occur morpheme-internally, as shown in (2) below. Underlying /t/ appears only to palatalize to [č] in derived environments. Thus, although the /t/ in the reciprocal voice suffix *-eti·-* in (2a) has the right phonological conditioning environment, it fails to undergo palatalization to [č] because the /t/ does not surface near "new" information, i.e., at a morpheme boundary. Also like (1), this pattern is not restricted to a particular subset of the lexicon: derivational (2a, c, e), inflectional (2b), and verbal and nominal roots (2d, f) all show effects of this kind.

(2) Nonderived environment blocking:

a.	/e·h-ma·wačim-ti·-wa·-t-i/ AOR-call.together-ANTIPASS-3PL-3-CONJ	e·hma·wači**ti**·wa·či	'they called each other together'
b.	/pašito·h-etike/ old.man-VOC.PL	pašito·he**ti**ke	'old men!' (voc. pl.)
c.	/wača·h-etiso-w-a/ cook-REFL-3-3.ANIM.SG	wača·he**ti**sowa	'he is cooking for himself'
d.	/ti·kwe·-w-i/ patter-3-3.INAN.SG	**ti·**kwe·wi	'it patters'
e.	/kišk-itiy-e·-w-a/ fall.off-tail-TH-3-3.ANIM.SG	kiški**ti**ye·wa	'his tail falls off'
f.	/taneti·-w-aki/ gamble-3-3.ANIM.PL	tane**ti·**waki	'they gamble, make bets'
g.	-eti·-		reciprocal suffix
h.	-etiso-		middle voice suffix
i.	-etike-		vocative

(2a) is particularly striking, because it shows that the palatalization process may occur to one sequence of /ti/ in a word even when another sequence of /ti/ in the same word fails to undergo palatalization because it is morpheme-internal. Nonderived environment blocking of this sort has been reported in many languages. But on top of this, there is a separate and synchronic (Ives Goddard, p.c.) process of glide deletion in (3) which can bring about phonological contexts identical to those in (2) and which, in derivational terms, counterfeeds palatalization:

(3) Counterfeeding opacity:

a. /nekotw-ičiše/ one-inch	neko**ti**čiše	'one inch'
cf. /nekotw-ayaki/ one-group	nekotwayaki	'one group'
b. /na·-nekotw-i/ RED-one-PART	na·neko**ti**	'one apiece, one by one'
c. /očity-i/ bird's.tail-3.Inan.Sg	oči**ti**	'bird's rump or tail'
cf. /očity-ani/[1] bird's.tail-3.INAN.PL	očitye·ni	'bird's tails'
d. /pe·škity-i/ basket-3.INAN.SG	pe·ški**ti**	'basket'
cf. /pe·ški**ty-**ani/ basket-3.INAN.PL	pe·ški**ty**e·ni	'baskets'

This process brings about surface sequences of [ti] which do not underlyingly qualify as morphologically driven blocking of palatalization, because a glide such as /y/ or /w/ stands in the way of that morphological edge. And yet when glide deletion prevents these from surfacing in the output, it has the same effect as if the /t/ were underlyingly at a morpheme boundary. We may summarize these effects in (4) below.

(4) Summary of above phonological generalizations in Meskwaki:

Palatalization	/ni·mi-t-i/	ni·mi**či**	'he dances'
Nonderived environment blocking	/e·h-ma·wačim-ti·-wa·-t-i/	e·hma·wači**ti**·wa·či	'they called each other together'
Glide deletion	/nekotw-ičiše/	neko**ti**čiše	'one inch'

[1] It is not altogether certain that *ty*-stems are synchronically /ty + ani/, rather than /t + ye·ni/ (Ives Goddard, p.c.), but as the *tw*-stems show, throwing out these forms would not get rid of the underlying problem. To complicate matters further, *ty*-stems sometimes *do* cause palatalization; for fuller details, see Goddard (2001).

We are faced with not simply having to account formally for how the morphological status of affixes affects the palatalization process, but also for why a completely unrelated process in this language, glide deletion, brings about the same kind of surface structure which is otherwise illicit. Any theoretical account of phonological opacity such as this must be able to capture this many-to-one relationship between processes and surface outputs.

2. The Architecture of Comparative Markedness

Classical derivational phonology, which like Optimality Theory assumed that all phonologically conditioned allomorphy should be handled by some synchronic phonological module, could approach this kind of situation with ease, and indeed that was one of the primary reasons advanced in favor of extrinsic rule ordering (Kiparsky 1968). Unlike intrinsic rule ordering, where processual interaction is held constant cross-linguistically, extrinsic rule ordering makes the prediction that, from the vantage point of the surface, languages may vary in how certain processes interact or not. Thus in Meskwaki, palatalization must logically[2] precede glide deletion, so that /ni·mi-t-i/ 'he dances' would palatalize to *ni·miči* while at that same logical step, a form like /nekotw-ičiše/ 'one inch' would not provide the palatalization rule the appropriate licensing environment. When the logically secondary glide deletion rule came into effect, the palatalization process could no longer have any say over sequences of [ti], thus leaving them as such in the output.

But having to work with a two-level mapping of input and output, the theory of Comparative Markedness (CM) cannot account for such facts so directly. The basic departure of CM from early work in OT is that the family of Markedness constraints is broken down into two separate yet intimately related families of Markedness constraints which are respectively sensitive only to "new" or only to "old" information relative to the input. Like all OT accounts, the GEN function creates a set of possible output candidates each of whose properties are assessed by a ranked hierarchy of constraints. Unlike most accounts in OT, however, one candidate, the Fully Faithful Candidate (FFC),[3] is given a privileged position within the candidate set, in that Markedness constraints now must take into account not just potential violations of a given candidate itself, but also whether that candidate shares that same violation with the FFC. McCarthy (2002) defines it in the following way:

[2] How such computations were actually mentally arrived at never gained anything resembling a consensus during early debates about generative phonology.

[3] The FFC is used, rather than direct reference to the input, because the FFC might contain completely predictable information such as syllabification not present in the underlying representation.

(5) "These novel markedness constraints distinguish between:

a. Mappings that fail to correct a marked configuration in the FFC. E.g., the mapping /ab/ → *ʔab* fails to correct the marked voiced obstruent in the FFC *ab*. That is, the NoVcdOb [No-Voiced Obstruent—TRW] violation in *ʔab* is 'old' because the fully faithful candidate *ab* has the same violation; and

b. Mappings that introduce new marked configurations. E.g., the mapping /ampa/ → *amba* (i.e., post-nasal voicing) introduces a voiced obstruent that is not present in the FFC *ampa*. That is, the NoVcdOb violation in *amba* is 'new' because the fully faithful candidate *ampa* doesn't have this violation." (McCarthy 2002:2)

Because markedness phenomena are no longer governed by a single theoretical construct—namely, by a single markedness constraint—but rather by two, the practical difference between a CM view of constraint ontology and the more traditional kind seen in OT can be realized only when some other constraint, usually a faithfulness constraint, intervenes between the two kinds of markedness constraints. McCarthy is able to derive a number of different kinds of phonological phenomena from opposite rankings of new and old constraints, as seen in (6):

(6) a. $_{N}$M >> F >> $_{O}$M: grandfather effects, derived environment effects (DEEs)
b. $_{O}$M >> F >> $_{N}$M: noniterating processes, coalescence paradoxes, counterfeeding opacity

A number of these phenomena have proven thorny for many earlier theories of phonology, and not just with opaque processes. DEEs and noniterating processes had required some notion of cyclic derivations within lexical phonology to constrain the effects of powerful rewrite rules. At the same time, another merit of CM is that it makes a clear prediction about constraint interaction. This is that an epiphenomenon of one ranking may not with the same set of CM constraints in the same hierarchy bring about surface forms that ought properly to be epiphenomena of the opposite ranking. That is, we should not expect to see a process that is subject to *both*, say, derived environment effects *and* counter-feeding opacity. This is a strong claim, and a desirable outcome of the architecture of any linguistic theory, because it can be directly tested by reference to new data and be thereby potentially falsified.[4]

Unfortunately for CM, as the Meskwaki data show, precisely such phonological systems *do* exist, indeed, in a situation very similar to that discussed by McCarthy using palatalization in Korean, as in (1) and (2) above:

[4] Of course, no synchronic theory can be proved correct as such; theories may only be *dis*proven.

(7)

a.	/pat^h-i/	pac^{h}i	'field-COP'
	/mat-i/	maci	'eldest-NOM'
	/put^h-i/	puc^{h}i	'to stick to-CAUS'
	/tot-i/	toci	'rise-NOM'
b.	/mati/	mati	'knot'
cf.	/kac^{h}i/	kac^{h}i	'value' (McCarthy 2002:23)

Here, /t/ palatalizes to /c/ before underlying /i/, as in *mat-i* 'eldest-NOM', but not when a phonologically identical string of segments has no internal morpheme boundary, as in (7b) *mati* 'knot'. Because DEEs constitute generalizations across paradigms and because inflectional morphemes by definition are never realized separately from the stems to which they are attached, McCarthy invokes the notion within Correspondence Theory of output-to-output correspondence. In this approach, an output form may be judged according to not just the potential constraint violations arising from its own input (i.e., from input-to-output correspondence), but also the potential violations arising from some other morphologically related form. This is in effect a kind of formalization of analogical processes. McCarthy layers this contrast in correspondence over the new and old markedness constraints to derive a four-way typology of constraints: IO-$_N$PAL, IO-$_O$PAL, OO-$_N$PAL, and OO-$_O$PAL, three of which will prove crucial to explaining the DEEs seen in Korean. These may be formally defined as follows:

(8) Constraint definitions:

a. IO-$_O$PAL: incurs one violation (*) for every locus of [ti] present in the FFC of the underlying representation of the word in IO-correspondence

b. OO-$_O$PAL: incurs one violation (*) for every locus of [ti] present in the FFC of the underlying representation of the form in OO-correspondence

c. OO-$_N$PAL: incurs one violation (*) for every locus of [ti] ***not*** present in the FFC of the underlying representation of the form in OO-correspondence.

d. IDENT: input features must be present in output, and vice versa

To bring about the DEEs of Korean, the constraint OO-$_N$PAL must be ranked above IDENT to impose palatalization in forms like *tot-i* [toci] 'rise-NOM' where the form in OO-correspondence, *tot*, has no locus of [ti] and thus nothing to enforce identity. Yet IDENT must be ranked above IO-$_O$PAL and OO-$_O$PAL to ensure that loci of [ti] in the FFC of the underlying representation of forms like *mati* 'knot' do not at the same time palatalize, since there is no form in OO-correspondence which does not have [ti] and thus no form relative to which the

output candidate [mati] is marked. These relations are shown in the tableau in (9)[5]:

(9) Korean: OO-$_N$PAL >> IDENT >> IO-$_O$PAL, OO-$_O$PAL

/tot/	OO-$_N$PAL	IDENT	IO-$_O$PAL	OO-$_O$PAL
a. tot (FFC) ☜				
b. toc		*!		
/tot-i/				
c. toci ☜		*		
d. toti (FFC)	*!		*	
/mati/				
e. mati (FFC) ☜			*	*
f. maci		*!		

3. Meskwaki DEEs and Counterfeeding Opacity

Formally, this situation is so far identical to our situation in Meskwaki: underlying /t/ palatalizes to /č/ before only those /i/'s which do not constitute part of the same morpheme. We could formalize this with the tableau in (10):

(10)

/ni·mi-t-a/	OO-$_N$PAL	IDENT	IO-$_O$PAL	OO-$_O$PAL
a. ni·mita (FFC) ☜				
b. ni·miča		*!		
/ni·mi-t-i/				
c. ni·miči ☜		*		
d. ni·miti (FFC)	*!		*	
/pašito·h-etike/				
e. pašito·hetike (FFC) ☜			*	*
f. pašito·hečike		*!		

In (10a-b), candidate (a) *ni·mita* is selected as most optimal because (b) *ni·miča* contains a gratuitous violation of IDENT where no locus of /ti/, underlying or otherwise, motivates it. Likewise, although (10d) *ni·miti* does not have any IDENT violations, it does contain loci of [ti] relative both to its FFC (i.e., itself) and to the FFC in (10a) *ni·mita* with which it stands in OO-correspondence. Thus it violates both OO-$_N$PAL and IO-$_O$PAL. It does not violate OO-$_O$PAL because (10a) *ni·mita* contains no locus of [ti], and thus cannot share that marked feature with (10d) *ni·miti*.

[5] I have taken over the formatting of this tableau directly from McCarthy (2002:24).

The DEE becomes clear when we look at (10e-f). Because the locus of [ti] in *pašito·hetike* is internal to the morpheme, the only possible OO-correspondence that this morpheme can have is with itself. This implies that no violation of OO-$_{N}$PAL is possible, since all loci of [ti] will be shared with the same FFC. The output form thus naturally falls out from the constraint hierarchy, since (10f) *pašito·hečike* does violate IDENT even though it does not violate the lower ranked constraints IO-$_{O}$PAL and OO-$_{O}$PAL, and thus the less marked form in (10e) *pašito·hetike* is selected by the EVAL algorithm.

The area that poses difficulties for the CM account of opacity, as mentioned above, is that Meskwaki also has a glide deletion process which can create loci of [ti] which however are both phonologically *and* morphologically "derived" *at the same level of the lexicon*. According to McCarthy's conception of CM, however, counterfeeding opacity can only come about as a result of the interaction of CM constraints if "old" constraints outrank "new" constraints. To illustrate this, the ranking in (11) is needed:

(11) *GLIDE >> OO-$_{O}$PAL >> IDENT >> IO-$_{O}$PAL, OO-$_{N}$PAL

/na·-nekotw-i/	*GLIDE	OO-$_{O}$PAL	IDENT	IO-$_{O}$PAL	OO-$_{N}$PAL
a. na·nekotwi (FFC)	*!				
b. na·nekoti ☜			*		*
c. na·nekoči			**!		
/nekotw-ayak-i/					
d. nekotwayaki ☜					
e. nekotayaki			*!		

The candidate in (11a) *na·nekotwi* is eliminated on the grounds that it contains an unlicensed glide in the onset with /t/, so the choice falls to (11b) *na·nekoti* or (11c) *na·nekoči*. Both candidates delete the underlying glide, but because (11c) *na·nekoči* both deletes this glide and changes the continuancy features on the preceding stop, it incurs a higher number of violations of IDENT relative to (11b) *na·nekoti*. That is, CM is capable of handling counterfeeding opacity as such, but only when it does not occur in the context of processes like DEEs derived from the contrary constraint ranking.

4. Implications

The fact that Meskwaki directly contradicts one central prediction of CM does not deal a death blow to the theory as such. One might claim that CM would still be useful to handle various sorts of processes like DEEs or grandfather effects that have proven awkward for earlier generative theories of phonology. But some mechanism—e.g., a kind of universal hierarchy that "new" always outranks "old" or vice versa—would have to be invoked to prevent the effects of the reverse constraint ranking from imposing contradictory results as in the Meskwaki data.

This would mean, to be sure, that the various phenomena that have been claimed to come under its ambit would not, after all, be able to be unified in the same way. Probably more importantly, this just raises larger issues about what CM and phonological theory at large are supposed to be doing in the first place. If CM can only work by effectively doubling the number of theoretical entities in the form of a new subfamily of constraints and needs peculiar mechanisms to make sure that it does not work itself into a contradiction, this opens the question of whether some simpler formalism might be able to capture the same generalizations at lesser cost. The answer to this depends in part on what one takes to be part of the speakers' synchronic grammar. If it could be shown that that in Meskwaki either the DEEs or the counterfeeding opacity were the result of diachronic changes that are no longer really a part of the speakers' internalized grammars—or to put it differently, the problem is synchronically a morphological, not a phonological, question—then our problem could be waved away. This is potentially the case with *ty*-stems in (3c-d), but *tw*-stems suggest that there must be a real synchronic element to this. As things stand, a great deal more research on modular interaction within languages like Meskwaki is needed.

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Department of Linguistics
University of Chicago
1010 E. 59th Street
Chicago, IL 60637, USA

trwier@uchicago.edu

Partial Reduplication in Some Austronesian Formosan Languages

SHIH-CHI STELLA YEH
National Tsing Hua University

0. Introduction

Reduplicative infixation has been a hotly debated topic, especially the invariant shape and the position of reduplicants. In the Amis language and several Austronesian Formosan languages, the pattern of partial reduplication seems to be infixation – copying a bimoraic form from the right edge except the final consonant. The main concern of this paper will be to evaluate the functions of Alignment constraints in terms of the position and the size of reduplicants, utilizing Optimality Theory. Languages mentioned in this paper display a more complete typology for the mora alignment constraint (Chrowhurst 2004) where the evaluation applies on the mora tier. In addition, while the invariant shape of the reduplicant can be predicted through alignment interactions in several languages (Gafos 1998, Hendrick 2001, Chrowhurst 2004), Amis and Thao differ. A constraint referring to the size is still necessary. I propose that the reduplicant position can be accounted for by Alignment, but the invariant shape should appeal to the Generalized Template constraint Red=Stem in Amis and Thao.

The organization of this paper is as follows. The first section presents the reduplicative patterns in Formosan languages Amis, Pazih, Paiwan and Thao. Section two displays the functions of Alignment constraints and illustrates an analysis regarding the positions of reduplicants. Section three is concerned with the templatic use in reduplication. I argue that the templatic constraint may not be substituted with Alignment interactions. The final section concludes the paper and discusses implications.

1. Description of suffixal reduplicative patterns

Suffixal reduplication in Amis and in several relevant Formosan languages is presented here. Amis is spoken by aboriginal people in the eastern territories of Taiwan. Based on my fieldnotes, one of the Amis reduplicative patterns, suffixal reduplication, copies material of bimoraic size from the right edge minus the root-final segment, which is always a consonant in content words, as in (1). This language permits onset clusters in word-initial position, and a maximum of one coda consonant. Therefore a tri-consonantal sequence word-medially is not

possible. ('-' stands for reduplicant morpheme boundaries; '=' represents general morpheme boundaries.)

(1) Suffixal reduplication in Amis

a.	ma.máʔ	ma.ma.-ma.má-ʔ	'father sg./pl.'
	lu.pás	lu.pa.-lu.pa.-s=án	'peach/woodlands of peaches'
	ru.níʔ	ru.ni.-ru.ni-.ʔ=án	'gourd/field of gourds'
	ma=li.ŋáɬ	misa=li.ŋa.-li.ŋá-ɬ	'work/pretend working'
b.	a.lu.pál	a.lu.pa.-lu.pa.-l=án	'persimmon/woodlands of persimmons'
	ka.ɬa.fúʔ	ka.ɬa.fu.-ɬa.fú-ʔ	'child-in-law sg./pl.'
	ta.ka.ráw	ta.ka.ra.-ka.rá-w	'tall/every subject is tall'
	pa͡tsiʔə́ŋ	kara=pa͡tsiʔə-͡tsiʔə́-ŋ	'big parotid bone sg./having big parotids'
c.	tam.ɬáw	tam.ɬa-m.ɬá-w	'person sg./pl.'
	faŋ.͡tsál	faŋ.͡tsa-ŋ.͡tsá-l	'good/every subject is good'
	siŋ.síʔ	siŋ.si-ŋ.sí-ʔ	'teacher sg./pl.'
	mi=nəŋnə́ŋ	mi=nəŋ.nə-ŋ.nə́-ŋ	'look/every subject is looking'
	kih.pí͡ts	kih.pi-h.pí-͡ts	'thin/every subject is thin'

The reduplicant mirrors two syllables from the right edge minus root-final consonant in (a) and (b). For words containing medial consonant clusters in (c), the reduplicants copy the last syllable plus the preceding coda minus root-final consonant. Assuming that codas are moraic except word-final ones, the reduplicants mirror two morae from the right edge except final consonants.

Formosan languages Thao, Paiwan, and Pazih resemble Amis suffixal reduplication in copying two morae from the right side minus the final consonant. In (2), the Pazih reduplicant is of the shape CVCV; the copy skips over the final consonant if there is one. Pazih permits Nasal-Consonant medial clusters in accord with the place feature, but they are not found in the reduplicative pattern.

(2) Pazih reduplication (Li and Tsuchida 2001)

ma=baza	m=in=a=baza-baza	'to know/very knowledgeable'
ta=ŋiti	ta=ŋiti-ŋiti	'angry/very angry'
zizaj	mu=ziza-ziza-j	'old/very old'
baket	maa=bake-bake-t	'to hit/to hit each other'

A northern dialect of the Paiwan language displays similar patterns, as shown in (3). Like Pazih, word-internal codas are rare so that medial clusters are uncommon. The reduplicants copy two syllables from the right edge except root-final consonants.

(3) Paiwan reduplication (Chang 2000, Tseng 2002)

ivu	ivu-<u>ivu</u>	'to talk/talking'
kalava	k=em=alava-<u>lava</u>	'to wait/waiting'
alemeqem	alemeqe-<u>meqe</u>-m	'sweet/sweety'
kalid^{j}ikid^{j}	kad^{j}iki-<u>d^{j}iki</u>-d^{j}	'to flash/flashing'

In the more complex case in (4), Thao suffixal reduplication copies the last two syllables minus word-final consonant in (C)CVCV(C) words. For words with medial consonant clusters ([$_{\sigma}$CC, C$_{\sigma}$][$_{\sigma}$C or C$_{\sigma}$][$_{\sigma}$CC), the reduplicants mirror the final vowel and the two consonants preceding it, skipping over final-consonants.

(4) Thao reduplication (Chang 1998, Blust 2003)

a.	šna.ra	pa=šnara-<u>nara</u>	'to ignite/to burn s.t. repeatedly'
	qu.li.uš	mia=quliu-<u>liu</u>-š	'long/stretch out'
	ki.ka.ɬi	ma=kikaɬi-<u>kaɬi</u>	'to ask/to ask around'
b.	aŋ.qtu	aŋqtu-<u>qtu</u>	'to complete/think about'
	m=ar.faz	m=arfa-<u>rfa</u>-z	'to fly/to keep flying around'
	iŋ.kmir	iŋkmi-<u>kmi</u>-r	'to roll into a ball/be rolled into a ball'
	dut.khun	mia=dutkhu-<u>khu</u>-n	'hunched over/hunch over'

The reduplicant acts as a suffix in vowel-final words. For consonant-final words, it behaves as an infix, breaking up the final consonant and other segments of the root. Concerning the invariant shape of reduplicants, it seems to alternate between one to two syllables. I argue that the position of the reduplicant can be predicted accurately through Alignment interactions, but the size cannot solely depend on Alignment constraints (with other phono-constraints). A Generalized Template constraint Red=Stem, though indirectly referring to the mapping between the morphological category Red and a phonological category, can properly account for invariant shape.

2. The position of reduplicants

In pre-OT theories, Prosodic Circumscription (McCarthy and Prince 1990, 1995) dealt with the position of the infixing reduplicant by circumscribing a part and applying reduplication processes to either kernel or residue. However, sometimes the cut portion could not be incorporated into the Prosodic Hierarchy, such as with the 'onsetless syllable' in Timugon Murut (5). Within the theory of Generalized Alignment in OT, McCarthy and Prince propose an analysis manifesting the higher-ranking phono-constraint ONSET. With ONSET outranking LEFTMOST-RED, the reduplication skips over the onsetless syllable in order to improve the overall prosodic structure (*om-<u>po</u>-podon* rather than **<u>om</u>-ompodon*).

(5) Timugon Murut (Prentice 1971; cited in MaCarthey and Prince 1993)

a.	limo	li-limo	'five/about five'
	bulud	bu-bulud	'hill/ridges in which tuberous crops are planted'
b.	abalan	a-ba-balan	'bathes/often bathes'
	ompodon	om-po-podon	'flatter/always flatter'

However, in Amis and other Formosan languages, a top-ranked NOCODA constraint would not improve the whole structure. Following previous work (McCarthy and Prince 1994, 1995, Gafos 1998, Downing 1998, 2000, Hendricks 2001, Crowhurst 2004), I argue that the position of the reduplicant can be predicted accurately through interactions of Alignment constraints which show morphology-prosody relations.

2.1. An alignment analysis in Amis

As shown in (1), Amis content words (which may undergo reduplication) end in consonants. Therefore, interactions between ROOT-Alignment and RED-Alignment may accurately predict the positions of reduplicants. We adopt the templatic constraint at present and take the assumption that codas are moraic except when word-final. In Amis, the dominant templatic constraint RED=Stem only requires a size of two morae (i.e., a Foot) but not edge alignment. Ranking Align-Rt-R over RIGHTMOST could exclude the root-final consonant from reduplication. Interactions of constraints are illustrated in tableaux (7) and (8).

(6) Constraint definitions

a.	Align-Rt-R(ight):	Align(Root, R, PrWd, R). Every root must coincide with a prosodic word at the right edge.
b.	RIGHTMOST:	A reduplicant must align with the right edge of a prosodic word.
c.	Red=Stem:	Red equals a Stem, which is bimoraic.
d.	MaxBR:	Every segment of B has a correspondent in R.

(7) Reduplication for Amis roots without medial clusters

Input: /kaɬafuʔ, Red/	Align-Rt-R	Red=Stem	RIGHTMOST	MaxBR
a. ☞ka.ɬa.fu.-ɬa.fu-ʔ			*	**
b. ka.ɬa.fu-ka.ɬa.fu-ʔ		*!	*	
c. ka.ɬa.fuʔ-fuʔ	*!	*		****
d. ka.ɬa.-fuʔ-fuʔ			**!*	

(8) Reduplication for Amis roots with medial clusters

Input: /tamɬaw, Red/	Align-Rt-R	Red=Stem	RIGHTMOST	MaxBR
a. ☞tam.ɬa-m.ɬa-w			*	**
b. tam.ɬa-tam.ɬa-w		*!	*	
c. tam.-ɬaw-ɬaw			*!**	
d. tam.ɬaw.ɬaw	*!	*		***

In tableau (7), candidate (c) satisfies the RIGHTMOST constraint at the expense of violating dominant Align-RT-R. It also violates the size requirement of the reduplicant because of the non-moraic final consonant. Candidate (b) copies too much, violating the templatic constraint. In tableau (8), a full-copied candidate (b) violates the size restriction. Candidate (c) satisfies MaxBR but incurs more violations of RIGHTMOST. Notice that in tableau (8), the existence of an undominated NOCODA constraint would not aid in selecting the optimal candidate.

2.2. Mora alignment in some Formosan languages

Since content words end in a consonant in Amis, the positions of infixing reduplicants can be attributed to the crucial ranking of Align-Rt-R >> Align-Red-R. However, in Pazih, Paiwan and Thao, the reduplicants behave as infixes in consonant-final roots but as suffixes in vowel-final ones. The ranking in Amis would be problematic for these cases. Consider the reduplicated forms in consonant-final and vowel-final roots. One thing consistent is that the reduplicants align the right edge on the mora tier. Adopting Crowhurst's (2004) mora alignment constraint, the positions of reduplicants can easily be accounted for. Analogous to constraint (6a) Align-Rt-R, a set of alignment constraint referring to different units (segments and morae) is incorporated into the analysis. For Align-Red_{μ}-R to outrank Align-Rt_{μ}-R, the reduplicant would press close to the right edge. Ranking Align-Rt_{sg}-R over Align-Red_{sg}-R ensures that the root stays at the right edge if possible. Moreover, for Align-Red_{μ}-R to outrank Align-Rt_{sg}-R, a reduplicative infix emerges if the rightmost segment is a non-moraic root segment. The constraint ranking is illustrated in tableaux (9-10). (For the sake of space-saving, the 'Align' is abbreviated to 'A'.)

(9) Thao reduplication for roots without clusters

/kikaɬi+Red/	Red=Stem	A-Red_{μ}-R	A-Rt_{sg}-R	A-Red_{sg}-R	A-Rt_{μ}-R	MaxBR
a. ☞kikaɬi-kaɬi			*		**	**
b. kikaɬ-ikaɬ-i		*!		*		*
c kika-kika-ɬi		*!		**		

/quliuš+Red/	Red=Stem	A-Red$_{\mu}$-R	A-Rt$_{sg}$-R	A-Red$_{sg}$-R	A-Rt$_{\mu}$-R	MaxBR
d. ☞quliu-<u>liu</u>-š				*	**	**
e. quliuš-<u>liuš</u>			*!***		**	*
f. quli-<u>quli</u>-uš		*!		**		
g. quliu-<u>u</u>-š	*!			*	*	****

In the above tableau, candidates (b-c) and (f) violate the dominant constraint Align-Red$_{\mu}$-R. Candidate (e) satisfies Align-Rt$_{sg}$-R at the expense of violating a higher-ranked constraint. After competing, (a) and (d) are optimal. Notice that if the templatic constraint did not exist, candidate (g) would defeat (d). Once Align-Rt$_{\mu}$-R and Align-Rt$_{sg}$-R are satisfied, other Alignment constraints would squeeze the reduplicant to the minimum.

(10) Thao reduplication for roots with clusters

/m=arfaz+Red/	Red=Stem	A-Red$_{\mu}$-R	A-Rt$_{sg}$-R	A-Red$_{sg}$-R	A-Rt$_{\mu}$-R	MaxBR
a. ☞m=arfa-<u>rfa</u>-z				*	**	**
b. m=arfaz-<u>faz</u>	*!		***		*	***
c. m=arfa-<u>fa</u>-z	*!			*	*	***
d. m=arfa-<u>marfa</u>-z	*!			*	***	

Tableau (10) illustrates reduplication for roots containing a medial cluster. Again, candidates (b-d) are ruled out by the dominant constraint. If we take candidate (a), (c) and (d) into consideration and suppose that Red=Stem is absent, candidate (a) would never win out because its violations are between candidates (c) and (d) in the lowest two constraints. So the templatic constraint indeed plays an important role.

Alignment constraints indicating different units or categories (root, segment or mora) can deal with the suffixal reduplication in vowel- and consonant-final roots in the aforementioned Formosan languages. The correct reduplicative position can rely on Alignment interactions; however, not the reduplicant size. The constraints restricting reduplicative shape will be discussed in section 3. In the following, languages displaying mora-alignment at the opposite edge are presented.

2.3. A typology of mora alignment constraints

Reduplication in Pazih, Paiwan and Thao has shown the right-edge effects of mora alignment constraints. Mora alignment at the left edge is also attested. Infixing reduplication in Mangarayi (Merlan 1982, McCarthy and Prince 1986) is a case of mora-tier evaluation at the left edge.

(11) Mangarayi partial reduplication

gamag	g-a.m-a.mag.-ji	'digging stick/having digging sticks'
jim.gan	j-im.g-im.gan	'knowledgeable one sg./pl.'
muyg-ji	m-uyg.j-uy.g-ji	'having a dog/having a lot of dogs'

Mangarayi reduplication is a mirror image of Amis and Thao, especially words containing medial clusters. Crowhurst (2004) proposes two crucial rankings, LEFTMOST-Rt_{SEG} >> LEFTMOST-Red_{SEG} and LEFTMOST-Red_{μ} >> LEFTMOST-Rt_{μ}. The interactions predict not only the reduplicant position but also the size. Once L-Rt_{seg} and L-Red_{μ} are satisfied, the reduplicant would copy as much as possible. The copy should not exceed one mora or it would incur more violations of L-Red_{μ}.

To sum up, this section presents data which favors the alignment constraint evaluated on the mora tier. Moreover, interactions between mora and segment alignment constraints predict different language types.

3. The invariant shape of reduplicants

A property of reduplicants is their steadfast size. In pre-OT phonology, a morphological-specific-template was stipulated to control the size. In OT the concept was directly transferred into a templatic constraint in the form of 'Red=X', meaning that Red equals a certain unit X (McCarthy and Prince 1993). Later, the Generalized template restricted the size by AFFIX ≤ σ or STEM=PRWD, mapping prosodic categories to morphological categories (McCarthy and Prince 1994, 1995). Recently, it has been proposed and exemplified that templatic constraints can be decomposed into interactions of a set of Alignment constraints (Gafos 1998, Hendrick 2001, Chrowhurst 2004). Based on partial reduplication data in Amis and Thao, I argue that templatic constraints still cannot be eliminated.

To see how Alignment interactions substitute the function of a templatic constraint, partial reduplication in Semai (Hendrick 2001) and Mangarayi (Crowhurst 2004) is illustrated below. But we will show that in Amis and Thao the accurate reduplicated form is neither maximal nor minimal and cannot win out if solely depending on Alignment interactions.

Semai expressive reduplication (Diffloth 1976, Hendrick 2001) copies the initial and the final consonant as the reduplicant, as shown in (12).

(12) Semai expressive reduplication

taʔəh	<u>th</u>-taʔəh	'appearance of large stomach constantly bulging out'
slayɛːw	<u>sw</u>-slayɛːw	'long hair in order'
kmrʔɛːc	<u>kc</u>-kmrʔɛːc	'short, fat arms'

The reduplicant copies one segment from each edge. The invariant shape of the reduplicant is difficult to account for by stipulating a template which is in the shape of a syllable without a nucleus. Ranking R-ANCHOR$_{IR}$ and L-ANCHOR$_{IR}$ undominated, Hendrick (2001) proposes the crucial ranking ALIGN-RED-L >> ALIGN-ROOT-L >> MAX$_{IR}$. Since Red and Root compete to align the left edge and ALIGN-RED-L is dominant, the reduplicant would sacrifice segment correspondence to incur fewer violations of ALIGN-ROOT-L. Thus the size of the reduplicant is compressed to a minimal CC constituent. The use of Alignment interactions is straightforward in Semai, as it is in Mangarayi. Crowhurst (2004) posits sets of Alignment constraints to deal with Mangarayi reduplication. For LEFTMOST-Rt$_{SEG}$ >> LEFTMOST-Red$_{SEG}$, the root would strive to align segments at the left edge; for LEFTMOST-Red$_{\mu}$ >> LEFTMOST-Rt$_{\mu}$, the mora alignment of the reduplicant is satisfied if there is no root mora preceding the reduplicant. Therefore, interactions of the ranking squeeze the reduplicant size in order to satisfy both LEFTMOST-Rt$_{SEG}$ and LEFTMOST-Red$_{\mu}$. The minimal partial reduplication can insightfully be accounted for by Alignment interactions.

Partial reduplication in Amis and Thao has several properties that distinguish it from the minimal partial reduplication of Semai and Mangarayi. First, the reduplicant in Amis and Thao is neither minimal (smaller than a syllable) nor maximal (whole root or prosodic word). Second, the reduplicant sometimes misaligns both edges with certain prosodic units. For example, Amis has a bimoraic reduplicant. If we adopt the ranking for Mangarayi, the reduplicant would copy as minimally as possible when both top-ranking Alignment constraints are satisfied, as in (13). Thus the ranking selects the accurate choice (d) in words containing clusters but fails to choose the correct one (a) in open-syllable words. A win-win situation cannot be gotten even if RMOST-Rt$_{\mu}$ and MAXBR are reranked.

(13) Alignment interactions in Amis

/pa͡tsiʔəŋ + Red/	RMOST-Red$_{\mu}$	RMOST-Rt$_{SEG}$	RMOST-Rt$_{\mu}$	MAXBR
a. pa.t͡si.ʔə.-t͡si.ʔə-ŋ			**	pa
b. ☹ pa.t͡si.ʔə-ʔə-ŋ				pa͡tsi
/tamɬaw + Red/				
c. tam.ɬa.-tam.ɬa-w			***	
d.☞tam.ɬa-m.ɬa-w			**	ta

Another possible solution can be turned to: an Alignment constraint mapping an augment to a certain phonological category. An augment is defined as 'the size increment by which the reduplicated form is extended compared to the corresponding unreduplicated form' (Crowhurst 2004:131). The augment-Red alignment constraint, such as 'RED-$\sigma_{\mu\mu}$-LEFT$_{SEG}$' (Align(Red, L, $\sigma_{\mu\mu}$, L)), has

been used in dealing with partial reduplication in Hopi (Hendrick 1999), Mokilese and Kamaiurá (Crowhurst 2004). The benefit of such a constraint is to demand an edge correspondence between the reduplicant and some phonological category without counting the size of the reduplicant. For example, Kamaiurá reduplication (Everett and Seki 1985, McCarthy and Prince 1986) in (14) mirrors two syllables from the right without the final consonant, just as in the case of Paiwan and Pazih. The ranking RED-PRWD-L_μ, RMOST-RED_μ >> RMOST-RT_μ >> MAXBR cleverly predicts the disyllabic forms.

(14) Kamaiurá partial reduplication

a.	o.hu.ka	o.hu.ka.-hu.ka	'he laughed'
b.	a.pot	a.po.-a.po-t	'I jump'
c.	o.mo.tu.muŋ	o.mo.tu.mu.-tu.mu-ŋ	'he shook it'

Analogously, we could posit a constraint that demands the reduplicant must align with the left edge of a bimoraic foot. The first problem with this is foot-parsing. Amis has only primary stress, which falls on the last syllable. How could a reduplicant align with a foot in a suffixed form like *lu.p.a-lu.(pa.-s=án)*? If we restrict Red-Ft alignment to within the root, open-syllable words would be fine: *pa.t͡si.ʔə.-(t͡si.ʔə́-ŋ)*. Words with medial clusters, however, would be more problematic. Should we postulate a foot spanning over syllable boundaries, like *tam.ɬa-(m.ɬa)-w*? It is not solved yet and needs further investigation. Hence I conservatively argue that a templatic constraint cannot be eliminated at present.

4. Conclusion and implications

This paper examined the functions of Alignment constraints in reduplication, especially in accounting for the position and the size of reduplicants. Examples from several Formosan languages argue for the use of mora alignment constraints, which evaluate violations on the mora tier. Patterns on both edges exist, certifying such a constraint. As for shape invariance, the case of Amis and Thao may not appeal to Alignment interactions only. They are unable to compress partial reduplication which is not a minimal copy. Therefore, I argue for the need of a templatic constraint at the present stage, but how to reduce such stipulation into interactions of primitive constraints requires further research.

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Graduate Institute of Linguistics
National Tsing Hua University
101 Kuang Fu 2nd Road
Hsingchu, Taiwan 300

d928704@oz.nthu.edu.tw

PARASESSION:
CONCEPTUAL STRUCTURE AND COGNITION IN GRAMMATICAL THEORY

Constructional Fast Mapping

DEVIN CASENHISER and ADELE E. GOLDBERG
Princeton University

0. Introduction

In learning a language, children must generalize over the utterances they hear so that they can creatively produce and understand utterances they have never heard before(Chomsky, 1957). Statistical properties of language have been demonstrated to be key in enabling the necessary formal generalizations (Childers and Tomasello, 2002; Gomez, 2002; Saffran, 2001; Saffran et al., 1996). However, no one has investigated experimentally how children come to learn mappings between novel phrasal forms and novel meanings: exactly the task that presents itself to learners in natural settings. The results reported here demonstrate that with surprisingly minimal input, children are able to generalize beyond their experience; moreover, the high token frequency of a single exemplar, which has been found to exist in naturalistic input to children, is demonstrated to have a facilitory effect. While the fast mapping might be taken as an indication of innate, language-specific knowledge, we argue on the contrary, that parallel results reported in a non-linguistic categorization task indicate that an appeal to an innate language faculty is not required in this particular domain.

Children learning language must come to know correlations between phrasal patterns and meanings, so that when they hear novel verbs in utterances such as She text-messaged him the directions, they are able to discern in a general way what that new utterance means: in this case something like "She GAVE him the directions using text messaging" (Goldberg, 1995; Landau and Gleitman, 1985). This is something on which all linguistic and psycholinguistic theories agree; there exist correlations between phrasal forms and meanings. The results reported here demonstrate that with quite minimal input, children can learn these correlations and can generalize on the basis of them. Moreover, we demonstrate that the learning is also critically facilitated by a high number of instances of a single verb type. This sort of statistical "skewing" of the input, where a restricted subset of types of utterances accounts for the preponderance of total utterances, is exactly what is found in naturalistic speech to children for a number of types of language patterns (Cameron-Faulkner et al., to appear; Diessel, 2002; Thompson

and Hopper, 2001). Thus the learning mechanism demonstrated here may have a fairly general utility, allowing learners to get an initial fix on many types of form-meaning mappings in language; this potentially offers a way that learners can crack into the system of learning to use language in an infinitely creative way.

Previous work has focused almost entirely on the question of whether mappings between phrasal patterns and meanings have been acquired at a certain age rather than on particular statistical factors that facilitate or inhibit the learning of the mappings. J. Childers and M. Tomasello (2001) is the only training study that has found a facilitating factor, namely the use of pronouns instead of full NP arguments in the acquisition of the English transitive construction; K. Abbott-Smith, E. Lieven, M. Tomasello, Developmental Science (in press) attempted to look for other factors but found null results. (Fisher, 1996; Naigles, 1990; Tomasello, 2000). To some extent the lack of experimental work is due to the fact that many researchers believe that these kinds of mappings must be innate, therefore essentially eliminating the need to learn them from the input; they have been thought to be hard-wired into a biological language mechanism called universal grammar (Nowak et al., 2002). If, however, the statistical nature of the input can be demonstrated to be critical to the domain of meaning as well as form, then it would reduce the necessity of invoking innate universal grammar to account for the mappings. This would be advantageous insofar as accounts that rely on a universal grammar fail to predict the item-based, or bottom-up way that children learn language (Tomasello, 2000, 2003). Moreover, recognizing that form-meaning mappings can be learned from the input allows for substantial variation in the mappings across languages, variation that in fact has been argued to exist (Bowerman and Brown, to appear; Bowerman, 1990). At the same time, it would raise the further question of whether the learning mechanism involved is specific to language, or whether the learning strategy is instead general to cognition.

An analysis of naturalistic data reveals that a single verb typically accounts for the lion's share of tokens of each of several simple patterns in the input speech of mothers to young children (Goldberg 1998; Goldberg et al., to appear; Ninio, 1999). For example *put* fills the verb slot in roughly 40% of the instances of the phrasal pattern, <Subject - Verb - Object – Locative Phrase>; *give* fills the verb slot in roughly 20% of the phrasal pattern <Subject – Verb – Object1 – Object2>; and *go* fills the verb slot in roughly 40% of the phrasal pattern <Subject - Verb – Locative Phrase>. These frequencies are strongly skewed in that the constructions have been found to occur with 43, 13 and 39 different verb types in the same corpus sample, respectively. Moreover, the meaning associated with highly frequent verbs like *put*, *give* and *go* has been independently claimed to be the semantic prototype of the meaning of the phrasal pattern in which these verbs occur so frequently (Goldberg, 1995; Pinker, 1989). For example, the verb *put* and the phrasal pattern with which it is associated convey a 'caused motion' meaning; *put* means 'to cause something to move to a location'. Likewise, *put*'s phrasal pattern, <Subject - Verb - Object - Locative Phrase>, also conveys a

caused motion meaning. That the phrasal pattern does in fact suggest such a meaning becomes apparent by considering a sentence such as *Pat mooped the feather onto the table*. Although it is not certain exactly what *mooped* means, it seems clear from the sentence that the feather in question has somehow found its way to the table with the help of Pat.

Since the input is typically structured such that a small subset of types account for the preponderance of utterances, we hypothesized that the existence of a high frequency exemplar facilitates association of a meaning with a phrasal pattern. To test this, we created a novel, non-English phrasal pattern and paired sentences instantiating this pattern with a film of various scenes in which a puppet or toy object appeared on the scene in some way. The intended meaning of the phrasal pattern was accordingly one of appearance. We then divided subjects into three groups: 1) the high frequency group watched the film and heard a corresponding set of sentences in which one novel verb occurred in half of the sentences, 2) the balanced group watched the same film and heard a set of sentences in which each of the novel verbs occurred with roughly equal frequency, and 3) the control group watched the same film with the sound turned off. Subjects were tested with a forced-choice comprehension task to determine if they were able to extend the meaning of the new phrasal pattern to which they were exposed during the experiment to correctly choose new scenes of appearance paired with new novel verbs over foil scenes we created that were not scenes of appearance but were similar to the scenes of appearance in every other way.

1. Methods

1.1. Subjects

1.1.1. Experiment One

51 native English speaking children aged 5-7 (mean = 6;4) were recruited from two elementary schools in Champaign-Urbana.

1.1.2. Procedure

A single training film was prepared that contained eight clips of puppets performing various actions. The same film was presented twice to each subject (a total of 16 video clips). In the non-control conditions, we paired each clip in the film with audio descriptions of the scene and arranged the words in the description according to a novel phrasal pattern that we created. The novel pattern involved two known nouns along with a nonsense verb and were arranged in the form <noun phrase$_1$ - noun phrase$_2$ - nonsense verb + *o* >. For example, given a video clip in which a spot appeared on the king's nose, the corresponding sentence was 'The spot the king moopo-ed'. At the beginning of each scene, subjects heard a present tense version of the sentence, and heard a corresponding past tense version of the sentence at the end of the scene.

The meaning of the phrasal pattern was that of appearance, (a meaning novel for English phrasal patterns): the entity named by the first noun phrase comes to exist in the place named by the second noun phrase, according to the action

encoded by the verb. For example, the intended meaning for the sentence *the sailor the pond neebod* was 'the sailor sailed onto the pond from out of sight' as opposed to, for example, 'the sailor sailed (around) the pond'.

Subjects were randomly assigned to one of three conditions that varied the frequencies of input exemplar nonsense verbs; the number of different nonsense verbs (5) and the overall number of examples (16) were held constant. Training in the balanced condition consisted in hearing expressions with five nonsense verbs paired with video clips, each occurring 1 or 2 times (1-1-2-2-2); the high frequency condition also heard 5 nonsense verbs used in the novel phrasal pattern, but one nonsense verb was heard with high frequency (1-1-1-1-4). Subjects in the control condition saw the identical film of 8 clips shown twice (for a total of 16 clips) but heard no language. The training film was played twice for each of the three groups. The total length of the training session was less than three minutes.

The test was a forced choice comprehension task: subjects saw two *new* film clips presented side-by-side on the screen and heard a sentence describing one of the clips (sample film clips are available at http://www.linguistics.uiuc.edu/casenhis/fastmap/). Sentences included 7 test trials with the novel phrasal pattern and *new* novel verbs; interspersed were 5 filler trials with other new novel verbs in the familiar transitive pattern. Each test film clip pair showed the same entity involved in a similar action, but only in one did the entity appear on the scene within the clip (e.g., in one case, a sailor sails in on a boat from off the screen; in the paired foil clip the sailor sails around in a boat on screen). Subjects were then asked to point to the film clip that corresponded to the description that they heard. Responses were coded for accuracy. Any difference among groups can only be attributed to a difference in the linguistic input that subjects were exposed to, as all three conditions watched exactly the same video.

1.1.3. Results

The results of the experiment show that after only three minutes of training, children in the balanced and high frequency groups learned to associate a novel meaning with a novel phrasal pattern. Moreover, the high frequency group performed significantly better than the balanced group, thus confirming our hypothesis that learning is particularly facilitated when one verbal token accounts for the majority of utterances as seen in figure 1.

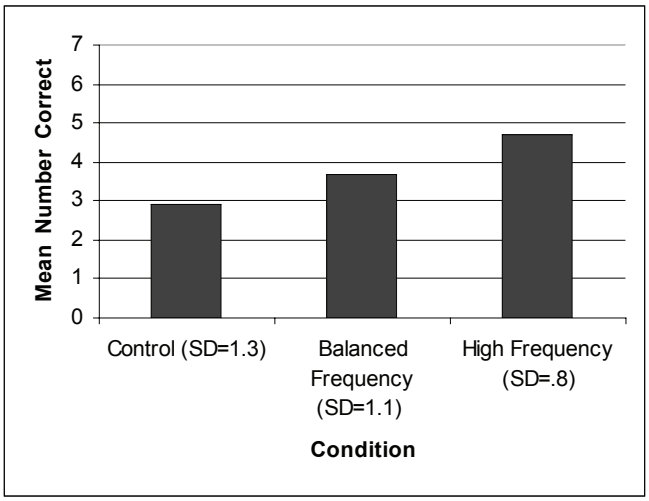

Figure 1 Mean number of times subjects were able to correctly match the scene of appearance to the novel phrasal pattern.

An ANOVA confirmed a significant main effect for group, $F_{2, 48} = 11.57$, $P < .001$. Planned comparisons analysed with Fisher's PLSD show that both the high frequency and the balanced groups performed significantly better than the control group ($P < .001$ and $P < .05$ respectively). Moreover, the high frequency group performed significantly better than the balanced group ($P < .01$).

Similar results have been found for adults (Goldberg, Casenhiser, and Sethuraman 2004); in the adult experiment, each nonsense verb was matched with a specific type of action, so that the two training conditions saw slightly different films. In addition, the control condition in the previous experiment did not watch the film but went straight to test.

It is possible that the quick learning of the mapping could be taken as an indication that the particular mapping is a part of universal grammar and is innately available. A mapping between subject and thing coming to exist, on the one hand, and displaced noun phrase and location on the other, could be added to the set of mapping principles sometimes claimed to be universal. However, we know of no language that has a general mapping that encodes "appearance" in this way. Thus, given its cross-linguistic rarity, there is no independent reason to believe that the particular generalization learned in the study reported here is innately available.

Moreover, there is reason to suspect that the learning *mechanism* is not specific to language, but is general to cognition insofar as work in the non-linguistic category literature has found a parallel facilitory factor to that reported here. That is, there is an advantage to training on low-variance input, and on prototypical instances before more varied input in the learning of non-linguistic categories (Elio and Anderson, 1984; Homa et al., 1991; Nosofsky, 1988; Rosch and Mervis, 1975). For example, there is a strong correlation between the frequency with which a token occurs and the likelihood that it will be considered a

prototype by the learner (Nosofsky, 1988; Posner and Keele, 1968; Rosch and Mervis, 1975). Homa, Dunbar and Nohre (1997) found that token frequency was an important variable at early and intermediate stages of category learning, with increased token frequency facilitating category learning. In learning generalizations about dot patterns, Posner, Goldsmith and Welton (1967) demonstrated that the rate at which subjects classified patterns correctly was a direct function of the amount of distortion from their respective prototypes: the less variability or distortion, the faster the category was learned.

Elio and Anderson's (1984) non-linguistic category learning experiment set up two conditions: in the "centered" condition, subjects were initially trained on more frequently represented, more prototypical instances, with the study sample growing gradually to include the full range of members in the category; in the "representative" condition, subjects were trained on a fully representative sampling from the start. Categories were learned more accurately in the centered condition, yielding better typicality ratings and accuracy during the test phase on new instances.

We performed a second experiment with a parallel design to test the relationship to non-linguistic categorization. We created a random dot pattern (with 10 dots) to be used as a prototype as well as 4 systematic variations from the prototype pattern. Subjects in the high frequency group saw twice as many instances of the prototype dot pattern as any of the other dot patterns. Subjects in the balanced group were not given this preferential training with the prototype; instead, they saw a more balanced distribution of the prototype pattern in comparison to the other dot patterns. Subjects were again tested with a forced choice to determine if they were able to distinguish a *new* variation of the prototype from a dot pattern generated randomly. New variations used at test differed from the prototype to the same degree as the variations used in training.

1.2. Experiment Two

1.2.1. Subjects

28 University of Illinois undergraduate students.

1.2.2. Procedure

A prototype dot pattern consisting of 10 uniformly-sized white stars scattered across a 30 by 40 grid was prepared. From this prototype, a set of 10 close variations of the prototype were created by moving 4 of the stars 1-3 grid squares in a random direction. The number of squares each star moved was also chosen randomly. 6 foil patterns were created by moving 4 of the stars 3-6 grid squares in a random direction. Again the number of squares and the stars that were moved were chosen randomly. The training set included the prototype slide plus four of the close variation star patterns chosen randomly (for the sake of clarity, these will be refered to as variations 1-4). The test set included each of the 6 remaining close variation star patterns (variations 5-10) placed beside of the 6 foil star patterns.

Slides were ordered randomly and each was created with a different background color. Subjects viewed each slide on a computer screen for 3 seconds. To prevent the illusion of movement when one star pattern was presented immediately after another, each star pattern slide was separated from the following one by a black slide with a regular grid of moons.

Subjects were randomly assigned to one of two groups. The high frequency group saw a set of slides in which half (8) of the slides were the prototype slide. The remaining 8 slides were prototype variations 1-4 and were viewed twice each. The balanced group saw the prototype slide plus variations 1 and 2 shown four times each. Variations 3 and 4 were shown twice each. Both groups watched the slide show containing a total of 16 star pattern slides twice. The first star pattern in each group was the prototype, and the second star pattern in each group was one of the close variations (1-4). All other slides were randomly ordered. Each group's training lasted 2 minutes and 7 seconds.

The test was a forced choice task in which subjects were shown a slide containing two star patterns placed side-by-side. One of the star patterns was from variations 6-10 and the other was one of the foil star patterns. Subjects were asked to choose the pattern that was the same as the star pattern from the training portion of the experiment.

1.2.3. Results

The results demonstrate that subjects in the high frequency group were more accurate at test than those in the balanced frequency group, thus confirming the suggestion that learning of categories generally is facilitated when a prototype is encountered with high frequency as opposed to experience with the same variety of instances including the prototype, when the prototype does not account for the balance of items as seen in figure 2:

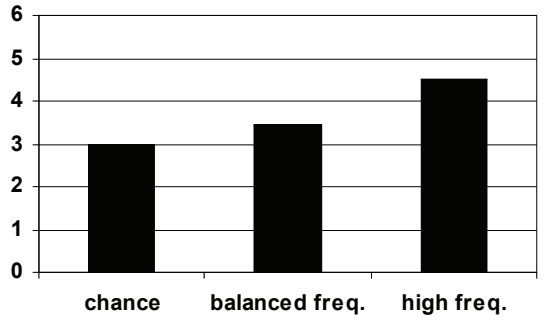

Figure 2: Mean number of times subjects were able to correctly match the new variation of the random dot pattern.

An ANOVA confirmed a significant main effect for group, such that the high frequency training condition performed significantly better than the balanced frequency training condition $F(1,27)=6.78$, $p < .02$. Chi-square test with 6 degrees

of freedom was performed to compare subjects' performance to chance. Subjects in the balanced group did not perform significantly above chance $p = .13$. Subjects in the high frequency group did perform significantly above chance $p < .01$.

2. Conclusion

In the case of language, we have found that pairings of novel phrasal patterns and novel meanings are generalized with remarkable speed. When they are instantiated predominantly by a single verb, they are generalized even more effectively. We have also reported evidence that the latter effect is paralleled in a non-linguistic categorization task, providing a strong indication that the learning mechanism is not specific to language. Since natural linguistic input tends to be skewed in this way, it seems that the associations of form and meaning that exist in languages do not need to be hard wired or universal—children are quite expert at learning the mappings, given general categorization strategies.

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Devin Casenhiser

Adele Goldberg
Psychology Department
Green Hall
Princeton, NJ 08544

adele@princeton.edu

Constructional Compositionality and Blending: The Case of Polish SLVF Constructions

BARBARA DANCYGIER
The University of British Columbia

0. Introduction

Building upon the frameworks introduced by Goldberg (1995), Fillmore, Kay, and O'Connor (1988), Fillmore and Kay (1999), and Fauconnier (1985 [1994], 1997), recent work in Construction Grammar and Mental Spaces (cf. Sweetser 1999, Dancygier and Sweetser 2005) suggests a new treatment of the emergence of constructional meanings. It is argued that some of the aspects of form found in grammatical constructions make meaning contributions of their own and can therefore reappear in different constructions, thereby prompting the emergence of specific aspects of meaning. For example, as was shown by Dancygier and Sweetser (2005), the tense configuration characteristic of predictive conditionals such as *If you follow the instructions, your application will be processed sooner* (Present Tense in P, predictive *will* in Q) prompts a predictive interpretation in a similar construction with *and*, as in *You follow the instructions and your application will be processed sooner*, as well as in a conjunctionless construction such as *You follow the instructions, your application will be processed sooner*. On the basis of such, and many other, similar constructions, Dancygier and Sweetser argue for the concept of *constructional compositionality*, understood in terms of form-meaning correlations which can recur in different constructions and contribute systematically to constructional meaning. At the same time, compositionality alone cannot exhaustively explain constructional meanings in all cases and it is often crucial to distinguish compositional aspects of meaning from those which arise conventionally.

This paper will look at a cluster of related constructions in Polish to further examine the applicability of the concept of constructional compositionality. The constructions to be analyzed use a number of specific formal features in different configurations. In all cases the forms used contribute consistently to how the constructions as wholes are interpreted. At the same time, many of the constructions involved also express conventional meanings, not attributable to any specific form-meaning mapping.

1. SLVF Constructions

Polish is an inflectional language in which verb forms commonly appear without their pronominal subjects. In standard cases, this happens when the referent of the omitted subject pronoun can be identified on the basis of the discourse context alone. However, omission of the subject seems required in the cases where *general-state* meaning is involved, and then the verb appears in *subjectless third person singular verb form* (henceforth abbreviated as SLVF). The most common examples of such general-state constructions are those describing weather phenomena, as well as emotional and physical states as experienced by un-specified, not profiled participants. Examples (1) and (2) show common instances of such SLVF constructions:

(1) Jest nudno. / gorąco. / smutno.
be-**3SG**-PRES boring-ADV / hot-ADV / sad-ADV
'The atmosphere is boring / sad. It is hot.'

(2) Ale wieje!
how blow-**3SG**-PRES
'What a wind!'

In (1), the general experience of a physical or emotional state is described, but no specific participant is profiled as the experiencer. Such sentences are typically understood as affecting the speaker, but other participants may be implicitly included. The SLVF usage represented in (1) and (2) is best seen as an example of a construction, since the seemingly deleted subject (presumably equivalent to *it*) cannot be introduced into the sentences. That is, a sentence such as **To jest nudno* is not acceptable.[1]

Sentences (1) and (2) are SLVF constructions of non-transitive verbs. Transitive verbs can be used in this way as well, and then it is possible to profile the affected participant as the object, standardly appearing in the accusative case. The source of the experience remains unprofiled, but the sentences are no longer interpretable as general-state constructions. Example (3) illustrates such instances:

(3) Mdli **mnie**. / Trzęsie **mnie**.
nauseate-**3SG**-PRES 1SG-**ACC**. / shiver- **3SG**-PRES 1SG-**ACC**.
'I feel nauseous. / I'm shivering'

Sentences in (3) appear to represent an independent construction, because of the standard profiling of the affected experiencer. As I will argue, only the SLVF form shown in (1) and (2) can further be used in other constructions, which build on the general-state meaning and combine it with other aspects of interpretation.

[1] It is acceptable to say *To jest nudne* 'It/This is boring-ADJ', but not in the general-state meaning.

2. Dative of "Experiential Sphere"

Many studies of Slavic case discuss the non-prototypical use of the dative (Wierzbicka 1988, Janda 1993, Rudzka-Ostyn 1992). Dąbrowska's monograph on the Polish dative (1997) describes the use appearing in SLVF constructions as representing a participant's *experiential sphere.* Common examples are sentences like *Tylko mi nie choruj!* (just 1SG-DAT not get-sick) 'Just don't get sick on me!', where the dative form represents the participant typically not profiled by the verb, whose experiential sphere will nevertheless be indirectly affected by the sickness.

The dative of experiential sphere can also be used in general-state SLVF constructions. As a result, the experience is now localized, or represented from one participant's viewpoint, but the participant mentioned is not fully profiled and the general-state meaning is not lost. Such constructions typically take one of two forms: either the adverb describing the state is fronted and the verb is omitted (as in (4)), or the dative is added after the verb (as in (5) and (6)):

(4) Nudno **mi**.
boring-ADV 1SG-**DAT**
'I feel bored.'

(5) Jest **mi** nudno.
be-**3SG**-PRES 1SG-**DAT** boring-ADV
'It is boring to me.' ('I'm bored; it's my judgement that it is boring.')

(6) Jest **mi** gorąco / smutno.
be-**3SG**-PRES 1SG-**DAT** hot-ADV / sad-ADV
'I'm hot / sad.'

Interestingly enough, the dative can also be added to an SLVF construction describing weather phenomena, if the sentence also contains the information on the specific manner in which the participant's experiential sphere is affected. An example of such a use is given in (7):

(7) Wieje **mi** w oczy.
blow-**3SG**-PRES 1SG-**DAT** in eyes-ACC
'The wind is blowing in my eyes.'

The combination of general-state SLVF and dative shows how each of the forms involved contributes the meaning it represents to the overall interpretation of the construction. The resulting construction, though, is not interpreted merely as a combination of meanings brought by the specific forms. As the discussion below will show, the conventional aspects of a construction's interpretation arise irrespective of the number of independently motivated grammatical forms added.

3. The Marker *się*

In the literature on Polish grammar, the discussion of the marker *się* is one of the most prominent topics. Some analysts treat it as a reflexive marker, some as a clitic, while others see it as a core of middle constructions.[2] To complicate matters further, *się* has a number of different uses, some of which escape the distinction between reflexives and middles altogether. However, only two types of *się* are in fact relevant to the discussion of SLVF constructions undertaken here. Both types are used in constructions which detransitivize standard transitive scenarios.

3.1. The "Experiencer" Scenario

The first transitive scenario to be considered profiles the source of experience as the subject, and the experiencer as the object, as in (8):

(8) Ten film **mnie** nudzi.
this film 1SG-**ACC** bore-3SG-PRES
'This film bores me.'

Sentence (8) does not seem unusual in any way. The experiencer-object is marked as accusative and the passive is possible. However, the verb *nudzić* 'to bore' can also be used with *się*, and then the only profiled participant is the experiencer, appearing as the subject.

(9) (Ja) Nudzę **się**.
(I) bore-1SG-PRES **self**
'I bore self.' ('I'm bored; I feel boredom.' [Not the same as *I bore myself*])

In (9), *się* is not a reflexive marker proper. As I argued in earlier work (Dancygier 1997), only the so-called "heavy" reflexive markers can be interpreted in this way. Their characteristic feature is standard case marking (which *się* does not allow), while in terms of interpretation they are best seen, along with reflexives in other languages, as instances of the "split-self" metaphor, as it was described by Lakoff (1996). *Się*, contrary to the heavy reflexives, does not separate two aspects of a person to give each of them its own participant role in a sentence. On the contrary, as noted by Schenker (1993), it blurs the differences between participant roles. Consequently, *się*, as used in (9), prevents the profiling of the source of boredom, but at the same time presents the experiencer as somehow responsible for allowing boredom to continue.

The processes responsible for the construction in (9) can be viewed as representative of two different aspects of conceptual integration, or blending, as described by Fauconnier and Turner (1998a, 1998b, 2002). Within the blending framework, we can talk about two or more mental spaces (*input spaces*) being blended into one. The blended space inherits aspects of structure from the input

[2] For a discussion of middles and reflexives see Kemmer (1993) and Pederson (1991). A general discussion on *się* can be found in Kubiński (1982), Kański (1986), Schenker (1985, 1993), and Słoń (1998).

spaces, mostly by compression of different relations, but it also creates new structure of its own (*emergent structure*) which makes the blend usable as a whole. For example, a person pointing at his/her old photograph may say *This is me*, thus blending the representation and the person, and compressing the temporal, spatial, and representational dimensions separating the photo and the speaker. The emergent structure allows one to maintain a coherent picture of one's identity, in spite of the obvious changes occurring through time and space. But the speaker may continue by saying *I was a different person then*, thus *decompressing* the aspects of his/her identity which now can be viewed as separate.

The scenario represented by the verb 'to bore' in Polish is typically understood as a whole. It can, however, be decompressed in such a way that only one of the participants is profiled. At the same time, the profiled participant is not presented in a standard way (as an accusative), because some degree of the responsibility for being bored is blended with the core meaning of being an experiencer. Positioning the experiencer in the subject slot (normally reserved for the source of experience in such a scenario) used in combination with the marker *się* (which blends different aspects of the roles involved) yields a new construction which is interpreted against the meanings contributed not only by the changes in forms, but also by the standard understanding of the scenario.

One could take this kind of analysis still further and say that the concept of "experiential sphere" or "viewpoint" described above would not be possible without our understanding of the scenario represented in (8), and that the dative form marking it (evidently separate from the accusative marking of a prototypical experiencer) is also a result of separating (decompressing) an aspect of the scenario. Such a concept of "experiential viewpoint," originally extracted from the standard "experiencing" scenario, can then be used in other constructions (SLVF, among others) to compositionally contribute to their interpretation.

3.1.1. SLVF + *się* + Dative

When we think of the possible combinations of forms mentioned so far (SLVF, dative, and *się*), it seems clear that the dative of "experiential sphere" cannot combine with *się* as used in (9), because the subject of the construction in (9) profiles the experiencer much more saliently than the dative, and in a sense includes the meaning that the dative could contribute. However, it is possible to rephrase the "boredom" scenario with the use of SLVF, dative, and *się*, all combined together.

(10)	Nudzi	**mi**	**się**.
	bore-**3SG**-PRES	1SG-**DAT**	**self**
	'(It) bores self to me' ('I'm bored')		

In (10), the experiencer is profiled less saliently than in (9), but more saliently than in (5). The lack of subject and the verb form (SLVF) introduce the general-state meaning, which is then localized in a participant's experiential sphere. That participant is also presented as partially responsible (via *się*) for the state of boredom affecting him/her.

Interestingly enough, this type of construction is also available in the cases of scenarios where no participant is suppressed, but the sense of responsibility is reduced. For example, a sentence such as (11), which profiles an experiencer as the subject, but can also be understood as a refusal, can be rephrased as (12) to soften the impact:

(11) (Ja) Nie chcę spać.
(I) not want-**1SG**-PRES sleep
'I don't want to sleep.'

(12) Nie chce **mi** **się** spać.
not want-**3SG**-PRES 1SG-**DAT** **self** sleep
'(It) doesn't want self to me to sleep.' ('I don't feel like sleeping')

As in the examples above, the forms conspire to reduce experience-hood and responsibility.

The data presented so far suggest consistent contribution of the mechanisms of constructional compositionality and blending. The SLVF form and its meaning of "general state" is imported "wholesale" into other constructions. The transitive "experiencer" scenario, on the other hand, can be decompressed to create two related concepts: the experiential sphere and a blended participant, as marked by *się* in (9). These three form-meaning packages can then be recombined in two ways: SLVF + Dative, as in (5)-(7), and SLVF + *się* + dative, as in (10) and (12).

3.2. The "Control" Scenario

The second type of a transitive scenario which can be detransitivized with a *się* construction is exemplified in (13):

(13) Janek wylał herbatę.
John-NOM spill-3SG-PAST tea-ACC
'John spilled the tea.'

The sentence resembles a standard transitive agent-patient scenario, but it is natural not to attribute volitionality to the subject's behavior (although (13) could mean that John spilled the tea intentionally for, let's say, ritual purposes). Rather, the subject participant is expected to control the object-patient, but temporarily loses his ability to control it. It is in this sense that (13) can be detransitivized with *się*:

(14) Herbata **się** wylała.
tea-NOM **self** spill-1SG-PAST
'The tea (got) spilled.'

In (14), the participant in control is not profiled, while the affected participant is now profiled as subject, with *się* again blurring the contrast between controller and controlled. Not surprisingly, a dative can now be added to (14), to highlight the experiential viewpoint of the participant who will have to deal with the mess.

(15) Herbata **mu** **się** wylała.
tea-NOM 3SG-**DAT** **self** spill-3SG-PAST
'The tea (got) spilled / He spilled the tea.'

The meaning of (15) changes the original scenario in (13) in many ways. The affected object (tea) has been granted some degree of responsibility, while the subject in control, though demoted, participates in the scenario only as the locus of the experiential viewpoint. These changes result not only from the different configuration of syntactic functions, but also from the specific meaning contributions of formal features such as *się* and the dative.

3.3. Compositional and Conventional Meanings of Constructions

As I argued above, the "control" scenario can be reorganized with the use of *się* and the experiential dative in ways which rely to a significant degree on the compositional contribution of the two forms. It should also be emphasized that the forms (*się* and dative) are not only contributing different meanings, but also relying on their original "source" scenarios in doing so. The use of *się* in (14) and (15) signals a redefinition of the "control" scenario in a way which demotes the participant in control and promotes a blended controlled/controller participant. The use of the dative in (15), on the other hand, adds the experiential viewpoint extracted from a standard "experiencer" scenario to the now redefined "control" scenario. The resulting construction (in (15)) is thus a blend of elements decompressed from two different standard constructions. Interestingly enough, this "hybrid" construction can still be interpreted primarily as compositional, although the components both arise via decompression from other constructions.

However, the forms reviewed so far can participate in constructions which are also used in specific, conventional ways. The interpretation of such constructions relies to some degree on the compositional contribution of individual forms, but to a significant degree on other, conventional factors. For example, one of the most common constructions using SLVF and *się* is known in literature as the "generic" or "impersonal" construction.

(16) Wychodzi **się** przez sekretariat.
go-out-**3SG**-PRES **self** through office-ACC
'(One) goes out through the office.'

It seems, however, that the construction in (16) is not just simply generic or impersonal. In fact, it is probably more appropriately labelled as a "how-to" construction, since it obligatorily contains a description of the proper way to do things (so (16) could not be used to say something general about going out, but has to be understood as prescribing the correct way to do it). The "how-to" meaning does indeed rely on the general-state SLVF and the demoting of the main participant via *się*, but the forms themselves do not guarantee a "how-to" interpretation in each case.

Another case in point are the so-called "type of experience" constructions, as shown in (17) and (18):

(17)	Tę	kurtkę	łatwo	**się**	pierze.
	this-ACC	coat-ACC	easily-ADV	**self**	wash-**3SG**-PRES
	'This coat washes easily.'				

(18)	Lasem	szybko	**mi**	**się**	idzie.
	forest-INSTR	fast-ADV	1SG-**DAT**	**self**	walk-3SG-PRES
	'Hiking through the forest is fast. (I can hike fast through the forest.)'				

The constructions in (17) and (18) both focus on the type of experience, as described by the adverbs *łatwo* 'easily' and *szybko* 'fast'. Both use the SLVF, which highlights the generality of the statement made (this is especially clear in (17), which can easily be construed as a generic statement). Both use *się*, and as a result demote the actual participant going through the experience (the "washer" or the "hiker"). Sentence (18) also uses the dative, thus bringing the experience to the speaker's experiential sphere. However, the obligatory use of adverbs describing the experience and the presence of phrases such as *lasem* 'through the forest' which further specify the nature of the experience are lexical components of the constructions which contribute to their conventional interpretation.

It appears, then, that the form-meaning pairs distinguished in this paper can participate in meaning construals of various kinds. They can compositionally contribute to many constructions in a variety of combinations, but they can also be used in constructions which are interpreted more conventionally, and which rely to an important degree on lexical means, not on form alone.

Furthermore, the form-meaning pairs can also be exploited in almost idiomatic expressions which seem to fill important gaps in the language user's repertoire. In its basic use, the construction with SLVF (as exemplified by (1)) describes a state. The stative interpretation is naturally the result of the verb used—the verb 'to be'. When a change of state is described, the lexical choices are rather limited in Polish. The verb which is typically co-opted into the construction is the verb *robić* 'to make', with *się*, as in (19):

(19)	Robi	**się**	gorąco.
	make-**3SG**-PRES	**self**	hot-ADV
	'It's getting hot.'		

In the constructions in (16)-(18) it was difficult to say whether the *się* used had its source in the experiencer scenario or the control scenario, as the conventional aspects of the constructions made the scenarios called up by the verbs a less salient aspect of the overall interpretation. In (19), for comparison, the verb clearly calls for a participant in control, but the situation to be described is meant to be viewed as caused by factors other than human control. It seems natural, then, that *się* would be used here to downplay the "control" aspect of 'make'. As a result, (19) represents both a new construction and a new lexical usage: Polish now has a verb *robić się*, which describes a change of state in the same way in which *być* 'to be' describes the state.

Given the interpretation of (19), and the behavior of SLVF constructions exemplified in (4)-(6), it is not surprising that the dative can also be used in a sentence like (20):

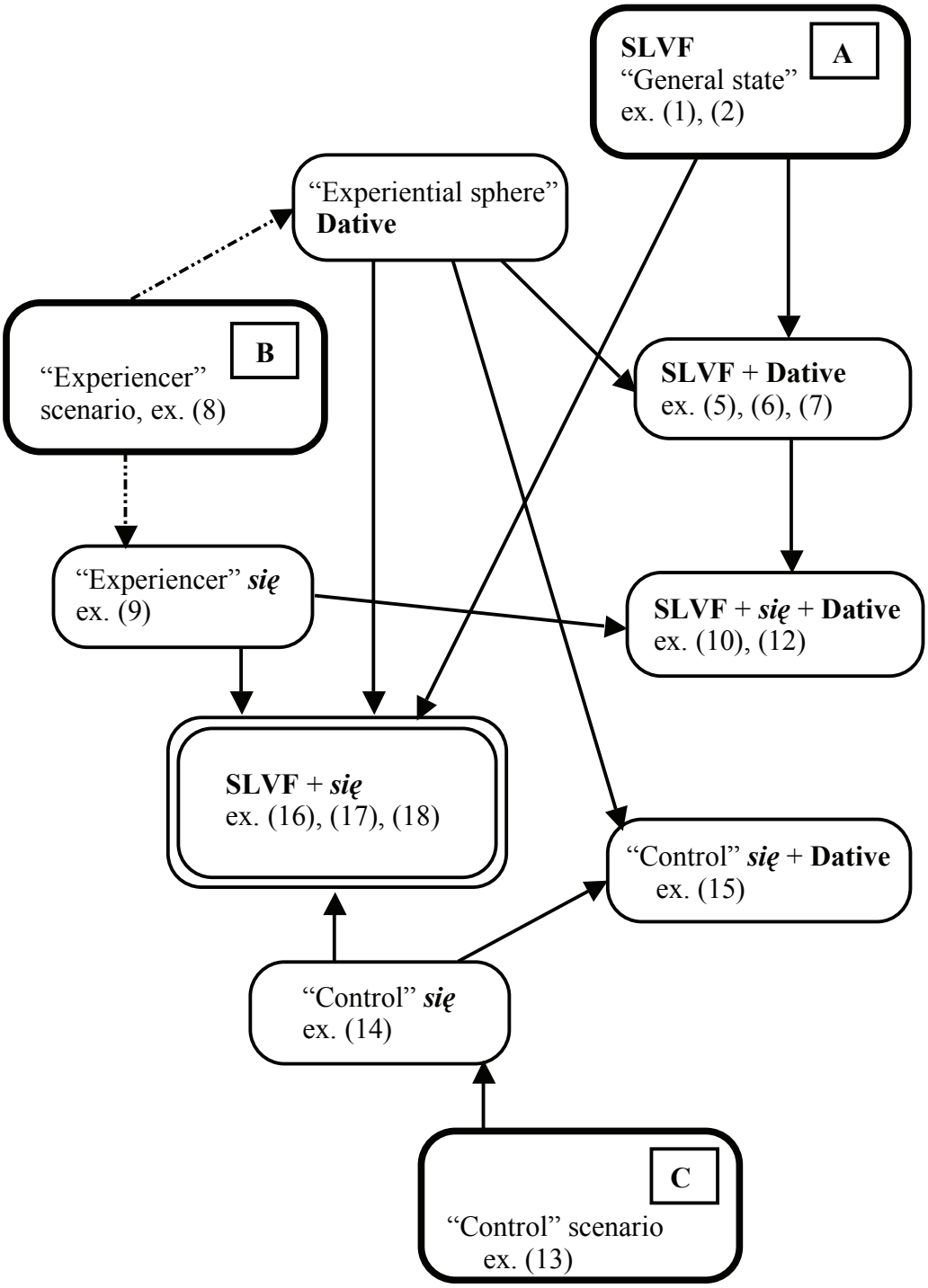
(20)	Robi	**mi**	**się**	gorąco.
	make-**3SG**-PRES	1SG-**DAT**	**self**	hot-ADV
	'I'm getting hot.'			

As in the other cases, the dative consistently calls up a participant's experiential sphere, without portraying the participant as being in control.

3.4. Conclusion

The processes responsible for the emergence of the constructions discussed here can now be summarized as a network of interrelated components, represented in Figure 1. All the forms appearing in what I have labelled SLVF constructions originate in three basic scenarios: the SLVF scenario (box A), which contributes its specific verb form and the "general-state" meaning; the "experiencer" scenario (box B), which is responsible for the emergence (marked by dashed arrows) of the dative of experiential sphere and the *się* which allows the construction not to profile the source of experience; and, finally, the "control" scenario (box C), which can be re-configured (see the dashed arrow) via the use of *się* which allows one not to profile the participant in control. These components can be combined in a number of constructions. In Figure 1 these types of constructions are represented by boxes, filled with the description of the form, and the numbers of relevant examples in the text. The continuous-line arrows show how the forms spread through the network. One box, marked with a double line, has arrows reaching it from all boxes representing a single form and stands for all constructions which cannot be described in compositional terms alone and are at least partly conventional in their meaning.

Figure 1. Network of SLVF Spaces



The network of constructions described above seems to strongly support the idea that constructional compositionality offers an explanation of a number of phenomena related to the emergence of meaning at the constructional level. First of all, it appears that some form-meaning packages (such as the tense pattern in predictives, the SLVF form, or the dative of experiential sphere) may have limited use on their own, but are readily accessible as building blocks which can then reapply in many different constructions and contribute elements of meaning to their overall interpretation. Such partial building blocks of structure and meaning can compositionally combine to give form and function to a construction, but the overall conventional meaning of a construction cannot be determined by those building blocks in any strict sense. On the other hand, those basic form-function packages may themselves be "extracted" (or decompressed) from more general and more standard scenarios, which are partly responsible for the meaning which emerges in the partial, decompressed chunks.

Finally, the mechanisms of constructional compositionality apparently rely on the mechanisms of conceptual integration. I want to argue that one can view a construction such as the one in (10) as a result of blending of mental spaces set up or evoked by the forms involved (SLVF, *się*, dative). While compositionality might be understood by some as a simple additive process, where new forms entering the construction add new meanings to it, what actually happens in constructions is nothing like this. The combination of meanings brought into the construction by individual form-meaning packages gives rise to new, emergent aspects of meaning. That is, the description of boredom in (10) is not simply a combination of 'general-state + no source of experience profiled + experiential sphere'. This combination of meanings is the basis on which the speaker may express her dismay at being bored without taking any responsibility for not counteracting it. Naturally, the emergence of new layers of meaning goes much further in more conventionalized constructions, such as (16), where the "how-to" interpretation builds on the "general-state" meaning without expressing it in any explicit way.

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Department of English
The University of British Columbia
397-1873 East Mall
Vancouver, B.C., V6T 1Z1
Canada

barbara.dancygier@ubc.ca

Iconicity and Viewpoint in Determining Word Order in Japanese Dative Construction

NORIKO IWASAKI and MISUMI SADLER
University of California, Davis and University of Illinois, Urbana-Champaign

0. Introduction

The alternation in word orders in dative clauses has been discussed in various languages from numerous perspectives (e.g. Bresnan and Nikitina 2003; Givón 1984; Thompson 1990, 1995). In English, for example, there are two possible orderings of ditransitive clauses as in (1):

(1) a. *Laura gave Nim a bagel.*
b. *Laura gave a bagel to Nim.* (Thompson 1995: 156)

While some linguists in earlier work consider this alternation, which is often referred to as "dative shift," to be an optional movement, recently a number of scholars have pointed out some semantic, discourse-pragmatic and cognitive factors that influence this alternation, such as: context, animacy, referentiality, topicality, accessibility and weight or heaviness of NPs (e.g. Collins 1995; Givón 1984; Smyth, et al. 1979; Thompson and Koide 1987; Thompson 1990, 1995; Wierzbicka 1986).

Japanese also has three-argument dative clauses which have at least two possible orderings: goal-patient or patient-goal as demonstrated in (2):

(2) a. *Taroo-ga* *Hanako-ni* *nimotu-o* *okut-ta.*
-NOM -DAT package-ACC send-PAST
b. *Taroo-ga* *nimotu-o* *Hanako-ni* *okut-ta.*
- NOM -ACC -DAT send-PAST
'Taro sent Hanako a package.' (Miyagawa and Tsujioka 2004: 5)

Japanese is said to be a free word order language. In dative clauses, goal is generally marked with the particle *ni*, and patient is marked with the particle *o*. It is generally assumed that the goal-patient order as in (2a) is the canonical order, and patient-goal as in (2b) is derived by optional scrambling (e.g. Hoji 1985;

Yatsushiro 2003). However, some argue that these two orderings are base-generated (e.g., Miyagawa 1997). Miyagawa and Tsujioka (2004) further proposed that permutations happens only when goal is locative (as in *Taroo-ga Tokyo-ni nimotu-o okutta* 'Taro sent a package to Tokyo' p. 9), and that it is irrelevant when goal is possessive (e.g. *Taro-ga Hanako-ni nimotu-o okutta* 'Taro sent Hanako a package' p. 9). They claim that these two instances have distinct structures: the goal being a PP in the former, and a DP in the latter.

In the current study, we assume the standard analysis: that these two orderings are permutations of one structure. This is unlike the English dative shift, which *unarguably* involves two distinct structures. Moreover, the previous literature suggests that these two orderings of NPs in Japanese are not motivated by semantic factors. Thus, examining Japanese dative clauses possibly provides us with an opportunity to reveal the relation between word order and cognitive factors without the confounding factor of obvious structural or semantic differences. Hence, we examine both spoken and written corpora and discuss the role of iconicity and viewpoint that potentially affect the orderings of goal and patient.

1. Iconicity and Viewpoint

Some linguists contend that language mirrors the human conceptual system in that there is an isomorphic relation between the serial order of words or clauses expressed in language and the order in which entities in the event are perceived in the real world (e.g., DeLancey 1981, Givón 1995, Haiman 1980).

DeLancey (1981) proposes that split case-marking and verb-agreement patterns in some languages can be explained by the notions of iconicity ('attention flow' in DeLancey) and viewpoint. According to DeLancey, iconicity or attention flow "determines the linear order of NPs," and "[t]he NPs in a sentence are presented in the order in which the speaker wishes the hearer to attend to them" (p. 632). In the case of dative clauses, the most prototypical and common pattern is from agent to patient as in (3a):

(3) a. ***She*** *gave me a check.*
b. *I got a check from* ***her****.* (DeLancey 1981: 638)

(3a) is iconic in that it matches the natural attention flow from the giver/source of an event, *she*, who is the natural starting point, to the receiver/goal, *me*. (3b), on the other hand, is not iconic since the receiver/goal is selected as the agent of the sentence rather than the giver/source. According to DeLancey (1981), non-iconic sentences like (3b) are highly marked in many languages, and the existence of such patterns can be attributed to the notion of viewpoint, or "the perspective from which the speaker describes the event" (p. 626). The non-iconic sentence (3b) exhibits the prototypical viewpoint in that 'the receiver/ goal,' *I*, is chosen to be the viewpoint as the "natural locus of viewpoint" (DeLancey 1981: 639).

What determines "inherent eligibility for viewpoint status" (DeLancey 1981: 639) of NPs in dative clauses may be associated with their 'topic-worthiness' (Thompson 1990, 1995) in discourse. Topic-worthiness is defined as "a cluster of properties which influence the packaging of information in languages of the world, specifically to the likelihood of a noun phrase being the topic of discussion" (Thompson 1995: 158). Topic-worthiness can be measured by the animacy, heaviness/length, referentiality and accessibility of NPs. Considering such properties, Thompson (1990, 1995), for example, account for the dative shift in English.

The notion of iconicity and viewpoint, which may be associated with topic-worthiness, may also explain the alternation in the word order of Japanese dative constructions. In the study of acquisition of children learning Japanese as their first language, iconicity was found to affect Japanese children's word order preference of dative sentences. Although goal-patient order is considered to be the canonical order in Japanese, Suzuki et al. (1999) found that Japanese children preferred iconic patient-goal word order both in comprehension and production tasks.[1] The patient-goal word order is iconic in that the entity to be transferred is expressed before the destination of the transfer; it is iconic to the event both in spatial and temporal senses. The same effect of iconicity was also found among Korean children (Cho et al. 2002).

Kawano (2004) examined the orders of NPs that co-occur with verbs of spatial expressions and found that the NP-*o* NP-*ni* order was more frequent than the NP-*ni* NP-*o* order when verbs refer to events in which patient moves between source and goal such as *utusu* 'move' and *hakobu* 'carry' in a corpus of newspaper articles. She attributed this to iconicity (i.e., the order of perception of the patient and goal in the event). These verbs are similar to verbs in dative clauses in the sense that source and goal are involved.

Previous literature examined some discourse-pragmatic factors that may affect the orderings of NPs in Japanese dative clauses. Yamashita (2002) examined a total of 2,635 sentences in magazine articles and found 19 non-canonical word order sentences among which were six instances of patient-goal dative clauses (i.e., patient NP is scrambled to the position before goal). She found that the prominent characteristics of scrambled NPs in the non-canonical word order sentences were that they were heavy as shown in (4a), and that they made reference to preceding contexts as shown in (4b).

[1] Sugisaki and Isobe's (2001) findings were inconsistent with those of Suzuki, et al. Japanese children in their study had more difficulty in comprehending the patient-goal than the goal-patient order sentences.

(4) a. (from Seiji Kuroi, 'Kenzaburo Oe and the Nobel prize')

Nooberusyoo-no	*zyusyoo-wa,*	*[[Oe Kenzaburoo-si-no*		
Nobel Prize-GEN	receiving-TOP	Oe Kenzaburo-Mr.-GEN		
bungaku-ga	*sono*	*hukami-to*	*hirosa-ni*	*oite*	*ikkoku-no*
literature-NOM	its	depth and	width in	one country-GEN	
iki-o koeru	*mono de aru*	*koto]]-o*	*sekai-ni*	*meezi-sita.*	
range-ACC	exceed thing COP	fact-ACC	world-DAT	showed	

'[Mr. Oe's] receiving of the Nobel prize clearly demonstrated to the world that Mr. Oe Kenzaburo's literature exceeds, in its depth and width, the [standard of] one country.' (Yamashita 2002: 605)

b. (from 'Men of My Type'; the speaker is a model, talking about Robin Williams)

Akarukute	*atatakai*	*kanzi dasi,*	*sono atatakasa-o*
cheerful and	warm	look and	that warmness-ACC
mawari-ni-mo		*hurimaite*	*kuresoo.*
surrounding people-to-also		sprinkle	looks like

'[He] looks like he is cheerful and warm, and [he] looks likely to give such benevolence to people around him.' (Yamashita 2002: 625)

Although referentiality was one of the characteristics of scrambled constituents, Yamashita (2002) found that only seven of 19 scrambled constituents represented given information. Ferreira and Yoshita (2003) found given-new effects in subjects' production of dative sentences in their psycholinguistics experiment utilizing a spoken recall task, but they attributed the effects to the efficiency in spoken production rather than to cognitive factors. They suggested that speakers position a mentioned or activated argument earlier due to its availability.

Another psycholinguistic study, Yamashita et al. (2003), found that Japanese preferred to produce sentences of the same thematic order as the ones they just produced, regardless of animacy status of the NPs.

The current study examines naturally occurring conversation and modern Japanese novels to shed light on the role of iconicity and viewpoint (i.e., factors contributing to topic-worthiness: animacy; heaviness/length; referentiality; accessibility) in the orderings of NPs.

2. Data and Methodology

There are two sets of data used for the present study. The conversational data consists of 26 transcripts of audio taped casual conversations (Aoki et al. to appear). The transcripts consist of single-sex and mixed-sex conversations with two to five participants; each conversation is 3 to 18 minutes long. The total amount of data used is approximately 150 minutes long and 278 pages of transcripts (approximately 5000 clauses). The speakers are 15 to 50 years old and

use standard Japanese. The relationships between the speakers are mostly friends, couples or family, and the recordings took place in private homes or restaurants either in Japan or in the U.S. during the 1990s.

The written data consists of four modern Japanese novels in an existing modern Japanese literature corpus, *Shinchosha no zeppan 100-satsu.[100 out-of-print books from Shinchosha Publisher] CD-ROM* (2000).[2] The first two authors are male and the other two are female. Approximately 3150 pages, 6300 clauses in total, are examined. All the clauses are divided into two: the narrative portion and the conversational portion.

We selected seven verbs in (5) that possess the prototypical semantics of ditransitive verbs and that take two goal positions (location and recipient), in keeping with Miyagawa and Tsujioka (2004) in order to examine the occurrences of both location and recipient as goal.[3]

(5) *ageru* 'give' *okuru* 'send' *kaesu* 'return'
ataeru 'give' *azukeru* 'entrust' *todokeru* 'deliver' *dasu* 'send'

We excluded the following clauses from the analysis: relative clauses, whose heads are either patient or goal; passive clauses; topicalized clauses; clauses which contain *–te morau*, and fixed clauses such as *kuti ni dasu* 'to express.'

As soon as we started to examine the data, we encountered difficulty distinguishing between location and recipient. This may be because there is a parallelism between a motion event such as shown in (6a) and an event which involves three arguments as in (6b) and (6c) (DeLancey, 1981).

(6) a. *Ken-ga* *Tookyoo-ni* *it-ta.*
-NOM -LOC go-PAST
'Ken went to Tokyo.'
b. *Ken-ga* *Miki-ni* *hana-o* *okut-ta.*
-NOM -DAT -ACC send-PAST
c. *Ken-ga* *hana-o* *Miki-ni* *okut-ta.*
-NOM -ACC -DAT send-PAST
'Ken sent flowers to Miki.' (constructed)

In Japanese, both locations and recipients are marked with the particle *ni*. This particle is characterized to be a "lexically complex grammatical morpheme" (Kabata 2000) due to its wide range of semantic and grammatical roles in discourse. In (6a), for example, *ni* marks the location 'Tokyo,' and in (6b) and

[2] We examined the following novels: *Geta no ue no tamago* by Hisashi Inoue, *Shatei* by Yasushi Inoue, *Shokutaku no nai uchi* by Fumiko Enchi and *Jiuta* by Sawako Ariyoshi.

[3] Miyagawa and Tsujioka claimed that it was possible for these verbs to occur with both recipient and locative goals, but we did not observe any such instances in our data. Note also that we excluded the verb *kakeru* 'ring' from our analysis since it is often used as a collocation, taking *denwa* 'telephone' in its patient position (as in *denwa o kakeru*).

(6c), the same particle appears with the recipient of flowers, *Miki*. In terms of syntactic status, it is not entirely clear whether a given *ni* is a dative case marker or locative postposition. Using syntactic tests, Sadakane and Koizumi (1995) suggested that *ni* following goal NPs in dative causes is a dative case marker; however, the current authors' judgment to the syntactic tests is that they are variable depending on the verb and NPs.

While some NPs are more locative-like or recipient-like, we encountered some difficulty coding NPs in our data. For example, although a place name is typically identified as a location in a prototypical motion event such as shown in (6a), in three-argument clauses like (7a) and (7b), it is not easy to determine whether *Tokyo* refers to a location or a recipient (who is in Tokyo).

(7) a. *Ken-ga* *Tookyoo-ni* *nimotu-o* *okut-ta.*
-NOM -LOC/DAT(?) -ACC send-PAST
b. *Ken-ga* *nimotu-o* *Tokyo-ni* *okut-ta.*
-NOM -ACC -LOC/DAT(?) send-PAST
'Ken sent a package to Tokyo.' (constructed)

The identification of categories becomes even more difficult when a terminal point is not a place name as seen in (8).

(8) a. *Ken-ga* *byooin-ni* *hana-o* *okut-ta.*
-NOM -LOC/DAT(?) -ACC send-PAST
b. *Ken-ga* *hana-o* *byooin-ni* *okut-ta.*
-NOM -ACC -LOC/DAT(?) send-PAST
'Ken sent flowers to the hospital.'

Due to this difficulty, we will use the term GOAL to indicate both location and recipient as the terminal point of an event in three-argument clauses.

In order to explore how viewpoint determines the orderings of NPs, we examined goal and patient NPs in terms of properties associated with topic-worthiness: referentiality, animacy, heaviness, and information accessibility. The coding schemes in (9) are used for the current study:

(9) Coding Schemes for NPs
Referentiality: Referential or Non-referential
Animacy: Animate or Inanimate
Heaviness: Heavy (NP with modifiers) or Not heavy (NP without modifiers)

Information Accessibility: Given, Inferable, or New

- Given (when a referent is lexically given in the preceding context, or is present as an interlocutor as in the cases of NPs such as *you* and *I*)
- Inferable (when a referent is inferable from previous discourse or its previous mention is rather distant)
- New (when a referent is newly introduced)

In examples (10) taken from the narrative portions of our written data, the goal NPs are double-underlined, and the patient NPs are single-underlined. (10a) shows the canonical dative construction in which the goal is expressed before the patient. Under our coding schemes, the goal, *zyakusya no mikataosuru Tamajiroo* 'Tamajiro, who supported the weak,' is identified as referential, animate, heavy, and given. The patient, *kassai* 'cheers,' is no-referential, inanimate, not heavy, and new. (10b), on the other hand, is an instance of a non-canonical construction where the patient, 'Yumiko' (=referential; animate; not heavy; inferable from the previous context) precedes the goal, 'hospital' (=non-referential; inanimate; not heavy; given).

(10) a. (from Sawako Ariyoshi, "*Jiuta*")

zyakusya -no	*mikataosuru*	*Tamajiroo-ni*
the weak-GEN	support	-GOAL
seken-wa	*kassai-o*	*okutte-ita*
people-TOP	cheers-ACC	send-PROG:PAST

'People had sent cheers to Tamajiro, who supported the weak'

b. (from Fumiko Enchi, "*Shokutaku no nai uchi*")

Yumiko-o	*byooin-ni*	*azukeru*	*kotonishi-ta …*
-ACC	hospital-GOAL	entrust	decide on-PAST

'(that he) decided on leaving Yumiko in hospital's care'

3. Findings

3.1. Overall Distribution

There were 13 dative clauses out of 5000 clauses in the conversation data, and 97 dative clauses out of 6300 clauses in the written data. The low frequency in the spoken data is not surprising considering the fact that three-argument verbs are extremely rare in conversational English as well (Thompson 1990).

Because Japanese is a pro-drop language, any arguments that can be inferred from the context can be non-overt. Regardless of whether data are written or spoken, among the three arguments in dative clauses, agent is most frequently left unstated, followed by goal and patient as illustrated in (11).

(11) Conversation: Agent 92.3% > Goal 84.6% > Patient 7.7%
(12/13) (11/13) (1/13)
Written: Agent 62% > Goal 39% > Patient 12%
(58/93) (38/97) (12/97)[4]

Given the fact that non-overt arguments may be the equivalents of pronouns and that pronouns are considered to be more topic-worthy than full noun phrases (Thompson 1990), the frequency of non-overt arguments suggests that agent is most topic-worthy followed by goal and patient.

Because of the high frequency of non-overt arguments, the number of clauses that contain both goal NPs and patient NPs is small. There were only two clauses in conversation and 50 clauses in written data.

Table 1: frequency of each of seven verbs

	English equivalent	Written	Conversation
ageru	give	11	4
ataeru	give	39	0
azukeru	entrust	10	0
dasu	put out	1	2
kaesu	return	14	1
okuru	send	13	6
todokeru	deliver	9	0
Total		97	13

Table 1 shows the frequency of each verb in the data. The primary difference between the two types of corpora was that the verb *ataeru* occurred only in the written data and was the most frequent in the written data.

3.2. Frequency of Goal-Patient vs. Patient-Goal

Obviously, the data that are relevant for the examination of word order are the 50 clauses that contain both goal NPs and patient NPs. The two instances observed in the conversation data consist of one each of goal-patient and patient-goal as shown in (12a-b).

(12) a. (from *Japanese Corpus*, "Yoyaku")
sore-o *anata-ni* *okur-u* *kara*.
that-ACC you-GOAL send-NONPAST FP
'I am sending that to you.'

[4] Four clauses were irrelevant in the examination of whether or not an agent is overtly expressed: two in request forms, and two in relative clauses whose heads were agents.

b. (from *Japanese Corpus*, "Saikin no ko")

sono tyuuzaiin-no	*ozyosan-ni*		
that overseas employee-GEN	daughter-GOAL		
Hikarugenzi-no	*syasin-o*	*okut-te*	*age-ru*
Hikarugenji-GEN	photo-ACC	send-GER	give-NONPAST

'(I'll) send Hikarugenji's photos to that overseas employee's daughter.'

We distinguished between two types of written data: narrative and conversation. Because the writers imitate conversations in the latter, its characteristics may diverge from those of written narratives. There were 45 instances of dative clauses containing both goal NPs and patient NPs in the narrative portions, and 5 instances in the conversational portions. The former consists of 32 goal-patient clauses and 13 patient-goal clauses; the latter consists of 2 goal-patient clauses and 3 patient-goal clauses.

In sum, although there were some occurrences of patient-goal orders in all three types of data (i.e., conversation, conversational portion and narratives in written data), the canonical order clauses were found to be much more frequent. Thus, the canonical order prevails over the iconic patient-goal order. But a question arises whether the frequent occurrence of goal-patient order is merely due to the fact that it is a canonical order, or is due to factors that contribute to topic-worthiness. We will now look at each of the factors.

3.3. Referentiality

Because the numbers of dative clauses occurring with overtly mentioned goal and patient are too small in the conversational data and written quotes data, we will hereafter discuss the results from the narrative portions only.

In order to examine the effect of referentiality, each NP was first coded as referential or non-referential. Then, word orders of goal and patient NPs were counted for three types of referential status of the two NPs: 1) the referential status of two NPs are equal (i.e., both NPs are referential, or both NPs were non-referential); 2) goal NP is referential but patient NP is not; and 3) patient NP is referential but goal NP is not. Table 2 shows the results.

Table 2:

Referentiality	Goal-Patient	Patient-Goal
Goal = Patient	67% (12/18)	33% (6/18)
Goal > Patient	80% (20/25)	20% (5/25)
Goal < Patient	0% (0/2)	100% (2/2)

Clearly, there is a tendency that referential NPs precede non-referential NPs. When goal is referential and patient is not (i.e., "Goal>Patient"), it is more likely for goal to precede patient than when goal and patient have equivalent referential status. This is compatible with what Thompson (1990) found: goal is more topic-worthy than patient, and referentiality being one of the criteria for topic-

worthiness, goal is likely to be more referential than patient. There were only two instances in which patient is referential when goal is not; in both cases, the word order was non-canonical patient-goal.

3.4. Animacy

Each NP was coded for animacy status (i.e., "A" for animate or "I" for inanimate). Table 3 demonstrates how the animacy statuses of NPs affect the word order of dative constructions in discourse.

Table 3:

Animacy	Goal-Patient	Patient-Goal
Goal(A) = Patient(A)	100% (3/3)	0% (0/3)
Goal(I) = Patient (I)	29% (2/7)	71% (5/7)
Goal(A) > Patient (I)	79% (26/33)	21% (7/33)
Goal(I) < Patient(A)	50% (1/2)	50% (1/2)

We see a general tendency that an animate NP is more likely to precede an inanimate NP. Although the numbers are very small, the canonical word order (goal-patient) appears to be preferred when both goal and patient are animate, while preference is not observed when patient is animate and goal is not.

3.5. Heaviness

Each NP was coded as 'heavy' when it has a modifier of any length. The relationship between the heaviness of NPs and the word order of sentences is indicated in Table 4:

Table 4:

Heaviness	Goal-Patient	Patient-Goal
Goal = Patient	85% (17/20)	15% (3/20)
Goal > Patient	61% (11/18)	39% (7/18)
Goal < Patient	57% (4/7)	43% (3/7)

Heavy NPs are more likely to precede NPs without modifiers in our data. When the heaviness of Goal and Patient NPs are equal, the canonical goal-patient is preferred. This is in accord to Yamashita's (2002) finding.

3.6. Accessibility

The accessibility of each NP was coded as Given, Inferable, or New. The older the information that an NP represents is, the higher accessibility it has. In Table 5, "Goal > Patient" indicates that the referent of goal NP is older than patient (e.g. goal NP is given or inferable when patient NP is new).

Table 5:

Accessibility	Goal-Patient	Patient-Goal
Goal = Patient	65% (11/17)	35% (6/17)
Goal > Patient	83% (20/24)	17% (4/24)
Goal < Patient	25% (1/4)	75% (3/4)

When goal NP is more accessible than patient NP, goal-patient order is more frequent than in cases in which the information statuses of goal and patient are equivalent. Moreover, although the number of cases in which patient NP is more accessible is very small, in these cases, patient-goal order seems to be preferred. Thus, in our data, more accessible NPs tend to precede NPs referring to newer information.

4. Conclusions

We first found that the spoken corpus and the conversational portion of the written corpus had very few instances of dative clauses in which both patient and goal are overtly expressed. Thus our analysis focused on the written corpus.

In the written corpus, canonical goal-patient order was the predominant word order of NPs in dative clauses. The goal-patient order may be selected because viewpoint is on the goal NP due to its topic-worthiness measured by such factors as referentiality, animacy, and accessibility. Goal NPs tended to be referential, animate, heavy and accessible.

In the few instances in which patient has topic-worthy characteristics, the preference for the goal-patient order seemed to disappear. In other words, the dative clauses resulted in iconic patient-goal order when patient was topic-worthy, especially when goal is inanimate. However, the number of such instances is too small for us to submit the results to statistical testing or to make any conclusive statement.

In the current study, the topic-worthiness of NPs was considered separately for each factor; however, the factors may have additive effects (e.g., a referential animate NP may be more topic-worthy than a non-referential animate NP). Hence, in future investigation on the role of iconicity, it may be beneficial to examine a number of cases in which patient and goal can be considered as roughly equally topic-worthy considering the multiple factors.

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Noriko Iwasaki
EALC
University of California Davis
One Shields Avenue
Davis, CA 95616

niwasaki@ucdavis.edu

Misumi Sadler
EALC
University of Illinois Urbana-Champaign
FLB 2090, 707 Mathews
Champaign, IL 61801

sadlerm@uiuc.edu

Measuring the Relationship of Structure to Use: Determinants of the Extent of Recycle in Repetition Repair*

VSEVOLOD M. KAPATSINSKI
University of New Mexico

0. Introduction

When a speaker produces a disfluency, defined as an interruption in the flow of speech, he/she may often repeat a part of the utterance already produced. When making such repetition repairs, speakers may repeat only the last word they (partially) produced, as in (1) and (2), or they may choose to go back (recycle) further, repeating two, three, or even more words. The dependent variable used in this study is the Extent of the Recycle in Repetition Repair (ERRR), which is equal to the number of words the speaker repeats, where the final word he/she has produced is counted as one unit, regardless of whether it was completed. Thus, examples (1) and (2) have ERRR=1, example (3) has ERRR=2, and example (4) has ERRR=3. Equivalently, we can say that the repair goes back to the first transition (word boundary) in (1) and (2), the second transition in (3), and the third transition in (4). We will call the part in bold the repairing, and the part in italics the repaired, and we will say that repair goes back to *appreciated* in (1), *just* in (2), *areas* in (3), and *I* in (4), i.e. the word the repair goes back to is the word preceding the repaired. The location of the plus sign in (1)-(4) is the location of the repair onset. All of the examples are taken from the Switchboard Corpus (Godfrey et al, 1992).

(1) I really appreciated [*the*, + **the**] whole, uh, English class
(2) I have been involved, uh, just [*sli*-, + **slightly**] in a case
(3) The crime level is not as high as it is in other areas [*of the*, + **of the**] city
(4) I [*had a similar*, + **had a similar**] health plan

The extent of recycle in repetition repair has been used as evidence for (hierarchical) constituent structure (e.g. DuBois, 1974; Fox and Jasperson, 1995; Clark and Wasow, 1998; Ford et al, 2003; Sanchez-Ayala, 2003): people tend to

* My special thanks go to Joan Bybee, Jill Morford, Caroline Smith, Rena Torres-Cacoullos, and Catherine Travis for helpful and insightful comments on earlier versions of this paper.

recycle back to the nearest constituent boundary. However, Fox and Jasperson (1995) located a major exception to this generalization: people tend not to recycle back to the beginning of the VP.

A probabilistic or frequency-based account of constituent structure (e.g. Gregory et al, 1999, Jurafsky, 2002, Bybee 2002, 2003) would account for this finding by noting that the transitional probability for any given verb after any given subject is higher than the transitional probability of any direct object after any given verb or that mutual information (the frequency of the two-word string divided by the product of the frequencies of the component words) or simple string frequency of subject + verb collocations is higher that mutual information or string frequency of verb + object collocations.

This paper surveys the full range of online frequency-based and probabilistic (FP) factors that could predict the extent of recycle in repair and explicitly spells out the implications of different formulations. We apply a corpus-based multi-variate method to determine whether an FP factor or syntactic constituency is a better predictor of the extent of the recycle. The results indicate that speakers do tend to go back to the nearest constituent boundary except when that boundary is high in backward transitional probability.

1. Methods

1.1. Sampling and Exclusions

Four samples were taken from a tagged for disfluencies 1,000,000 word subset of the Switchboard Corpus, which consists of two-party telephone conversations between native American English speakers on predetermined topics (Godfrey et al, 1992): 1) a random sample of 250 repairs with ERRR=1 that were chosen using a random number generator available at www.random.org; 2) a random sample of 250 repairs with ERRR=2; 3) a sample of 47 repairs with ERRR=3, which contained all such repairs available in the corpus; and 4) a completely random sample of 950 repairs, which reflects the proportions of one, two, and three-transition repairs in the corpus.

Several types of repairs were systematically excluded from the samples.

First, replacement repairs (Sanchez-Ayala, 2003) were excluded. These are repairs, in which the repairing is not an exact repetition of the repaired but replaces some part of the repaired. The reason for this exclusion is that in these cases the speaker has to repeat the word following the word being replaced for the hearer to know how the repairing fits in with the preceding utterance. Thus, the choice of ERRR is not free.

In addition, repetitions that are separated from the utterance they repeat by other lexical material are excluded because there is no way to know that we are dealing with the same phenomenon in these cases, which may well be accidental or emphatic repetitions rather than repairs, and thus could have distinct properties.

The largest set of excluded repairs consisted of repairs that were initiated within three words from a clause boundary as in (5)-(7). The reason for this exclusion is that the tendency to recycle back to the nearest clause boundary

overrides all of the clause-internal factors we are interested in. When a clause boundary is in the second transition preceding repair onset, speakers recycle to it in 92 out of 100 tokens of such repairs we have collected, compared to the average recycling rate to second transition of 18%[1] and hence including such tokens would result in floor effects for other factors and obscure the differences between them. It is assumed that there is a clause boundary after clause-connecting conjunctions.

(5) I feel kind of sorry for them right now, because the people [are, + are, + are,] uh, wanting things
(6) Because [I often, + I often] sort of wonder how, having never been to the Soviet Union, um, how different the people there really are,
(7) I mean, [this, + this] is amazing

Also excluded were tokens initiated within three words of the completion of another repair as in (8). The reason for this exclusion is to avoid priming effects and speaker-specific preferences.

(8) I was really familiar [with a lot, + with a lot] [of, + of] the AOR type music.

If two or more repair tokens were initiated after identical three-word sequences, only the first token found was included so that effects obtained cannot be attributed to particular lexical items or collocations sampled.

Another exclusion consists of repairs within three words of a contracted form, such as *'ve*, *'s*, *'d*, *n't*, *of* in *kind of/sort of/lots of*, and *to* in *going to*. This exclusion is due to difficulties in calculating the number of transitions due to phonological reduction. One cannot start the repairing with a contracted word but there *is* a (low-frequency) possibility to recycle back to the beginning of the contracted element and start the repairing with its full version. Thus these tokens are ambiguous as to how many transitions they contain. The low likelihood of a recycle to the beginning of the contraction may be due to the high frequency of the collocation or the fact (resulting from the high frequency of the combination) that the contracted element has to be changed for the repairing to be grammatical. Therefore, including such cases would bias the sample towards FP factors. By excluding these tokens, we ensure that our findings are unambiguously attributable to FP factors, rather than phonological reduction.

The range of values for ERRR examined in this study is restricted to one, two, and three-word repairs. This decision is motivated by the fact that all tokens with ERRR greater than four were recycles back to a clause boundary, which we have excluded from the study because of our interest in clause-internal constituent

[1] The tendency to recycle back to the clause boundary is apparently not universal and is reported to be absent in Japanese, cf. Ford et al (2003).

structure. There were only four tokens of such repairs in the corpus, three with ERRR=5, and one with ERRR=6. There were three tokens with ERRR=4 that were not recycles back to a clause boundary. All of these tokens include a frequent collocation (*a lot of* in (9), *bring'em over* in (10), and *for the sake of* in (11)), which is often phonologically fused and hence does not include possible transitions before *of* in (9) and (11) and before *them* in (10). These tokens were excluded from consideration because of the presence of transitions at which the repairing cannot be the same as the repaired. However, the fact that all extra-long repairs include a frequent collocation provides support for FP factors.

(9) I do [a lot of the, + uh, a lot of [the, + the ba-, + the back] work, and stuff.
(10) I get a whole bunch of them [and bring'em ov-, + and bring'em over.
(11) I'm sure they would all of a sudden band together just [for the sake of, + for the sake [of, + uh, of, + of] unity against us or something

1.2. Factors

1.2.1. Structural Factors

Two structural factors are considered in this study: 1) NCB, defined as the tendency to recycle back to the nearest constituent boundary, which has been the only factor proposed in the literature as a predictor of ERRR; and 2) OPEN, defined as the tendency to recycle back to the nearest open class item, where open-class items include nouns, verbs, adjectives, and adverbs.

The following set of constituents is used in this study: NP, VP, PP, *to* VP, AP, and Conj. The VP boundary within the *to* VP is excluded from the set of constituent boundaries as is the NP boundary within the PP.

While the *to* VP construction (12) has traditionally been assumed to be a purpose clause, these clauses lack subjects, and their initial boundaries pattern like clause-internal constituent boundaries and not like clause boundaries with respect to repair. Thus *to* VP may be better considered a type of a prepositional construction of the form P VP, similar to the P NP structure of PP.

(12) They wanted some gray [to do the, [[+]] to do the] trim.

The reason for the exclusion of the P XP internal boundaries from consideration as attractors of the recycle is the definition of *constituent* we adopt. Levelt (1989) has argued that, since, given unidirectional binary branching, every word boundary is a constituent boundary, the statement that repair tends to go back to the nearest constituent boundary is equivalent to saying that it tends to go back to the nearest transition. Thus, Levelt proposed that the repaired and the repairing must be conjoinable with *or*. However, this constraint prohibits any repairs that were initiated after determiners as in (13), a common repair.

(13) Sometimes I get bogged down [in the, [[+]] {D you know,} in the] ideology (*in the or in the[2])

We adopt a definition that is more semantically-oriented by defining a constituent as a phrase that has or may have a syntactic function where the syntactic functions are subject, object, oblique, and verb.

1.2.2. Relative vs. Absolute Frequency and Probability

FP factors can be divided in terms of whether they involve relative or absolute frequency or probability. Relative FP factors state that the repair goes back to the nearest transition with a lower frequency or probability than the neighboring transitions. Absolute FP factors state that the repair goes back to the nearest transition with a frequency or probability lower than some numerical value. While relative FP factors assume an online comparison of transitions by the speaker, absolute FP factors involve no online computation and refer only to long-term properties of collocations. Both types of FP factors are used in this study. Absolute FP factors will be denoted by absolue value bars around the factor name, e.g. |SF| stands for absolute string frequency.

1.2.3. Frequency-Based Factors

Usage-based grammaticization theory claims that words used together fuse together (Bybee, 2002, 2003). Five frequency-based factors are coded in this study: 1) relative two-word string frequency (SF); 2) absolute two-word string frequency (|SF|); 3) relative mutual information (MI), 4) absolute two-word mutual information (MI); and 5) recursive string frequency (RSF).

String frequency is the number of times a certain two-word combination appears in the corpus. Mutual information, on the other hand, is string frequency divided by the frequencies of the words in the string as shown in eq. (1), (2), where F is frequency, w is a word, and n is its number in the production sequence.

eq. (1): $SF = F(w_n; w_{n\pm1})$

eq. (2): $MI = \dfrac{F(w_n; w_{n\pm1})}{F(w) * F(w_{n\pm1})}$

While |SF| postulates that speakers will tend to recycle back to a transition with a two-word frequency lower than some predetermined numerical value, RSF, which is also an absolute FP factor, uses strings of different length for different transitions. Thus, the recycle goes back one more transition if the frequency of the string that begins with the word immediately preceding the transition and ending with the word immediately preceding repair onset is larger than a prespecified numerical value (a.k.a. the cutoff point). Thus, while in first transition before the

[2] There are no instances of *the or* on Switchboard, except for one repair (or the + or the)

repair onset the RSF string consists of two words, it consists of three words in second transition as shown in (14), where *of the* is the RSF string in first transition, while *areas of the* is the RSF string in second transition. The cutoff point is shared by all of the strings of a particular length, e.g. the median SF of two-word strings is larger than the median SF of three-word strings.

(14) The crime level is not as high as it is in other [areas [of the]] + of the city

The frequencies of the words and strings were taken from the corpus. All phonologically identical uses of a word were grouped together as long as all of these uses belonged to the same lexical category. Thus the frequency of *like* in *John and Mary like swimming* would not include the tokens where *like* is a conjunction or a discourse marker. Similarly, the demonstrative *that* was separated from the conjunction *that*. On the other hand, all nominal uses of *bank* would be grouped together, regardless of whether they meant 'a financial institution' or 'shore'. All phonologically distinct forms of a word were considered separately, except for phonologically conditioned alternations. Thus, the frequency of *likes* was calculated independently of the frequency of *like* but *an* and *a* were grouped together.

1.2.4. Probabilistic Factors

Jurafsky and his collaborators (Gregory et al, 1999; Jurafsky, 2002) have proposed that frequency is just a special case of probability and that items that are more predictable on the basis of the item that preceded them in the processing sequence tend to reduce and fuse with the preceding item. Thus, in this model, the emergence of constituent structure is inherently directional and hearer-based, i.e. it depends on the speaker's estimate of the predictability of the next item for the hearer.

In the case of repair, the processing sequence need not correspond to the temporal order in which words are produced. Rather, speakers may attempt to model the hearer's comprehension process. Repetition repairs involve a syntactic reanalysis on the part of the hearer, in which, according to serial models of reanalysis (e.g. Fodor and Inoue, 1998), hearers move in the direction opposite to the direction of speech production and word-by-word through the sentence. Therefore, we may consider it likely that the speaker's processing sequence in determining ERRR is the opposite of the temporal sequence of producing the utterance. Thus, backward transitional probability (TP-B) may a priori be considered as plausible a determinant of ERRR as direct transitional probability (TP-D). Transitional probability is defined as the number of times a given two-word string occurs in the corpus divided by the number of times the first (TP-D) or the second (TP-B) word occurs (eq. 3, 4). Both absolute and relative TP-D and TP-B are used in this study.

eq. (3): $TP - D = \dfrac{F(w_{n-1}; w)}{F(w_{n-1})}$

eq. (4): $TP - B = \dfrac{F(w; w_{n+1})}{F(w_{n+1})}$

Example (15) presents a token from the corpus and the application of the relative TP-D and TP-B to it. W4 is the word in or immediately after which the repair is initiated, w3 is the immediately preceding word, and so on. The SF of the second and third transitions are equal in this example. However, TP-D ((9/*other*) ? (9/*areas*))[3] predicts ERRR=3, since *areas* is less frequent than *from*, hence TP-D is smallest in the third transition (w1-w2), while TP-B ((9/*areas*) ? (9/*of*)) correctly predicts ERRR=2, since *of* is more frequent than *areas*, hence TP-B is smallest in second transition (w2-w3). The arrow shows actual ERRR.

(15) The crime level is not as high as it is in other areas [of the, + of the] city.

String	String Frequency	TP-D	TP-B	Transition
other areas w1 w2	9 F_{w1}=1033;F_{w2}=98	0.0087 = 9/1033	0.0918 = 9/98	3
areas of w2 w3	9 F_{w2}=98;F_{w3}=12457	0.0233 = 9/98	0.0007 = 9/12457	2 ←
of the w3 w4	1890 F_{w3}=12457;F_{w4}=20007	0.1517 = 1890/12457	0.0945 = 1890/20007	1

1.2.5. Magnitude-Dependent Dominance

Magnitude-dependent dominance is a way to combine factors, where by combining factors we mean considering their joint effect.

For magnitude-dependent dominance to be used, at least one of the component factors must be able to make predictions with various degrees of certainty. This is not true of the two structural factors in our study, since a constituent boundary either is or is not there. However, it is true of the FP factors: a relative FP factor predicts that speakers will recycle to the transition that has the lowest frequency or transitional probability. The magnitude of the difference between transitions varies from token to token. Similarly, absolute FP factors stipulate that the recycle will go to the nearest transition with frequency or probability lower than some value, but the magnitude of the difference between the frequency or probability in a transition and the cutoff value varies from transition to transition. Therefore, magnitude-dependent combinations of FP factors with structural factors are possible and are considered in this study. Under magnitude-dependent dominance, the prediction of the composite factor is the same as the prediction of the factor with higher magnitude in the token under consideration. If one of the factors has

[3] where '?' stands for '>, <, or ='

constant magnitude, e.g. NCB, a cutoff value is specified for the variable magnitude factor it is combined with, e.g. TP-B. Then TP-B is overridden by NCB whenever TP-B's magnitude is smaller than the cutoff. Magnitude (delta) of an FP factor is calculated through eq. (5),(6).

eq. (5) $\Delta F_i = MAX((M/X),(M/Y),(M/Z))$

where F is a factor; i is a token number; X, Y, and Z are factor values in the three transitions preceding repair onset; and

eq. (6) $M = X+Y+Z-MIN(X,Y,Z)-MAX(X,Y,Z)$

For magnitudes of different factors to be compared, they must be reduced to a common denominator since factors vary in their average magnitudes, in the range of the magnitudes, and in how magnitudes are distributed across that range. We ranked each factor's magnitudes separately from other factors from the largest (#1) to the smallest (#547)[4]. Then the factor with the larger magnitude is the factor whose magnitude has the smaller ranking number, i.e. is closer to the maximum magnitude *for that factor*. Magnitude-dependent dominance can achieve significant improvement in performance over the best component factor even when the component factors are highly correlated and even when they make predictions on all tokens, as long as the factors are less confident in their wrong predictions than they are in their correct ones.[5]

1.2.6. Cutoff Adjustment

Cutoff adjustment can be used on FP factors. Cutoff adjusted relative FP factors do not stipulate that the recycle will go back to the transition with the lowest frequency or probability but specify a relation between the frequency or probability in that transition and its nearest competitor as in eq. (7), where k is a constant coefficient specified by the factor, x is a transition, and X, Y, and Z are factor values in the three transitions considered.

eq. (7): choose x iff $X < k \cdot MIN(Y,Z)$

[4] The number of magnitudes ranked corresponds to the number of repair tokens in the sample.

[5] Two other ways to combine factors are possible: 1) strict dominance and 2) equality. Under strict dominance, when the component factors make competing predictions, the prediction of the factor designated as dominant is the prediction of the composite factor. The less dominant factors have their say only when the more dominant factors make no prediction. This is not optimal for our task because only OPEN makes no predictions in more than 10% of the tokens. Therefore, a strictly dominant combination of factors will not perform better than the dominant factor. Under equality, when the component factors make competing predictions, the composite factor makes no prediction. The utility of equality in two-factor models is limited, hence equality is not used here.

We must note that any k different from 1 is an assumption about which transition the speaker defaults to. If k for a transition is smaller than one, the speaker prefers that particular transition to others, and the reverse holds for k > 1. Since this means that changing k from 1 means introducing preferences for transitions as an independent factor, which could only be justified if recycles to some transition were less predictable than recycles to others, we always use k=1 for relative FP factors. However, cutoff adjustment is used with absolute FP factors where no implication of preferences for transitions holds.

1.2.7. Window of Attention

Finally, we consider two possibilities for the window of attention the speaker uses while recycling. One possibility (serial recycle) is that the speaker considers transitions in pairs beginning with the transition that is closest to repair onset and only goes back if needed. The other possibility (instant recycle) is that for every token the speaker simultaneously considers all three transitions preceding repair onset as possible sites to recycle to. In other words, the question is whether the speaker compares the first transition to the third transition, or chooses the first transition if its frequency or probability is lower than that of the second transition without regard to the third transition. A related issue is whether in serial recycle for absolute FP factors, the speaker may return to a transition after rejecting it based on comparison with cutoff when the frequencies and probabilities of the following transitions are also larger than cutoff. We assume that this does not occur, and the speaker chooses the last transition he/she considers, but this is an area for future work. Absolute FP factors can only produce many predictions with serial recycle and thus are not considered under instant recycle.

2. Results

In the random sample of 950 repairs, great majority have ERRR=1 (Table 1). Factors are not compared over this sample because of the unequal distribution of tokens across ERRR values. If factors were compared in this sample, factors performing well at ERRR=1 would win over factors performing well at ERRR=2 and ERRR=3. Since we are interested in predicting the distribution, this would not be appropriate.

Table 1: Distribution of tokens across ERRR in random sample of 950 repairs

ERRR	1	2	3
% of data	79%	18%	3%

Factor performance is defined as the percent of tokens on which a factor makes the correct prediction, out of the total number of tokens on which it makes a prediction. Note that 33% is the chance level. The results are shown in table 2. Shaded cells contain factors that are not significantly different from the best factor at the .05 level according to the chi-square test and hence are not eliminated. The cutoff for all of the absolute FP factor combinations has been optimized, while the

magnitude-dependent combinations shown are ones that give a significant improvement over the best component factor. The ideal factor (combination) would not be eliminated in any of the data sets and would successfully describe the distribution function, i.e. would be equally predictive regardless of ERRR. The need for this additional condition is that it ensures that the winning factor is independent and need not be combined with a preference for certain transitions.

Table 2: Factor performance in balanced sample

a. Serial Recycle

ERRR	TP-B	TP-D	SF	MI	NCB	OPEN	|TP-B|	|TP-D|	|SF|	|MI|	RSF	NCB/|TP-B|
1	63%	38%	48%	62%	74%	62%	70%	61%	83%	43%	50%	72%
2	68%	27%	53%	49%	69%	55%	61%	28%	37%	59%	79%	70%
3	34%	19%	19%	30%	44%	32%	60%	28%	43%	62%	37%	57%

b. Instant Recycle

ERRR	TP-B	TP-D	SF	MI	NCB	TP-B/NCB	OPEN
1	47%	15%	37%	42%	74%	63%	62%
2	68%	27%	53%	49%	69%	76%	55%
3	70%	32%	57%	62%	44%	64%	32%

From these data, we note that NCB is the only factor that is not eliminated under either serial or instant recycle. However, it performs relatively poorly in predicting long (ERRR=3) recycles (44%), which motivates combining it with |TP-B| for serial recycle and TP-B for instant recycle. We may note that the strengths of TP-B and NCB lie in different samples in that NCB is good at predicting ERRR=1 tokens and bad at predicting ERRR=3 tokens. The reverse is true of TP-B. Their magnitude-dependent combinations provide the correct distribution function. Since magnitude-dependent combinations perform well only when the FP factor on average has a larger magnitude when it makes a correct prediction than when it makes an incorrect one, good performance of NCB/TP-B indicates that speakers recycle to NCB unless the transition it favors is exceptionally high in TP-B (relative to some other transition).

The various factors examined are correlated to different degrees. FP factors that perform well tend to be correlated with NCB more than those that perform poorly (table 3).

Table 3: Factor correlations and mean percentages of data covered across samples

Absolute FP Factors			Relative FP Factors		
Factors	Correlation	Coverage	Factors	Correlation	Coverage
NCB/|TP-B|	.66	64%	NCB/TP-B	.73	58%
NCB/|SF|	.55	54%	NCB/MI	.64	49%
NCB/|MI|	.45	55%	NCB/SF	.58	44%
NCB/|TP-D|	.38	39%	MSB/TP-D	.46	26%

Thus, the best frequency or probability-based factors, the absolute and relative TP-B are highly correlated with NCB. How might we explain this? The reason for this correlation is that English is a preposing language, therefore in the sequence shown in (16), the constituent boundary is at transition 1 where the lexical item precedes the grammatical item.

(16) lex] 1 [gram 2 lex]

Since the frequency of a lexical item is on average lower than the frequency of a grammatical item, TP-B of transition 1 (where the frequency of the gram is in the denominator) would be lower than TP-B of transition 2 (where the frequency of the lexical item is in the denominator). The reverse is true of TP-D. Therefore in preposing languages TP-B serves as a reliable predictor of syntactic constituent boundaries, while TP-D may serve this function in postposing languages.

Extending this work to postposing languages is likely to provide us with a valuable glimpse into the relationship between syntactic constituency and various FP factors. If the good performance of TP-B reflects the processing sequence involved in repair, it should perform well regardless of whether a language is preposing or postposing. If, on the other hand, its good performance is due to its correlation with NCB, we expect it to perform poorly in postposing languages and TP-D to perform well.

Another direction for future research is to include prosodic structure as a possible factor. In addition, it is not yet clear whether all constituent boundaries are equally attractive for repair to go back to, and what predicts how attractive a given boundary (type) is. More research on the window of attention in repair as well as reanalysis is needed. Finally, the method used here may, with slight modifications, be applied to other dependent variables, such as disfluency onset locations, phonological fusion of frequent collocations, and codeswitching sites.

I hope to have demonstrated a rigorous quantitative method to examine the relationship between structure and use in syntax, which can be applied to other variables that are supposed to be sensitive to structural and FP factors. The fact that a magnitude-dependent combination of NCB and TP-B works indicates that speakers do tend to recycle to the nearest constituent boundary rather than a transition with lower frequency or probability by default whereas long recycles are motivated by an exceptionally high TP-B (relative or absolute) at transitions closer to repair onset. This is tied to the observation that recycles with ERRR>3 that do not go back to a clause boundary consist solely of recycles that include very frequent collocations. Speakers seem to ignore differences in frequencies and probabilities between words in a sentence, unless they are larger than a particular value. This value is lower than what is necessary for phonological reduction and fusion, since all tokens of phonological fusion were excluded from the sample. It appears that backward transitional probability influences the constituent structure of an utterance even when no effect on phonology can be observed. Other FP

factors do not appear to be reliable predictors of constituent boundaries or the extent of recycle in repair.

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Vsevolod Kapatsinski,
MSC03-2130, Linguistics,
1 University of New Mexico,
Albuquerque, NM, 87131.

alator@unm.edu

Embodied Verbal Semantics: Evidence from a Lexical Matching Task

SHWETA NARAYAN[1], BENJAMIN K. BERGEN[2], and ZACHARY WEINBERG[3]
University of California, Berkeley[1]
International Computer Science Institute[1, 3]
University of Hawai'i, Manoa[2]

0. Introduction

Neural processes involved in language understanding are often not considered to be of direct interest to linguists. However, these processes place constraints on linguistic theories in that a linguistic theory that correctly predicts observable non-linguistic phenomena is generally preferable to a linguistically equivalent one that does not.

One standard way of thinking about linguistic semantics is that it is ultimately based in some kind of logical system (e.g. Barwise and Perry, 1983). Another is that it is embodied, that is, concretely based on people's interactions with the world (e.g. Fillmore, 1982; Lakoff, 1987; Fauconnier, 1997).

This second, embodied perspective makes a strong claim that the logical perspective does not: Namely, that linguistic semantics is grounded in the perceptual and motor systems, and therefore reflects characteristics of these systems. We present some evidence that supports this prediction, and suggest a methodology for further investigating the question of the role of perception and action in meaning.

Recent studies have shown that some of the neural circuitry involved in the execution of motor actions is also activated when the same motor actions are seen, or when language about those motor actions is understood. (Gallese et al., 1996; Rizzolatti et al., 1996; Tettamanti et al., ms). This activation may be epi-phenomenal – the simple and non-functional result of spreading excitation from perceptual to motor structures. Alternatively, this so-called mirror system might play a crucial role in our understanding of verbal semantics. In this case, at least some aspects of language understanding are crucially dependent on sensorimotor representation. If this is true, it raises serious problems for any theory in which semantics is not grounded in our sensorimotor systems.

Human premotor cortex is somatotopically organized, and has major subdivisions specialized for hand, foot and mouth actions. It has been shown in an imaging study (Buccino et al., 2001) that this somatotopic organization extends to mirror cells in premotor cortex. That is, the part of premotor cortex that becomes activated when people carry out foot actions is also activated when they watch

foot actions being carried out. Similarly, a different part is activated when people carry out or watch hand actions, and a third when they carry out or watch mouth actions. In addition, Pulvermüller et al (2001) found that verbs associated with different effectors were processed in different parts of motor cortex, and that their processing led to reaction times that varied by effector type.

If understanding a verb depends on activation of mirror circuitry, then in order to understand verbs whose meaning involves particular effectors (body parts), very specific circuits must be activated in the corresponding parts of premotor cortex. There should therefore be differential activation in premotor cortex based on effector type; and, crucially, this activation should be involved in understanding. If this is the case, we would expect that if we ask subjects to compare two different concepts involving the same effector, these two concepts will interfere with each other to a certain extent, since there is an overlap in the neural circuits required to understand them. If we compare two concepts that involve different effectors, on the other hand, there should be less interference, since there are two distinct parts of premotor cortex being activated.

We would expect increased interference rather than facilitation because the task involves comparison of similar but non-identical concepts. Very similar concepts would have a large degree of overlap in the neural circuits that encode them; therefore, someone trying to compare two similar concepts would have two very similar neural patterns activated. These would more strongly inhibit each other since they are in close competition, and it would therefore be relatively difficult to decide that they were different.

In a previous experiment (Bergen et al., 2003), subjects were shown an image of a stick figure performing an action. This image was displayed for one second, and was followed by a 500ms interstimulus interval.[1] Subjects were then presented with a written verb. Their task was to judge, as quickly as possible, whether the verb matched the image.

The image/verb pairs fell into three categories. Matches, where the verb was a good descriptor for the image, made up half the stimuli, and provided the control condition. The other half of the stimuli were non-matches. There were two non-matching conditions: one where the image and verb involved different effectors, and one where they involved the same effector.

We hypothesized in that study that subjects would have relatively longer reaction times when comparing non-matching stimuli involving the same effector than when comparing non-matching stimuli involving different effectors, due to the greater interference between same effector concepts predicted by the embodied model. In both cases the reaction time would be higher than in the control condition (where we would not expect interference effects).

Consistent with this hypothesis we found that mean reaction time was significantly higher for the same-effector condition than either of the other two ($p<.0001$). While mean reaction time was higher for the different-effector condition than the control condition, this difference was not significant (Table 1).

[1] In the first 450ms of this, a visual mask covered the screen; this was to make sure there were no effects caused simply by visual imagery.

Table 1: Means Table for Reaction Time as an effect of Condition in the Image-Verb matching task

Condition	Count	Mean (msec)	Std. Dev.	Std. Error
Match	1596	740.57	257.54	6.45
Non-match same-effector	840	798.54	251.00	8.66
Non-match different-effector	870	750.93	204.74	6.94

However, there were several possible confounds that needed to be addressed. The first was that subjects might be reacting to some abstract semantic similarity of the particular verb-image pairs that had nothing to do with effectors. To test this possibility, we evaluated the similarity of each non-matching verb with its corresponding matching verb, using the semantic similarity metric of Latent Semantic Analysis (LSA, Landauer et al., 1998). LSA is a statistical method for judging the similarity of words based on the context in which they appear, and has been shown to perform similarly to humans in several ways, including synonym and multiple-choice tasks. LSA uses a continuous pairwise comparison function ranging from -1 to 1. That is, two words that appear in all the same contexts would have an LSA rating of 1, two words that appear in none of the same contexts would have an LSA rating of -1, and any overlap in contexts would result in a rating between -1 and 1. This analysis can therefore provide a numeric measure of abstract similarity, independent of effector type.

For each non-matching condition, we obtained the verb's LSA rating with respect to the corresponding matching verb. We then performed a regression analysis of this rating against the mean reaction time (RT) per trial. There was a very weak positive correlation between LSA rating and RT ($R = 0.094$), suggesting that more similar items tend to take longer to distinguish. However, this correlation was not significant, so while it might constitute a small, partial explanation for our results, it cannot be the full story.

Another potential confound was that subjects may have been responding to visual properties of the images rather than motor properties of the actions they depicted. A picture of one action might just resemble a subject's mental image of another action involving the same effector, regardless of whether the actions themselves were similar. If there was more visual similarity between actions that used the same effector, then this would yield greater visual interference (and thus the observed longer reaction times) when non-matching items used the same effector than when they used different ones.

In order to test this possibility, the following experiment was conducted. Subjects were shown a verb, followed by a near-synonym or a mismatch. Again the mismatches fell into two different categories; the actions being compared involved either the same effector, or a different one. Subjects were asked to decide whether the two verbs had approximately the same meaning.[2] The absence of images in this design removes the possibility of a visual confound.

[2] This follow-up was therefore as similar to the initial experiment as possible given the removal of images, but one change in particular led to a slight difference in the hypothesis. If the cause of the

1. Hypotheses

Null hypothesis: The motor/premotor activation found when subjects read and understand action verbs is epiphenomenal, and not necessary for understanding. When subjects are asked to judge whether two verbs mean approximately the same thing, simultaneous activation of the same motor or premotor areas by both verbs will play no part in that judgment. Therefore reaction time will not be affected by whether mismatches involve the same or different effectors.

Alternate hypothesis: When subjects are presented with verb-verb pairs and asked to judge whether they match, the reaction time for mismatches will be significantly longer when the verbs share an effector than otherwise.

2. Methods

2.1. Subjects

Subjects who participated in this study were all adult native English speakers (people who had started speaking English at age 5 or younger). A few were volunteers, but most were undergraduate cognitive science students at UC Berkeley. These received either extra credit or payment for their participation; those receiving extra credit, were allowed to participate regardless of their English proficiency. However, we omitted the data from non-native speakers from our analysis. We similarly omitted data from subjects who had participated in our previous study.

The classes for which students could receive extra credit by participating in this experiment had not, at the time of the experiment, covered material that would help students to guess the study's purpose.

2.2. Design

2.2.1. General Overview

Subjects were asked to sit at a computer and press labeled keys for yes or no, as appropriate. They were asked to sit comfortably and use different hands for each key, and to place their fingers on the keys before starting. At this stage, an experimenter was in the room with them.

They were then presented with written instructions. These started by informing subjects that this was a linguistics study, and reassuring them that it was not an intelligence or personality test.

They were then given more detailed written instructions. These informed subjects that they would be presented with two verbs in succession, and they were to say whether they considered the two to mean “approximately the same thing”. This phrasing was necessary because it is not possible to find exact synonyms for

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effect seen in the previous experiment really is an effect of motor activation being involved in verb understanding, we would still expect subjects to take longer to discount mismatches in the same-effector condition than the different-effector condition. But we would also predict that some interference would be involved in the comparison of near-synonyms. We would therefore predict relatively long reaction times for the matching condition. In effect, we would expect this task to be harder than matching pictures to verbs, because the matching condition does not involve exact matches.

common English action verbs. They were asked to respond to each pair as fast as possible, because there were a lot of pairs to get through; they were not explicitly informed that this was a reaction-time study.

Subjects were then asked three questions (whether they were left-handed, right-handed or ambidextrous, whether they were native English speakers, and whether they had previously participated in a related study). After this, they had a practice session, which consisted of eight randomly-chosen filler trials. During this, they were given (displayed) feedback. This part was also self-paced; subjects had to press a key to advance to the next trial, and were allowed to pause to ask the experimenter for clarification.

Once the practice session was complete, the screen informed subjects that it was, and reminded them to ask the experimenter any questions they might have. They were also reminded that there would be no feedback during the study, and that the program would continue immediately to the next pair of words once they pressed yes or no.

The experimenter then asked whether they had questions, and told them to come into the waiting area when they had completed the study. Then the experimenter left.

At the end of the study, the reminder to come into the waiting area was repeated on the computer screen, along with a message thanking subjects for their participation.

2.2.2. The Study

During the study itself, subjects were presented with a fixation cross in the center of the screen for 2 seconds.[3] This was followed by an English action verb presented for 1 second, then a visual mask for 0.45 sec and a blank screen for 0.05 sec. Then the second verb was displayed, and stayed on the screen until the subject pressed "yes" or "no". At this point, the next trial started.

All verbs were capitalized and presented in the center of the screen. Verb pairs could fall into the following categories:

1. Test stimuli: These were the verb pairs we were interested in. They involved hand, foot or mouth verbs, and constituted 50% of stimuli.
2. Filler: The remaining 50% of the stimuli were fillers, which were put in to make the point of the experiment less obvious. For the fillers, we tried to pick verb pairs which did not involve hand, foot, or mouth actions.[4]

In addition to this, the second verb in the pair could relate to the first in the following ways:

[3] It was found that a shorter presentation of the fixation cross made the study very stressful to take, and might therefore have caused an elevated error rate.

[4] In a few cases we failed, but the few students who ventured hypotheses after participating did not seem to notice the conditions we were looking at. We therefore have reason to believe that the fillers were effective.

1. Matching: near-synonyms. 50% of the pairs presented were matching.
2. Non-matching: verbs with clearly different meanings.[5] 50% of the pairs presented were non-matching.

The non-matching pairs for the test condition fell into two different categories:

(a) Same effector: In this case, both verbs referred to verbs whose primary effector (hand, foot or mouth) was the same.

(b) Different effector: the two verbs did not share a primary effector.

These were split evenly, so that 25% of the test pairs, or 12.5% of the overall pairs, fell into each of these categories. These percentages are shown in Table 2.

Table 2: Breakdown of Presentation Data

Condition	Matching	Non-matching same-effector	Non-matching different-effector	Non-matching total
Filler	25%	n/a	n/a	25%
Test	25%	12.5%	12.5%	25%

Examples of the different conditions are shown in Table 3. It should be noted that while some of the filler verbs referred to bodily action, the test condition verbs referred exclusively to human bodily action.

Table 3: Examples of Presentation Data

Condition	Initial verb	Match	Non-match same-effector	Non-match different-effector	Non-match
Test	SCREAM	SHRIEK	LICK	STEP	n/a
	TIE	KNOT	CLAP	RUN	n/a
	DANCE	WALTZ	LIMP	YELL	n/a
Filler	LEAK	DRIP	n/a	n/a	RUST
	GRAZE	FEED	n/a	n/a	PAUSE
	CHEAT	SWINDLE	n/a	n/a	BREAK

2.2.3. Design Issues

- **Choosing verb pairs**: Each initial verb was presented twice to subjects; once followed by a near-synonym, once by a mismatch. Subjects saw each test verb with only one mismatch: either the same-effector case or the different-effector case. Therefore 50% of the correct answers were "yes".

Mismatches were chosen out of the same pool of verbs as initial verbs. Verb pairings were pre-calculated before the experiment to ensure that each subject saw half of the initial verbs with a same-effector non-matching verb and half with a

[5] As determined by the pre-test to the previous experiment.

different-effector non-matching verb. Each subject saw any given non-matching verb in the second postion only once, as either a same-effector mismatch or a different-effector mismatch. Given this constraint, non-matching verbs were assigned randomly to initial verbs.

This divided subjects into two groups, depending on which set of initial verbs they saw with same-effector non-matching verbs. The survey software alternated between groups.

- **Choosing verbs**: There are not many English bodily action verbs that are short, commonly-used, and unambiguous in a neutral context. As a result, we did not have a very long list of choices, and did not select based on verb frequency.[6]

Choosing near-synonyms was problematic because for the most part, there are no commonly-occurring synonyms for simple action verbs. Some of the synonyms given were arguably mismatches (for instance, WINK and BLINK). However, we omitted all 'wrong' answers from our analysis, thus using only those answers where subjects' judgments matched our own.

- **Presenting a visual mask**: In the previous experiment, this was done to prevent iconic memory from affecting the results. This was much less important in the current study, but the visual mask was kept to maintain the parallel between the studies.

- **Running the experiment**: Subjects were presented with a python script written by one of the experimenters, and running on a machine that was not running any other programs. The accuracy of the script's timing, when tested, came to within 10ms.

3. Results

3.1. Data Considered

Non-native English speaker data was removed from the data set. In addition, we discarded all data from subjects whose mean reaction time (RT) was more than three standard deviations from the global mean. We also removed all data from subjects whose percentage error rate was more than three standard deviations above the global mean. Items whose mean RT was more than three standard deviations from the global mean would have been removed, but there were no such items.

It is worth noting that there were some clear outliers among the subjects whose data were not eliminated from the study. Of the 53 subjects whose mean reaction time was not more than three standard deviations from the global mean,

[6] Our verbs were selected by subjects in the pretest to the previous experiment, in which they identified the verb they associated with the visual images. We chose the verbs most commonly produced by subjects in response to the visual stimuli. These verbs were used for this experiment also; this ensured that we kept a consistent stimulus set.

six account for every response time of more than 4 seconds, and of those, three account for every response time over 4.4 seconds. The extreme outlying points in Figure 1, therefore, are not indicative of subjects' performance in general.

For this study, we have not considered how subjects performed on the filler sentences, nor the performance of non-native English speakers.

3.2. Errors per Condition

In the previous study, the number of errors was extremely low (under 2%). There were far more errors in this study. Subjects got the correct answer for 99.1% of the different-effector mismatches, but only 93.5% of the same-effector mismatches, and 87.8% of the near-synonyms. Performance on the different-effector mismatches was significantly more accurate than performance on either the near-synonyms (p=1.207e-10) or the same-effector mismatches (p=7.392e-07), and performance on same-effector mismatches was significantly more accurate than performance on the near-synonym condition, though this difference was less pronounced (p=1.042e-3).[7]

3.3. Reaction Times

Counting only correct replies, the mean reaction time was 0.93 seconds for the different-effector mismatches, 1.03 seconds for the same-effector mismatches, and 1.07 seconds for the near-synonyms. Figure 1 shows the mean and quartile reaction times for the three conditions. The whiskers extend to cover all data points which are no more than 1.5 times the interquartile range from the box.

As Clark (1973) shows, standard Analysis of Variance (ANOVA) is not sufficient for any generalization beyond the subjects and linguistic items tested. In order for a further generalization to be drawn, it is necessary to determine that F' is above significance; however F' is difficult to calculate. Clark sets forth a simple method to find the minimum possible value of F', called min F'; if this is above significance then F' must also be significant.

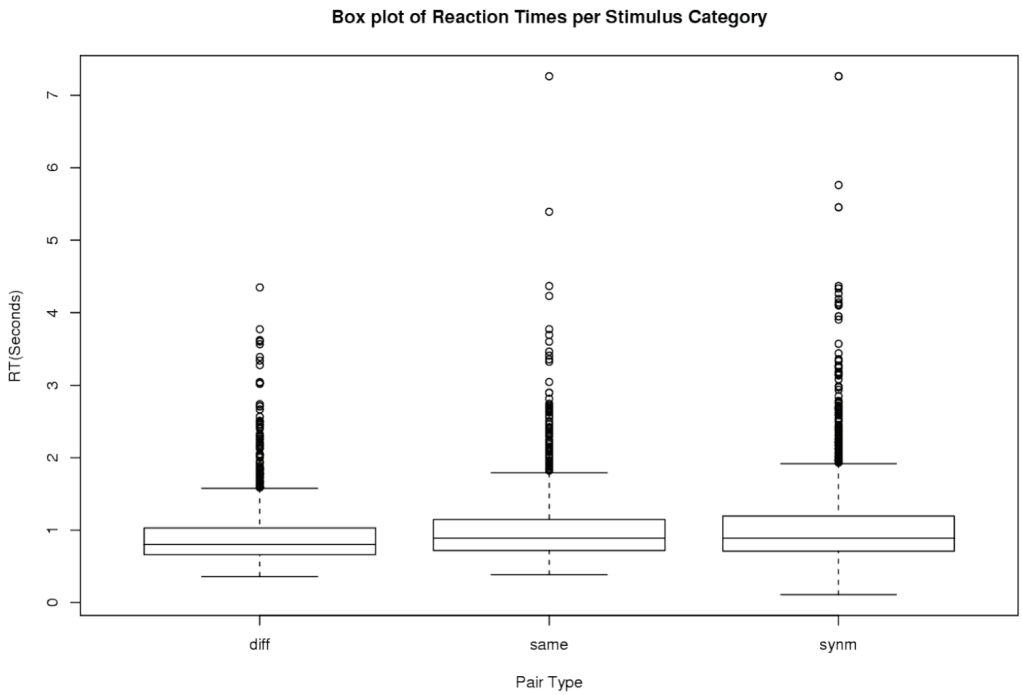
Following (Clark, 1973), we performed an ANOVA with subjects as a random factor ($F_1(1, 52) = 32.466$). We also performed an ANOVA with items as a nested random factor ($F_2(1, 82) = 12.607$). From these we determined that the difference in RT between the mismatch conditions is significant (min $F'(1, 126) = 9.0808$, $p = 0.0031 < 0.005$).

We therefore reject the null hypothesis.

Post-hoc tests comparing each of the non-matching conditions with the control condition give us the expected results. To compare the different-effector condition with the control, we performed an ANOVA with subjects as a random factor ($F_1(1, 52) = 25.454$). We also performed an ANOVA with items as a nested random factor ($F_2(1, 82) = 13.508$). From these we determined that the difference in RT between the control and the same-effector mismatch conditions is probably significant (min $F'(1, 126) = 9.781$). (Compare this to min $F'(1, 126) = 9.0808$ between the test conditions.)

[7] All data analysis was conducted using the *R* software package. Our thanks to Nathaniel Smith, who provided a great deal of help with both analysis and the software package.

Figure 1



To compare the same-effector condition with the control, we performed an ANOVA with subjects as a random factor (F_1 (1, 52) = 2.0015). We also performed an ANOVA with items as a nested random factor (F_2(1, 82) = 0.4675). From these we determined that the difference in RT between the control and the different-effector conditions is probably not significant (min F'(1, 129) = 0.3790).

Since these are post-hoc tests, we cannot simply convert the min F' values to p-values; however, the values are still worth noting.

4. Discussion

Subjects took significantly longer to reject a verb pair as near-synonyms when the two verbs shared an effector than when they did not. We also know from the previous study discussed above (Bergen et al. 2003) that subjects took longer to reject a verb that did not match a visual image when the action referenced by the verb and the action depicted in the image share an effector. These results provide evidence that the meanings of motion verbs include in their representations information about bodily action, in particular, the body part that is used to perform the action.

More broadly, the effect we see in understanding studies supports the notion that linguistic semantics are *embodied*, that word meaning is closely linked to the neural circuitry used for perception and motor action. It is still possible, however, that what we have found is an effect of memory, rather than lexical semantics. That is, it is possible that verb understanding is a completely abstract process, but that holding a verb in memory long enough to compare it to another involves

activation of the neural circuits discussed above. This possibility has been tested in recent work in our lab, using precisely the same methodology as the image-verb matching experiment described above, but with a reversed stimulus order, such that the written word preceded the image. The results once again demonstrated the same significant effect of shared effector on non-matching word-image pairs. The effect of memory will also be tested by a further study, in which the spoken word and image in each pair are presented simultaneously. Our hypothesis predicts that this should cause more interference if the verbs share an effector.

The work of Gallese et al. (1996) shows that in monkeys, mirror neurons can code not just for effector, but for finer distinctions, like specific handshapes. This leads to the possibility that similar actions could involve the activation of some of the same mirror neurons, in related circuits. If this is the case we might expect a fair amount of mutual inhibition between such circuits, and if so we would expect more inhibition between more similar circuits.

The work of Pulvermüller et al. (2001) and of Tettamanti et al. (ms) shows that words about motor actions cause activation of the specific mirror structures involved in performing those actions. The study presented here suggests that this activation is not epiphenomenal. When two verbs involving the same effector are presented, their neural representations are co-activated. These neural representations are similar, since they involve the same effector and therefore the same areas of premotor cortex. There is therefore a certain amount of competition between these circuits, and so it will take longer for both to become simultaneously activated, as would be necessary for the comparison required in this task. If the verbs do not share an effector, there will be less similarity between the neural representations, and they can become co-activated more easily.[8]

MacWhinney, Glenberg, and others have argued (MacWhinney, 1999; Glenberg and Robertson, 2000; Kaschak and Glenberg, 2000), that understanding language is based on internally simulating the described scenario. For instance, when we read the sentence "Sally sauntered sedately sideways"[9] we immediately understand the motor actions involved in sauntering; in fact, we do this so quickly that we need to reinterpret the sentence at the last word, since moving sideways would involve different motor actions from moving forward, which is our default. The results of this study are certainly consistent with these previous studies.

Regardless of the exact neural process responsible for our results, the findings reported above lend support to the hypothesis that verbal semantics are grounded in bodily experience, and our understanding of action verbs depends on our understanding of actions. This is part a growing body of work that supports the hypothesis that concepts, rather than being abstract and symbolic, are embodied in our sensorimotor experience. There is a great deal of evidence that imagined and

[8] In the case of near-synonyms, the representations share a great deal of similarity, but since they are only near-synonyms, they are not activating the same representation. Therefore there will still be mutual inhibition of circuits, and so it is not surprising that the near-synonym condition was one that showed the longest reaction times.

[9] Thanks to Alexander Lothar D'Archangel for this example.

remembered actions activate the same brain areas as performance of those actions (e.g. Wheeler et al., 2000; Nyberg et al., 2000; Nyberg et al., 2001; Porro et al., 1996; Rizzolatti et al., 1996). This study and its predecessor support the hypothesis that the same circuits are also involved in understanding language about actions. Other studies (e.g. Boroditsky et al., 2001) show that abstract domains, like time, are understood metaphorically in terms of concrete domains, like space. This suggests a way for embodied understanding of concrete concepts to map to understanding of abstract domains.

The evidence building up suggests a view of language and cognition that is ultimately grounded in our sensorimotor experience. In particular, our findings suggest that language understanding depends on the same motor circuitry involved in perceiving and producing actions, and that the organization of the sensorimotor system could be crucial to theories of language understanding.

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What Makes Path of Motion Salient?*

STÉPHANIE POURCEL
University of Durham

0. Introduction

The present research develops previous empirical work on the relationship between language and cognition, i.e. linguistic relativity. The approach taken adopts a combination of domain- and structure-centred epistemologies (Lucy 1997), departing from the experiential domain of human motion with a special focus on the dimensions of Path and Manner, and from the lexicalisation patterns available in the French and the English languages to express motion events.

This research expands on French and English linguistic and cognitive data obtained from categorization and elicitation tasks on motion (Pourcel in press a, b). The elicited data indicates that English lexicalises Manner and Path in 85% of motion verb phrases, whereas French lexicalises Path only in 65% of verb phrases – leaving Manner optionally lexicalised. This divergence led to the hypothesizing of a weaker level of cognitive salience for Manner amongst French speakers. Categorization tasks on motion with English and French subjects failed to support the hypothesis, as 60% of responses indicated Path salience in both groups.

This paper reviews these findings and their implications, and presents new experimental findings on memory, attention, inference, and overall cognitive salience of motion dimensions. Experiments include free recall, cue memorisation, and dimensional drawing. Preliminary findings confirm the cognitive prevalence of Path in motion conceptualization – regardless of the native input. Such findings would support the core schematicity of Path in language and in cognition proposed by Talmy (1991).

This paper further addresses the potential reasons behind the centrality of Path in human motion conceptualization. It suggests that, alongside previous proposals such as the cognitive simplicity of Path as shown through earlier acquisition and over-extensions by children (e.g. Choi and Bowerman 1991), other factors are responsible for Path salience. Indeed, single factors alone fail to explain findings

* This research has received approval from the Ethics Committee of the University of Durham (UK), and is funded by the Economic & Social Research Council (UK), award R42200154377.

in other studies reporting cross-linguistic Manner salience approximating 60% (e.g. Zlatev and David 2003).

The ultimate proposal is that Path receives greater salience depending on a range of variables, e.g. Path telicity, Manner force dynamics, Figure animacy and agency. The current tests aim to monitor these variables and assess their relevance in the differential cognitive salience of motion dimensions in conceptualization.

Empirical efforts attempting to prove the influence of the linguistic encoding of motion dimensions on motion conceptualization may therefore be valid only once these parameters of salience variability have been considered and their effects understood in experimental settings.

1. Expressing motion events in language

Non-linguistically speaking, motion events are characterised by a few fundamental features including a Figure (i.e. the moving entity), a Ground (i.e. the spatial reference), a Path (i.e. the directionality followed by the Figure), a Manner (i.e. the fashion in which the Figure moves), a Polarity (i.e. the spatial sequence of the Path), a Cause (i.e. the motivation behind motion), and a Result (i.e. the finality of the motion) – among others.

Linguistically speaking, Talmy's (1985) dual typology for motion expression is particularly relevant to a morphosyntactic appreciation of motion lexicalisation in French and English. It proposes that English – a 'satellite-framed' language – typically lexicalises the dimension of Manner in the main verb of the sentence, and the dimension of Path in a satellite element, e.g. a verb particle, so that both Manner and Path are part of the typical English motion verb complex, or verb phrase (henceforth VP), e.g.

(1)	She	flew	across	the Channel.
	Figure	Manner	Path	Ground

On the other hand, French – a 'verb-framed' language – typically lexicalises the Path dimension in the main verb of the sentence, and the Manner dimension in an optional constituent, so that only Path is part of the typical French motion VP:

(2)	Elle	a traversé	la Manche	en avion.
	Figure	Path	Ground	Manner
	She	*crossed*	*the Channel*	*by plane.*

The validity of Talmy's binary typology, as exemplified in (1) and (2), was confirmed in controlled elicitation tasks in 85% of instances in English ($N_{[motion\ sentences]}$ = 1382) and in 65% of instances in French ($N_{[motion\ sentences]}$ = 1800).[1] Albeit a matter of degree, these findings indicate a clear cross-linguistic difference of a structural nature. This structural state of affairs suggests

[1] Written elicitation tasks used 45 motion scenes shown on a TV set ($N_{English}$ = 31, N_{French} = 40).

differential linguistic foregrounding of Manner in French and English. Indeed, the French language tends to background the element of Manner to the extent that it is often left unsaid altogether – unlike in (2), e.g.

(3)	L'oiseau	est sorti	de sa cage.
	Figure	Path	Ground
	The bird	*exited*	*its cage.*

Encoding Manner may render sentences heavy, clumsy, and even redundant, so that sentences like (2) may be judged ungrammatical, e.g.[2]

(4)	?28%	Les enfants	vont	à l'école	en trépignant.
		Figure	Path	Ground	Manner
		The children	*go*	*to school*	*stamping their feet.*
(5)	?37.5%	Titi	sort	de sa cage	en volant.
		Figure	Path	Ground	Manner
		Tweety	*exits*	*its cage*	*flying.*

The reluctant codability of Manner in French is further mirrored at the lexical level, as verb-framed languages are indeed poorly equipped with lexical referents to Manner, as compared to satellite-framed languages, both quantitatively and qualitatively (Slobin 1997). The French construal of motion events highlights instead the static relations existing between scene components, e.g. Ground details and Figure states (e.g. psychological, locational, etc.).

Overall, both language types elaborate different discursive styles whereby different dimensions of motion construals receive foregrounding in linguistic expression. Linguistically speaking, the Path dimension is highly codable in both language types – though English may more readily accumulate Path and Ground combinations than French. On the other hand, Manner is highly codable in English only, and is represented by the lexicalisation pattern for motion expressions, whereas Manner is less codable in French and is typically left unsaid in natural discourse unless relevant to the arguments.

2. Dimensional categorization of motion in cognition

The question under debate, then, is whether speakers of different languages conceptualize motion differently because of the construals elaborated by their native language. Prior to investigating this question and the extent of its potential, it is fundamental to establish an understanding of motion conceptualization in general cognitive terms – one that is same for all speakers, regardless of their native tongue.

[2] Grammaticality judgements were provided by 64 native French speakers, in collaboration with Anetta Kopecka, Laboratoire Dynamique du Langage, Université de Lyon 2, France.

2.1. Methodology

Pourcel (in press a, in press b) has reported cognitive data testing English and French native speakers on cognitive visualisation tasks ($N_{English} = 64$, $N_{French} = 75$). Categorization experiments were implemented, requiring native subjects to judge mute visual stimuli (in the form of video clips) in terms of similarity, e.g.

(6) a. a man running up a hill
b. a man running down a hill
c. a man walking up a hill

The test comprised fifteen such triads, with differing Manner and Path types (but invariant Grounds and Figures), always organised so that two distinct pairs would correspond to Path similarity (e.g. 3a and 3c above) and to Manner similarity (e.g. 3a and 3b). Path types included instances of up, down, into, out of, across, along directions, and Manner types included instances of walking, running, tiptoeing, limping, cycling, climbing, kicking, pushing, pulling, and more.

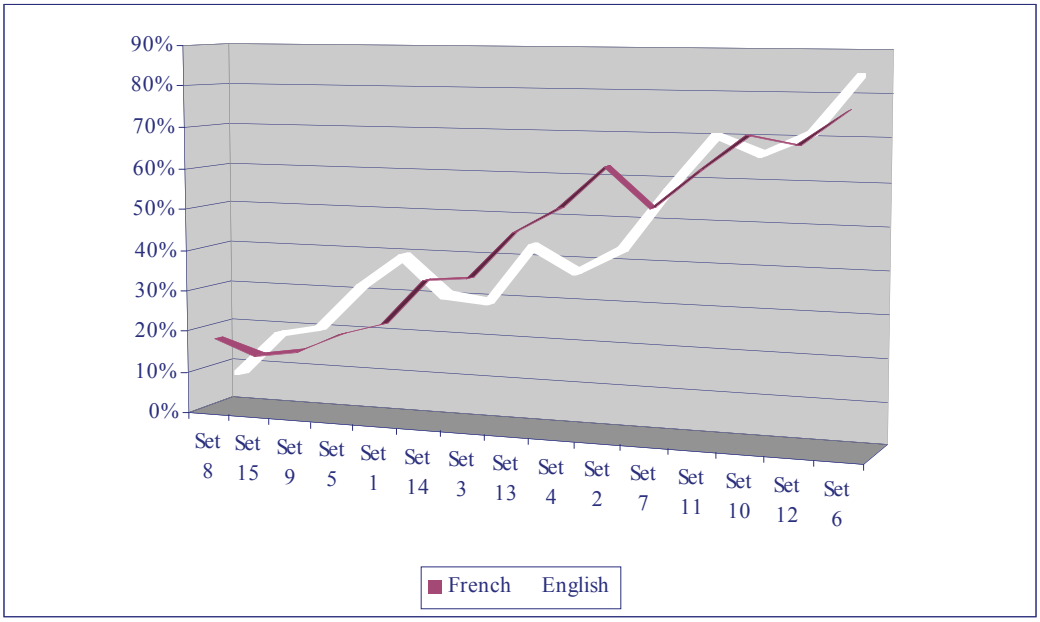
2.2. Experimental results

This experiment revealed striking similarities in cognitive performance, with both language groups favouring Path associations in 55.5% of choices in the English sample, and in 53.5% in the French sample – against 40.5% of English Manner choices, and 39.5% of French choices.[3] These patterns suggest that Path may be slightly more cognitively salient than Manner in human motion conceptualization.

A closer examination further revealed consistent response ranking across triadic stimuli type (see Graph 1), so that some triads yielded over 80% of Manner responses, whereas others obtained under 20% of Manner responses. This suggests that some intrinsic characteristics of the motion scenes trigger differential cognitive salience for Path and Manner. In other words, Path and Manner receive different levels of salience in conceptualization depending on the nature of the motion scenes themselves. These salience factors – which are not linguistic – must be identified and understood prior to investigating language as an additional factor influencing motion conceptualization. In the present case, the factors identified are conceptual and correspond to Path telos and to Manner force dynamics.

[3] Statistics do not equate to 100% in either language group, as some choices correspond to 'impossible' associations. The test – by its monitoring nature – did not present a target item with two alternate items.

Graph 1. Ranked Manner responses.



2.3. Path telos

As highlighted by Aske (1989), there exists two distinct types of Path, namely telic and atelic (or locative) Paths. Telicity entails an end-point or the crossing of a boundary, so that (7) represents a telic type of Path, and (8) an atelic one:

(7) We walked into the room.

(8) We walked along the beach.

Both language groups displayed a clear correlation between Path type and association type, whereby telic stimuli trigger Path preferences and atelic stimuli trigger Manner preferences (see Table 1).

Table 1. Proportion of association types relative to telicity.

	Telic sets		Atelic sets	
	Path	Manner	Path	Manner
English (N=64)	64%	36%	45%	54%
French (N=75)	64%	36%	43%	56%

We may infer from these figures that there is a definite link between the conceptual salience of either Manner or Path and telicity in motion. It is possible to offer a preliminary explanation for this state of affairs through an understanding of directionality. The notion of directionality in real-life, *human* motion combines with the notion of agent intentionality, in the sense that human behaviour is goal-

driven. Directionality in human motion may be understood to represent the very goal of motion – at least in typical cases. Such a suggestion would entail that the Path dimension overrides the Manner dimension in the cognitive appreciation of human motion as a general rule. The purposeful attitude on behalf of the agent presupposed by directionality is moreover somewhat lacking in the dimension of Manner – except possibly in ad hoc Manner types (e.g. tiptoeing bare-feet on gravel to avoid pain or jumping to get something out reach) – even when Path is partly inherent and invoked by other features such as Ground.

With humans being meaning-seeking creatures, it appears very likely that the purpose-loaded dimension of motion should therefore be the dimension receiving higher levels of cognitive salience across species members and hence across language groups. As a rule, the end justifies the means, and it is possible that the means, or the Manner of motion in this case, is secondary in human actions. Furthermore, in the case of a decontextualised task, such as the present categorization tests, it is also possible that subjects found an even greater need to reconstruct, or simply to identify or infer, agent intentionality in order to make sense out of the stimuli, and out of the task overall.

To explain the data in Table 1, it is evident that in telic cases, the agent's directional purpose is rendered particularly explicit, and hence salient. On the other hand, when directionality is unclear and intentionality is hence uninferable, subjects' performance granted Manner higher salience.

It is possible that Manner is never quite the most cognitively salient element in motion. Rather, Path may always be relatively more salient, unless it is atelic and the agent intentionality is unclear. Further, this suggestion may be valid to the limited extent that the motion agent is human, or at least animate, on two grounds, (a) intentionality is a cognitive ability requiring a cerebral creature, and (b) the natural human tendency to self-project entails that empathy on an intentional level is possible so long as the self-projection recipient conforms to the original, i.e. it has to be animate, and human ideally. This possibility would predict that similar experiments on non-intentioned moving agents (e.g. inanimate agents) would fail to reproduce the Path salience reported in the present research. This is indeed the case in studies implemented with the Max Planck Institute of Psycholinguistics's elicitation tool using 2-D digital vegetables in motion scenes. These studies report an overall two third preference for Manner, the opposite of the present findings (e.g. Zlatev and David 2003).

2.4. Manner force dynamics

The human body can perform motion in a number of different ways, or types of Manner. Manner types differ from one another depending on various aspects, such as the body part(s) used, instruments or vehicles, force dynamics, inherent directionality, the presence of an axis, actual displacement, and so on.

Based on the stimuli used in the present experimental set-up, I suggest a broad classification of Manner types with 3 categories of force features: (a) default, (b) forced, and (c) instrumental Manner types. Default Manner types refer to the

expected Manner for performing a motion, e.g. walking (humans), running (humans), crawling (babies), flying (birds), rolling (balls), e.g.

(9) He walked into the house.

Forced Manner types involve some conscious and intentional effort, or some form of physical impediment, so that the Manner of motion involves a level of difficulty in performance, e.g. hopping, skipping, kicking, throwing, limping, bouncing, marching, zigzagging, waltzing, e.g.

(10) She tiptoed up the stairs.

Finally, instrumental Manner types involve an extra element besides the human body used to perform the motion, e.g. cycling, rowing, ballooning, skating, e.g.

(11) We skied down the slope.

The data from this small-scale study already suggest a consistent correlation between neutrality of Manner (i.e. default) and low Manner scores on the one hand, and force and instrumentality features and higher Manner scores on the other hand (see Table 2).

Table 2. Proportions of association types relative to force features.

	Default		Forced		Instrumental	
	Path	Manner	Path	Manner	Path	Manner
English (N=64)	76%	24%	51%	49%	41%	59%
French (N=75)	74%	26%	50%	50%	48%	52%

These figures indicate that Path of motion receives higher cognitive salience than Manner when Manner types correspond to default expectations for motion performance, whereas attention is more strongly focused on Manner itself when force features involve efforts and/ or instruments.

This confirms the above suggestion that Path is more centrally salient than Manner in motion conceptualization, as Manner salience only obtains when default expectations are violated. However, Manner is never overwhelmingly more salient than Path, and the differences in forced and instrumental scores for Path and Manner choices do not yield statistical significance.

2.5. Summary

The identification of the above features as factors of influence on dimensional salience in motion conceptualization enables cognitive predictions for behaviour combining both Path telos and Manner force dynamics (see Graph 2). Indeed, we may predict the following:

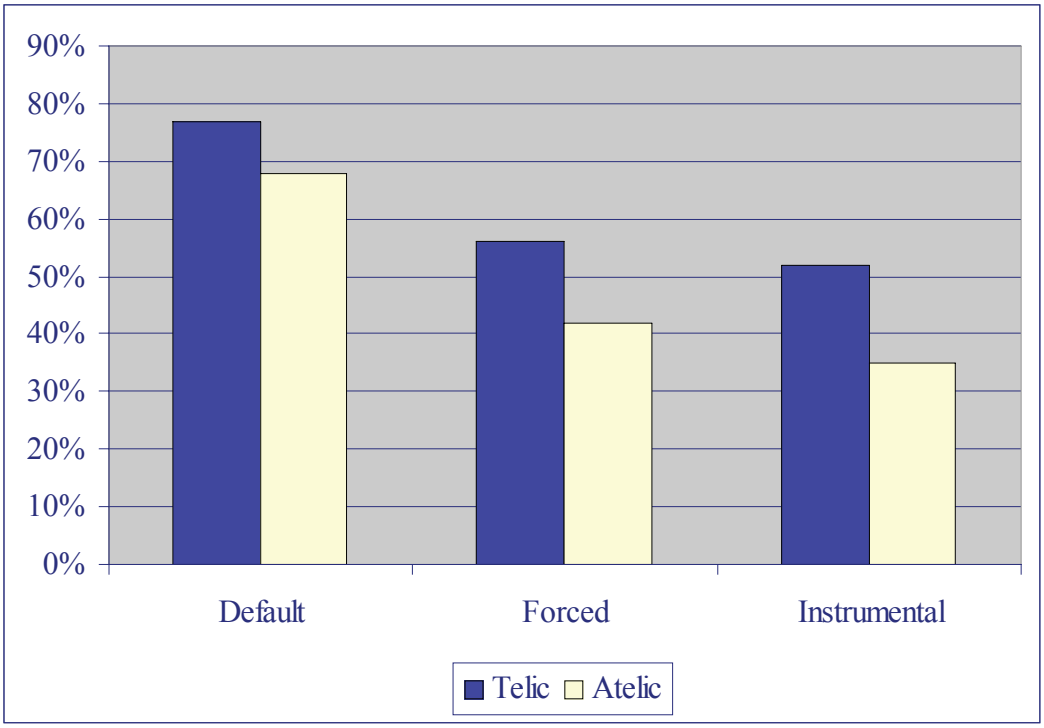
(12) [+telicity] [-force] = higher Path salience

(13) [-telicity] [-force] = higher Path salience but lower than in case (12)

(14) [+telicity] [+force] = mixed Path and Manner salience

(15) [-telicity] [+force] = higher Manner salience

Graph 2. Proportions of Path associations relative to force features and telicity[4]



It therefore appears, at preliminary glance, that what makes Path cognitively salient in motion conceptualization are Path telicity, default Manner types, human Figures, and agent intentionality.

3. Linguistic relativity

Based on the above understanding, further experiments were implemented testing memory and conceptualization through drawing. These experiments are at a pilot stage and the results are only suggestive therefore. Nonetheless, methodologically speaking, these tests offer new ways of investigating language effects on cognition. Preliminary results do suggest differences between English and French speakers following the patterns of their native languages.

[4] This graph illustrates the results of both language groups conflated together.

3.1. Conceptualising motion through drawing

3.1.1. Methodology

This experiment asked subjects ($N_{English} = 18$, $N_{French} = 8$) to produce drawings of 5 short video clips displaying motion scenes a few seconds long, as follows:

(16) A man running down a flight of stairs.

(17) A man jogging along a street and into a house.

(18) A man limping towards a woman sat down on a sofa.

(19) A man kicking a door shut.

(20) A man diving into a swimming pool.

In drawing tasks, subjects try to render the stimuli elements that they perceive to be salient so that drawings represent fair translations of the stimuli. With motion, subjects have to render an unbounded, dynamic 3-D image onto a bounded, static 2-D format; this means that subjects must select in and out features relevant to their conceptualization of the stimuli. For instance, Manner of motion may be particularly difficult to draw, e.g. limping, so that an attempt to render limping would entail that Manner has been selected as a particularly salient feature of the stimulus. Likewise, Path entails some change of location, and is therefore a dynamic concept that is not drawable in the sense that static entities, such as Grounds, are. Therefore, subjects would have to add arrows or dotted lines – not seen in the stimulus – were they to find Path a salient feature in their conceptualization of the stimulus.

3.1.2. Results

Few differences were observed across language groups in the drawing of Grounds, Figures, and Manners. Differences appeared in the rendering of Path, which French subjects drew more systematically, using lines, arrows, and segmented Figures. Likewise, French subjects more readily provided details of a contextual nature, i.e. descriptions of background settings (e.g. vegetation, sunshine). Finally, this task also tested the predictions in (12)-(15). The Manner types displayed in the video stimuli displayed a gradation in force features:

(21) RUN → JOG → LIMP → DIVE → KICK
[- force] → → → → → → [+ force]

Ironically, drawing default Manner types should be somewhat easier, which may encourage results going against the predictions. However, the reverse obtained so that subjects' performances strongly confirmed the force-based predictions for Manner salience in conceptualization (see Table 3).

Table 3. Proportions of Manner types drawn

	Default				Forced
	Run	Jog	Limp	Dive	Kick
English (N=18)	50%	56%	67%	72%	100%
French (N=8)	25%	63%	75%	88%	100%

With respects to Path, (12)-(15) would predict telic Path types to be drawn more consistently. However, all video clips displayed telic motion events. Yet, a gradation in degree of telicity is notable, with Path types showing a progression, e.g. along, less consistently drawn than punctual or sudden Path types, with an obvious change of location or end point, e.g. into. In other words, the more telic the Path, the more salient it seems to be in cognition (see Table 4).

Table 4. Proportions of Path types drawn

	[- telos]				[+ telos]
	Down	Along	Shut	Towards	Into
English (N=18)	39%	44%	50%	56%	67%
French (N=8)	25%	63%	63%	75%	75%

3.2. Memorizing motion dimensions

3.2.1. Methodology

The memory tests attempted to contextualize motion scenes in real-life settings, using a 4½ minute extract from Charlie Chaplin's *City Lights* – comprising numerous motion events with various types of Manner and Path. Subjects ($N_{English}$ = 14, N_{French} = 8) performed free prose and recognition recall tasks.

3.2.2. Results

Error rates in accurate memorizing in the free prose recall are low, overall, yet they reveal different patterns across the language groups (see Table 5). Language-based predictions would entail that motion (and Manner) may be more closely attended to by native English speakers – given the high codability of its dimensions in English – whereas Figure states, Grounds, and overall context may be more readily foregrounded in French cognition as a result of their linguistic foregrounding in French lexicalisation patterns for motion encoding.

Table 5. Proportions of errors in the free prose recall.[5]

	Agent motion	Object motion	Agent state
English (N=14)	7%	9%	11%
French (N=8)	13%	17%	7%

These predictions are further validated by the recognition results (see Table 6).

[5] Agentive and object motion were distinguished on the basis of the prior prediction concerning the higher salience of Path in animate motion in human cognition.

Table 6. Proportions of errors in the recognition recall.

	Manner	Path
English (N=14)	15%	80%
French (N=8)	32%	37%

One Manner question was excluded from this count as it skewed the statistics. It asked whether Chaplin runs at a critical point when a character is about to jump in a river to commit suicide. The right answer was positive. The English error rate was an unusual 55% (vs. 25% for the French). One comment was additionally often voiced by English subjects: "Chaplin never runs!" This may suggest that English speakers pay so much attention to Manner of motion, that people may be characterised and identified partly by the way they move. Such a characterisation means that some English answers may not have been actual recall, but inference, in which case their general characterisation of Chaplin's default Manner of motion induced them into error when an unexpected Manner type occured. The fact that French speakers did not make half as many errors is similarly suggestive that partial attention only to Manner did not generate this error to the same extent.

Finally, the figures reported on Path errors beg further comment. This rate corresponds to one question only, which asked whether a character took his shoes off before rescuing Chaplin from drowning in the river. The answer was negative. Examining the motion scene more closely, the act of taking one's shoes off is easily inferred from a preceding set of Manners of motion, e.g. sitting down, crouching, bending over, reaching for one's shoes. In the film, the character had just taken off his jacket, and then decided to sit on a bench, where he crossed his legs, and reached for one shoe – though he never undid either shoe in the end. Again, it may be suggested from the substantial difference in error rates, namely 43%, that English speakers inferred the result of having ones shoes off from the Manners of motion that preceded that result. The explicitness of those Manners led subjects to the false deduction that the shoes had come off. One possibility for this false inference by English speakers may relate to a higher level of attention paid to Manner by English native speakers. It is also worth noting that this particular error was also made in the free prose recall to the extent that some English subjects speculated that the character put his shoes back on at the end of the film. On the other hand, French subjects never made such a suggestion.

4. Conclusion

Through experimental set-ups, the present research has identified intrinsic motion properties responsible for the higher salience of Path in human motion conceptualization – telicity, default Manner types, agent animacy and intentionality. These properties were consistent findings in the categorization and drawing tasks. The memory tests aimed at testing linguistic relativity, asking whether Manner is differentially attended to across the 2 language groups. It provided an integration of motion scenes within a human context, and yielded differences concordant with the hypothesis that Manner would be more salient in English speakers' cognition.

This finding was reinforced by unexpected errors made by the English group on unexpected Manner types and Path inferences.

Importantly, these tests are only at a pilot stage and used small samples of native speakers. As such, they suggest new experimental approaches to the study of linguistic relativity and motion conceptualization. Nonetheless, the results are already suggestive, and further testing may reveal more consistent differences, and confirm some level of relativism in the domain of motion between French and English native speakers.

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Stéphanie Pourcel
School of Linguistics and Language
University of Durham
Durham, DH1 3JT
United Kingdom
s.s.pourcel@durham.ac.uk

Learning Japanese Case: Overextensions and the Effects of Feedback

TAKAAKI SUZUKI
Kyoto Sangyo University

0. Introduction

In a highly elliptical language like Japanese, where argument NPs are frequently dropped from a sentence, children receive little information about case-markers (Rispoli 1991). Quite naturally, learning Japanese case-marking is a time-consuming and error-driven process (Suzuki 1999). This study demonstrates that Japanese-speaking children often make overextension errors in case-marking, and that the errors are not easily corrected unless corrective feedback is continuously provided.

1. Japanese case-markers

In Japanese, grammatical relations are morphologically marked. Subjects of intransitive and transitive verbs are marked by the nominative *–ga*, and the direct object by the accusative *–o* as shown in the following sentences.

(1) Taro-ga hasiru.
Taro-Nom run
'Taro runs.'

(2) Taro-ga Hanako-o hometa.
Taro-Nom Hanako-Acc praised
'Taro praised Hanako.'

Thanks to these case-markers, it is possible to identify the grammatical relations when the word order is changed into OSV as in (3) and when argument drop happens as in (4).

(3) Hanako-o Taro-ga hometa.
Hanako-Acc Taro-Nom praised
'Taro praised Hanako.'

(4) Taro-ga hometa.
Taro-Nom praised
'Taro praised (X).'

Hanako-o hometa.
Hanako-Acc praised
'(X) praised Hanako.'

The Japanese case-marking system is explicit in the above sentences. However, case-markers are often unavailable in actual speech because argument ellipsis is very common, case-markers are often replaced with the topic particle *–wa*, and case-markers are sometimes dropped from argument NPs, referred to as case drop. If these phenomena happen in caregivers' speech, they are likely to cause a serious problem for children's learning of case-markers.

Analyzing caregivers' speech to Japanese-speaking children, Nakayama (1996) found that approximately 70% of parental speech to children involved argument drop. Rispoli (1991) also observed scant use of case-markers in parental speech. In his data, sentences involving nominative case-markers constitute only 8% of all intransitive sentences. In transitive sentences, nominative case-markers were used 4% of the time, accusative case-markers 7%, and both nominative and accusative case-markers were used only 1% of the time. According to these observations, it is possible to suggest that Japanese-speaking children receive very little information about case-marking from parental input.

2. Previous studies on the acquisition of case-markers

Despite the fact that children receive little case-marking information, it is widely believed that Japanese case-markers are acquired at relatively early stages of language development. For example, Nagano (1959) and Okubo (1967) looked at the emergence of case-markers in the children's speech and suggested that case-markers are acquired at around age 2. More recent studies (Clancy 1985, Morikawa 1989) examined children's use of case-markers and found few case-marking errors in children's speech production.

However, I question this "almost error-free acquisition of case." This is because in children's spontaneous speech, argument drop is very common, case-markers are often replaced with other particles, and case-markers are often dropped from argument NPs. Taking them into consideration, I believe that even if children's knowledge of case-markers is unstable, it may not be seen as errors in their spontaneous speech. Therefore, it is ideal to investigate this issue in experimental situations.

2.1. Experimental data on production (Suzuki 1999)

Suzuki (1999) examined children's speech production of case-markers in an elicited production task performed by thirty preschool children. The results show that many case-marking errors were made, and that they were observed on the

direct object more frequently than on the subject as shown in Table 1. It was also found that most of the case-marking errors were the overextension of the nominative case to the direct object as shown in Table 2.

Table 1 Percentages of case-marking errors

	Subject	Object
Younger	14.8%	46.6%
Older	7.9%	27.9%

Table 2 Error types

	Subject	Object
Accusative/Nominative	54 (96.4%)	174 (93.5%)
Other particles	2 (3.6%)	12 (6.5%)
Total	56 (100%)	186 (100%)

2.2. Experimental data on comprehension

The production data in Suzuki (1999) imply that children treat direct objects as if they were subjects. However, there is also the possibility that children know the function of the accusative case but they for some reason do not produce the accusative case-marker. A comprehension task can test whether children treat the direct objects as subjects or whether they understand the functions of case-markers but fail to produce the accusative case-marker.

Forty-four children aged between 3;1 and 6;2 (mean = 4;7) participated in the experiment. They were divided into two age groups: A younger group consisted of twenty-four 3- and 4-year-olds, and an older group twenty 5- 6-year-olds.

The child's task was to look at a picture where two animate entities were engaged in a certain action (e.g., hitting), and to answer the subject *wh*-question and the object *wh*-question as in (5).

(5) <u>subject *wh*-question</u>
Dare-ga tataita no?
who-Nom hit Q
'Who hit (X)?'

<u>object *wh*-question</u>
Dare-o tataita no?
who-Acc hit Q
'Whom did (X) hit?'

If the child understands the function of case-markers used in the test sentence, s/he can answer these questions correctly.

The results are summarized in Table 3. Incorrect responses were often observed, and they were more frequent for the object *wh*-question than for the subject *wh*-question. This asymmetry is consistent with the production task where children made case-marking errors more frequently for direct objects or the accusative case than for subjects or the nominative case. Thus, the results of the comprehension task suggest that preschool children's overextension errors in their speech production are due to their unstable knowledge of case-markers.

Table 3 Percentages of incorrect responses

	Subject	Object
Younger	14.6%	71.4%
Older	3.1%	40.0%

3. Learning Japanese case-markers

Two important questions arise from the results of the experiments reported above. One regards why children make overextension errors of the nominative case so frequently in comparison to other types of case-marking errors. The other is how children retreat from these errors in the end. As I have discussed the first question and made some suggestions in Suzuki (1999), I will now focus on the second question.

How children retreat from errors is commonly discussed in relation to a learnability problem: the investigation of abstract and universal properties of language not inducible from input. However, the target grammar dealt with here is not a typical instance of this issue for at least two reasons. First, Japanese case-markers are mostly language-particular phenomena. Learning phonological and morphological aspects of case-markers are not universal, and they seem to be independent of the acquisition of abstract Case (Suzuki 1999, see also Wexler et. al. 1998). Second, as has been observed, children make a lot of case-marking errors. Typical examples of abstract and universal properties of language, such as principles of UG, are believed to be error-free. However, in the case of Japanese case-markers, timing of the acquisition is rather late and the acquisition process involves making many errors.

For these reasons, I believe that learning Japanese case-markers is not a deductive process based on innate syntactic constraints. Rather, it seems to be oriented mostly by children's experience. Thus, it is worth exploring what types of parental input and adult responses contribute to children's learning of case-markers. As a first step to answering these questions, I have conducted two experiments that provide artificial learning circumstances where input data are controlled.

4. Experiment 1: Effects of positive evidence

Experiment 1 examines whether children can make use of positive evidence for the case-marking of newly learned verbs.

4.1. Subjects

The participants were seventeen Japanese-speaking preschool children whose ages ranged from 3;1 to 6;1 (mean age = 4;10). There were five 3-year-olds, five 4-year-olds, three 5-year-olds, and four 6-year-olds.

4.2. Materials and Procedure

In order to test the children's knowledge of case-markers and their responses to adult input, I adopted an elicited production task by using a set of pictures and a

doll called "the Judge." First, the child was taught a novel verb. Two pictures in Figure 1 were shown and the experimenter introduced *muteru* as a transitive verb. The experimenter mentioned two animals and the novel verb, and explained that the action depicted in the second picture is called *mureru*. A past form, *mutetta*, was also introduced to show that the novel word follows the verb's inflectional pattern in Japanese, but the experimenter never gave the child information about case-markers by dropping arguments. Then, the third picture in Figure 2 was shown where one of the animal entities is hidden with a black cover. The experimenter said, "We don't know who this is, can you ask the Judge who?" In the practice session, the child had been told that a doll named the Judge knew who the hidden animal was and that the Judge would give her/him a hint if the child asked appropriately.

Figure 1 The first two pictures to teach the novel verb *muteru*

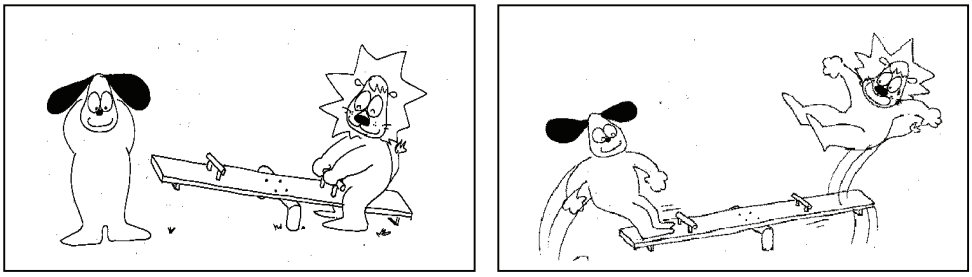
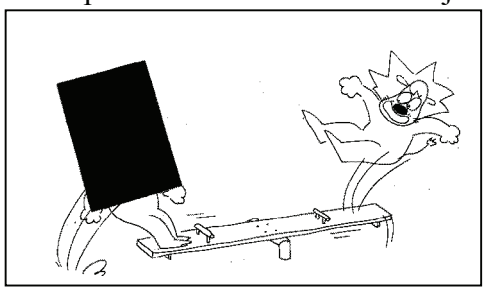


Figure 2 The third picture used to elicit the subject of *muteru*



The child's task was to ask the Judge who the covered animal was by using a novel verb. The target utterances are shown in (6): the subject *wh*-question and the object *wh*-question. This situation is called the no input condition, because the child has not yet received case-marking information at the time s/he tries to produce a case-marker.

(6)	<u>subject *wh*-question</u>	<u>object *wh*-question</u>
	Dare-ga mutetta no?	Dare-o mutetta no?
	who-Nom verb Q	who-Acc verb Q

In response to the child's question, the Judge would give her/him a hint like "It's the one that says oink," and the child almost always got a correct answer. At this

point, the experimenter gave the child the first evidence for the case-marking as in (7).

(7) So da ne. Buta-ga mutettan da ne.
so cop pcl pig-Nom verb cop pcl
'Right!' 'A pig did X.'

This is considered positive evidence, and the effect of the positive evidence was tested immediately after (7) by eliciting the same sentence structure while showing the same picture for another set of unknown entities. This situation is called the positive evidence condition.

A total of three novel verbs were tested. Other verbs were *rakeru* meaning that *X* having a certain device, directs it at *Y* who becomes sweaty, and *naneru* meaning that *X* jumps toward *Y* and hits *Y* with its head. The order of the three verbs and that of the arguments elicited were counterbalanced.

4.3. Results

All conversations were tape-recorded and the relevant portions were transcribed by the experimenter. The children's utterances for the question formation were then examined to see whether they were compatible with the target sentence structure shown in (8).

(8) *wh*-word + particle verb question-marker?

Although the omission of the case-marker is not necessarily ungrammatical, for the purpose of investigating children's usage of case-markers, the omission of the case-marker was treated as a non-targeted sentence structure. At this point, it was found that three children consistently produced sentences that were not compatible with the target sentence structure. Therefore, they were excluded from further analysis. The remaining 14 children (mean age = 4;9) occasionally produced non-targeted sentences, but their utterances also involved the sentence structure consistent with (8); therefore, these sentences were examined as to whether correct case-markers were used.

Table 4 summarizes the number of target sentences and correct case-markers produced by the children in the no input condition and in the positive evidence condition. Overall, it is clear that the children produced the correct case-marker for the subject *wh*-question more frequently than for the object *wh*-question, and that there was no difference in their performance between the two conditions. This subject-object asymmetry in case-marking errors is consistent with the results of previous experiments for existing verbs. However, error rates on the direct objects are higher for the novel verbs in the present experiment than for existing verbs in previous experiments. Only one child used the accusative case correctly on the direct objects in the no input condition as well as in the positive evidence condition.

Table 4 The number of target sentences and correct responses

	Subject		Object	
	Correct	Target	Correct	Target
No input condition	35 (13)	39 (14)	2 (1)	35 (13)
Positive evidence condition	36 (14)	39 (14)	2 (1)	38 (14)

The cumulative number of children is shown in the parentheses

A complex picture emerges when individual performance is examined for each of the three verbs. First, all fourteen children made case-marking errors in the no input condition, but only five of them changed their utterances in the positive evidence condition. In other words, most children persisted in their incorrect initial assumption even after correct positive evidence was provided. Second, as shown in Table 5, most case-marking errors were the overextension of the nominative case to the direct object, and only two children made other types of errors: overextension of the accusative (child #4), and that of the dative *–ni* (child #9). There was also misuse of the topic particle *–wa* on the subject by one child. Third, even if the children changed their utterances in the positive evidence condition, their errors rarely improved.

Table 5 Individual performance for three novel verbs in Experiment 1

		Verb 1				Verb 2				Verb 3			
		Subject		Object		Subject		Object		Subject		Object	
Child	Age	NC	PC	NC	PC	NC	PC	NC	PC	NC	PC	NC	PC
1	3;1	N	N	N	N	N	N	N	N	N	N	N	N
2	3;7	N	N	N	N	N	N	z	z	N	N	N	N
3	3;7	N	N	N	N	z	N	N	N	N	N	N	z
4	3;8	N	N	ug	N	A	N	A	A	N	A	A	A
5	3;11	N	N	N	N	N	N	N	N	N	N	N	N
6	4;2	N	N	N	N	N	N	N	N	N	N	N	N
7	4;7	N	N	N	N	N	N	N	N	N	N	N	N
8	4;10	N	N	rc	N	N	N	rc	N	N	N	N	N
9	5;8	T	N	D	D	T	T	D	D	T	T	D	D
10	5;9	N	N	N	N	N	N	N	N	N	N	N	N
11	5;9	z	z	z	z	z	z	z	z	N	z	z	N
12	6;0	N	N	N	N	N	N	N	N	N	N	N	N
13	6;1	N	N	N	N	N	N	N	N	N	N	N	N
14	6;1	N	N	N	N	N	N	N	N	N	N	N	N

NC: No input condition A: Accusative z: Zero-marking
PC: Positive evidence condition D: Dative rc: Relative clause
N: Nominative T: Topic-marker ug: ungrammatical sentence

In order to investigate how the positive evidence affected the children's performance, I will focus on five children who changed their utterances after positive evidence was provided. They are children #3, 4, 8, 9, and 13. Among them, four children (children #3, 4, 8, and 11) seem to have recognized what the

target sentence structure was after positive evidence was given. For example, for the elicitation of the object *wh*-question in the no input condition, child #4 initially produced an ungrammatical sentence like in (9). Similarly, child #8 produced a relative clause construction as in (10) for two verbs.

(9) * *Raketta wa dare?*
verb -Top who

(10) *Raketta no wa dare?*
verb one Top who
'Who is the one that was raketta?'

(11) Dare-ga raketta no?

(12) Dare raketta no?

However, after they heard the experimenter's modeled speech, they changed their sentence structure to an NP + V pattern as in (11), although they did not use correct case-markers. Also, children #3 and #11 initially produced a sentence without a case-marker as in (12), but then started to use it in the positive evidence condition. However, a reverse pattern was also observed for the same children (#3 and #11) for the other verbs and thus their performance may not have actually been affected by the positive evidence. In general, positive evidence is likely to help the child to recognize the target sentence structure, but it may not help the child to implement the correct case-markers.

However, there were two cases where positive evidence worked for the children's correct case-marking. Child #4 incorrectly used the accusative case for the subject of verb 3 in the no input condition, but he used the nominative in the positive evidence condition. Child #9 used the topic particle for the subject of verb 1 before positive evidence was given, but after receiving the positive evidence he used the nominative case correctly. Note that both cases here were limited to the nominative case-marker on subjects.

In sum, positive evidence may simply help the child to recognize the target sentence structure, but there are individual variations in children. However, it was not sufficient for correcting children's case-marking errors in most cases, since many children persisted in incorrect case-marker(s) even after they received positive evidence.

5. Effects of negative evidence

Experiment 2 investigates the effects of negative evidence. Negative evidence generally refers to the information of ungrammaticality about a sentence, including disapproval, clarification requests, and explicit correction. However, I will use the term "negative evidence" as defined by Saxton (1997:145) as shown in (13).

(13) Negative evidence: Negative evidence occurs directly contingent on a child error, (syntactic or morphosyntactic), and is characterized by an immediate contrast between the child error and a correct alternative to the error, as supplied by the child's interlocutor, as in (14).

(14) Child: He shooted the fish.
Adult: He shot the fish!

According to Saxton (1997), the negative evidence provided immediately after the child's error highlights the contrast between the child's error and the correct form. His experimental study demonstrates that English-speaking children can learn the irregular past tense form of novel verbs when negative evidence is given. In the present experiment, I will investigate whether negative evidence works for Japanese-speaking children's learning of a case-marker.

5.1. Subjects

The participants were 6 preschool children whose ages ranged from 3;7 to 5;9 (mean age = 4;6). There were two children each in the 3-, 4-, and 5-year-old ranges.

5.2. Materials and Procedure

This experiment adopted the same materials and procedure as in the first experiment, but the experimenter's reaction to the child's first trial was different. In this experiment, when a child produced an incorrect *wh*-question, the experimenter reacted as in (15) by contrasting the correct case-marker with the child's incorrect one.

(15) Child: Dare-ga mutetta no?
Exp: Dare-o mutetta ka kite mite?
'Why don't you ask (him) whom (he) did X?'

If the child's error was not corrected by this feedback, the experimenter continued to have the same reaction to give the correct case-marker to the child. The case-marker examined in this experiment was focused on the accusative on the direct object of three novel verbs.

5.3. Results

Table 6 summarizes the results and Table 7 shows the individual data. In the no input condition, no child produced the accusative case on the direct object, and 4 children produced the target sentence structure. Non-targeted structures included the omission of a case-marker and an ungrammatical sentence. When the first negative evidence was provided, no child improved, although there was one more child who started to produce the target sentence structure. As in the case of the positive evidence condition in the first experiment, children persisted in using the

incorrect case-marker, the nominative *–ga* for direct objects, even when they heard the accusative case in the experimenter's speech. Contrary to Saxton's results, no child benefited from the negative evidence immediately after the negative evidence was provided.

Table 6 The number of target sentences and correct responses

	Object case-marking	
	Correct	Target
No input condition	0	12 (4)
1st negative evidence	0	10 (5)
2nd negative evidence	3 (1)	15 (6)
3rd negative evidence	4 (3)	9/9 (4)

The cumulative number of children is shown in the parentheses

However, the negative evidence had some effects for some children when it was given continuously. Child #6 started to produce the accusative case-marker after the second negative evidence was given, although she omitted the case-marker in the no input condition and in the first negative evidence condition.

Table 7 Individual performance for three novel verbs in Experiment 2

Child #		1	2	3	4	5	6
Age		3;7	3;7	4;1	4;9	5;4	5;9
Verb 1	No input	N	N	N	z	N	z
	1st negative	z	N	N	N	N	z
	2nd negative	N	N	N	N	N	A
	3rd negative	---	A	N	---	N	---
	number of input required	---	3	---	---	---	2
Verb 2	No input	N	N	N	z	N	z
	1st negative	np	N	N	ug	N	z
	2nd negative	N	N	N	ug	N	A
	3rd negative	---	A	---	A	---	---
	number of input required	---	3	---	3	---	2
Verb 3	No input	N	N	N	ug	N	z
	1st negative	N	ug	N	z	N	z
	2nd negative	N	ug	N	z	N	A
	3rd negative	---	N	N	A	N	---
	number of input required	---	---	---	3	---	2

N: Nominative z: Zero-marking ug: ungrammatical sentence
A: Accusative np: not produced

After being given negative evidence for the third time, child #1 refused to try for all three verbs. Child #6 answered correctly on the second try, and the other four children (children #2, 3, 4, and 5) gave responses to the third negative evidence. The results were that two children (children #2 and 4) could use the accusative case for two of the verbs. This suggests that the overextension errors of the nominative case on direct objects could eventually be corrected by negative evidence.

As in the case of the positive evidence, the immediate effect of the negative evidence in Saxton's (1997) sense was not observed for accusative case-marking. However, both positive evidence and the negative evidence had a certain effect on the children's utterances. Some children who initially produced ungrammatical sentences seem to have learned that the novel word is a verb and how it is used in the target sentence structure.

6. Conclusion

From the results of the experiments, I would like to suggest that neither positive nor negative evidence is powerful enough for the children to learn how to use correct case-markers for novel verbs. There are two cases where the nominative case-marker was implemented due to the effect of positive evidence. On the other hand, the accusative case-marker was never used correctly immediately after either positive or the negative evidence was provided. The children's persistence to the nominative case is very strong, and it is not easy to correct their initial assumption unless negative evidence is continuously given.

Acknowledgements

This work was supported by Grant-in-Aid for Young Scientists (B) 14710383 from The Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

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Takaaki Suzuki
Department of Foreign Languages
Kyoto Sangyo University
Motoyama Kamigamo
Kita-ku, Kyoto 603-8555
Japan

takaaki@cc.kyoto-su.ac.jp