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Writing Systems and Orthography

Editors

Nicholas Rolle Jeremy Steffman John Sylak-Glassman

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

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Foreword

This monograph contains 34 of the 51 talks given at the 36th Annual Meeting of the Berkeley Linguistics Society (BLS 36), held in Berkeley, California, February 6-7, 2010. The conference included a General Session, one Special Session entitled *Language Isolates and Orphans*, and one Parasession entitled *Writing Systems and Orthography*. It was planned and run by the second-year graduate students in the Department of Linguistics at the University of California, Berkeley. The members of this executive committee were Jessica Cleary-Kemp, Clara Cohen, Stephanie Farmer, Melinda Fricke, Laura Kassner, and John Sylak-Glassman.

The papers contained herein were edited principally for style by the three editors Nicholas Rolle, Jeremy Steffman, and John Sylak-Glassman, and then given back to contributors to make changes. Nicholas Rolle took upon primary editorial responsibilities, Jeremy Steffman was an undergraduate editorial assistant, and John Sylak-Glassman helped to edit papers. Upon the final resubmission, the final versions of these papers were incorporated by Zachary O'Hagan and Nicholas Rolle into the monograph found here. Our goal has been the speedy publication of these proceedings, and as such, certain aspects – e.g., the complete unification of formatting – have been sacrificed. It is our belief that this does not detract from the final publication in any way.

Nicholas Rolle Jeremy Steffman John Sylak-Glassman

January 2016

Basque Genitive Case and Multiple Checking*

XABIER ARTIAGOITIA

Universidad del País Vasco / Euskal Herriko Unibertsitatea

Introduction

In this article I propose (a) that Basque genitive structural case is checked in the functional projection *possessive* (or *possessor* as proposed by De Wit (1997) and others based on pioneering work by Szabolcsi); and (b) that this functional projection allows both subject *and* object to check case simultaneously in a multiple specifier configuration. The diagram in (1) illustrates the core of the proposal: DP



^{*} This research is supported by grant FFI2008-05135/FILO from the Spanish Ministry for Science and Innovation. I use the following abbreviations: art = article, aux = auxiliary, A = absolutive, D = dative, E = ergative, gen = genitive, P = possessor, pl = plural(izer), R = root. When irrelevant for the discussion, I simply gloss the auxiliary verb as "aux".

This instance of multiple genitive case bears on the correct characterization of the *Person Case Constraint* and on the characterization of the operation *Agree*; the Basque data presented favors Jeong's formulation of the constraint in (2):

(2) General Person-Case Constraint

Two DPs cannot be [+person]/[+animate] if they check that feature against the same functional head (T/v) (Jeong 2004: 419).

I will argue that the functional head *possessive* in Basque allows more than one DP to check genitive case, but only one of them can be [+ person]. Therefore, the head *possessive* should be added to T/v in (2).

I have structured the article as follows: after a short introduction to Basque genitive DPs in section 1, section 2 makes a first sketch of the proposal. Section 3 develops it further and presents arguments for DPs' raising past QP in Basque to check genitive case in a multiple specifier possessive-phrase; I discuss superiority phenomena, together with PCC effects, as evidence for multiple checking.

1 A Descriptive Outline of Basque DPs and Genitives

My departing assumption is that the structure of Basque DPs looks like (3):

(3) [_{DP} [_{PossP} [_{QP} XP [_{Q'} [NP] Q]] Poss] D] where [XP = QPs, including numerals, and measure phrases]

The head *possessive*, the subject matter of this article, is a functional head with no morphological realization in Basque. I take it for granted that Artiagoitia's (2002) analysis of Basque quantifiers is on the right track, namely that prenominal quantifiers (including numerals, measure phrases, and heavier quantifiers like *hainbat*, *hainbeste* 'so many/much') occupy the specifier position of Q and that the head-like quantifiers occupy the Q position mediating between the Noun and the Determiner position. I provide illustrative examples in (4):

(4)	a. liburu	(gutxi)	hauek	= $[_{DP} [_{QP} [_{NP} liburu] [_{Q} (gutxi)]] [_{D} hauek]]$
	book	few	these	
	'these (few)	books'		
	b. hainbat	liburu		= $[_{DP} [_{QP} [_{QP} hainbat] [_{NP} liburu] [_{Q}\emptyset]] [_{D}\emptyset]]$
	so many	book		
	'so many be	ooks'		
	c. bost liburu	(-ak)		$= \left[_{DP} \left[_{QP} \left[_{QP} bost \right] \left[_{NP} liburu \right] \right] \left[_{D} (-ak) \right] \right]$
	five book	art		
	(the) five bo	oks'		

d. gela bete liburu = $[_{DP} [_{QP} [_{XP} gela bete] [_{NP} liburu]] [_DØ]]$ room full book 'a room full of books'

The main features of Basque genitive DPs in comparison with other wellknown languages are summarized in (5):

(5) a. Basque genitives are of the type DP + case;
b. Basque genitives are not in complementary distribution with determiner heads;
c. there are not two types of DP genitives inside noun phrases.

Basque genitives are of the type DP + case. In other words, subject, object

(and possessor) genitives are full DPs bearing the case mark -(r)en, the older form -(r)e in the case of personal pronouns. Relevant examples are given in (6):

(6)	a. Etorri	berri	den	gizoı	gizona-ren		anaia	
	come	just	aux.comp	man.gen		brothe	er	
	'the man v	vho has ju	ust arrived's b	orother'				
	b. Artista	hor-rea	n Mire	en-en	eta	ni-re	erretratua	
	artist	that.ge	n Mary.gen		and	I.gen	portrait.art	
	'That artis	t's portra	it of Mary an	d me'				

Basque genitive is akin to a case mark borne by DP arguments. In fact, most Basque scholars assume that genitive -(r)en is just the nominal counterpart of clausal ergative or absolutive case. A fully argument-loaded CP/DP parallelism strongly favors this conclusion, as you can see in (7):

(7)	a. Goenaga-k	bere	azken	artelan-ak-Ø	erakutsi	ditu.	
	Goenaga.E	his	last	artwork.art.A	exhibit	aux	
'Goenaga exhibited his last artworks'							
	b. Goenaga- <i>ren</i>	bere	azken	artelan-en	erakusketa		
	Goenaga.gen	his	last	artwork.gen	exhibition		

'Goenaga's exhibition of his last artworks'

Basque genitives are not in complementary distribution with determiner heads. This simply means that Basque articles, demonstratives and quantifiers, prenominal or postnominal, are never in complementary distribution with genitives, as it becomes evident upon looking at examples in (8):

(8) a. {Atxagaren/nire} liburu {-a, hau} Atxaga's I.gen book art this

	`{the, this} b	ook {o	f mine/	Atxaga	ı's}'	(several interpretations)
b.	{Atxagaren	/nire}	liburu	{bat,	batzuk	}
	Atxaga's	I.gen	book	one	several	
	'one, sever	al book	(s) {of	mine/A	.txaga's}	' (idem)
c.	{Atxagaren/	/nire}	hainba	ıt	liburu	
	Atxaga's	I.gen	so mai	ny	book	
	'so many b	ooks {c	of mine/	/Atxaga	a's}'	(idem)

There aren't two types of DP genitives inside noun phrases. Basque doesn't have two different types of DP genitives (synthetic and periphrastic), and both subject and object genitives, as well as regular possessors, are isomorphic and equally prenominal, as can be seen in the examples (6)-(7b) and (8) above. The difference between the genitive and the so called *locative genitive* has a different source. I give a couple of examples of the *locative genitive* in (9):

(9)	a. <i>Bilboko</i>	itsas-museoa	b.	zuretzako	oparia
	.ko	sea museum.art		you.for. <i>ko</i>	gift.art
	'The sea m	useum in/from Bilbao'		'a/the gift for	r you'

According to Goenaga (2003) and Artiagoitia (2006), there is a division of labor between–(r)en and -ko summarized in (10):

- (10) Basque DP-internal constituents
 - a. DP arguments take genitive–(*r*)*en*;
 - b. Other constituents (PP, NP, QP, CP, AdvP...) take the genitive -ko

The division of labor between the two genitives reflects a category distinction (*DP vs other categories*) or, in the worst case, a category *and* selectional distinction (*DP arguments vs other categories*). The distinction is reminiscent of a DP's need of abstract case, and ultimately, of the Case Filter.

2 Genitives Inside Noun Phrases: Basic Data

The basic and most relevant piece of data is that a genitive usually precedes all other modifiers (except for relative clauses); it precedes -ko modifiers and prenominal quantifiers:

(11)	a. <i>Jonen</i>	atzoko	txistea	b.	Mirenen	hiru	autoak
	John.gen	yesterday.ko	joke.art		Mary.gen	three	car.art
	'John's joke	e from yesterda	y'		'Mary's three	cars'	

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Let's focus on example (11b); it is worth noting that genitives are necessarily to the left of prenominal quantifiers like 'three' *hiru* or 'so much/many' *hainbat* as you can check in (12) and (13) respectively; this is so regardless of the interpretation of the genitive, as shown in example (13a) with a *picture* noun:

(12)	a. Mirenen	hiru autoak	(=11b)	b. * hiru Mirenen autoak
	Mary.gen	three car.art		
	'Mary's thre	ee cars'		
(13)	a. Jonen	hainbat	erretratu	b.* hainbat Jonen erretratu
	John.gen	so-many	portrait	
	'so many po	ortraits {by, of}	John'	

Assuming that relational and derived nouns can have both subject and object arguments, examples like (12-13) suggest that DP arguments raise to some position higher than QP in Basque noun phrases.

The same is also true of normal possessors if these originate in some high position inside NP or a related projection as assumed by Longobardi (2001), Alexiadou et al. (2007), and others. So (14) reflects the derivation of (13a), which can be three-way ambiguous:

(14) [DP ... Jonen_i [QP hainbat [NP ...t_i ... erretratu]] ... D] (where t_i = subject, object or possessor)

A similar raising analysis is required when both subject and object genitives co-occur in the same noun phrase; both subject and object must precede quantifiers (in 15a) and *-ko* phrases as well (e. g. in 15b):

(15) a. Velazquezen Felipe erregearen bost erretratuak king.gen .gen five portrait.art 'the five portraits of King Felipe by Velazquez' b. Peruren Mirenen igerilekuko argazkia (Zabala 1999: 150) Peter.gen Mary.gen pool.ko picture.art 'Peter's portrait of Mary at the swimming pool'

The derivation of the examples in (15) would be roughly as in (16):

(16) a. Velazquezen_i Felipe erregearen_j [$_{QP}$ bost [$_{NP}$ t_i t_j erretratu]]-ak b. Peruren_i Mirenen_i igerilekuko [$_{NP}$ t_i t_j argazki]-a

The conclusion is, then, that subject and object genitives raise past QP (and past nominal adjuncts) in Basque DPs. The natural question is: do they move to the specifier of the same projection or do they move to different projections?

In what follows, after further justifying the existence of a higher structural position for genitives, I provide positive evidence that all genitives raise to the specifier of the functional head *possessive*, thus creating a multiple-specifier configuration.

3 Multiple Genitive Case: Justification and Development of the Proposal

3.1 Arguments for Locating Genitives above QP

As the examples in (17) remind us, there is ample crosslinguistic evidence for a possessive-phrase on top of QP and below the DP projection, from a variety of languages and authors:

(17)	a. Catalan:	les	seves	novelles	de Nab	okov
		the	his	novels	of	
	•	[•] his nov	els of N	labokov'		(Picallo 1991: 284)
	b. Italian:	il	mio	libro		
		the	my	book		
		'my bo	ook'			(Schoorlemmer 1998)
	c. Hungarian:	(a)	Mari	kalap-	·ja-i	
		art	Mari.n	om hat.ag	r.pl	
		'Mary'	's hats'			(Szabolcsi 1994: 180)
	d. Maorese:	tā	Hōne	patu-nga o	te	wahine
		art	.gen	killing .gen	art	woman
		'Hone'	's killin	g of the woma	n'	(Pearce 1998: 427)

Seminal work by Szabolcsi is taken in the generative tradition as the main reference for proposing a functional projection right below DP connected with possessives; similar conclusions have been reached independently by many scholars, which may differ in the qualification of that functional projection: *nominal inflection* (Szabolcsi 1994 and related work); *possessor* (De Wit 1997, Delsing 1998, Schoolemmer 1998); *Number* (Picallo 1991); or just *AGR* (Alexiadou et. al. 2007). Here, I call this projection *possessive*, slightly adapting De Wit's and Schlooemer's nomenclature.

Coming back to Basque, we have already seen the main argument for locating Basque genitives above QP: both subject and object arguments show up to the left of prenominal quantifiers, as sketched in (14) and (16) above. Furthermore, coordination data internal to Basque suggest that genitives and QP or NP form a constituent outside the scope of D (i.e. the article, demonstratives). The relevant examples are in (18):

(18)	a. [[_{PossP} zure	li	buru]	eta [Poss	sP	nire	artikulu]	-ak]	
	you.ge	n b	ook	and		I.gen	article	art	
	'the books of yours and articles of mine'								
	b. atzo	aipatu		zenitue	n [[_{PossF}	•	zure	bi	
	yesterday mentio			aux.comp			you.gen	two	
	liburu]	eta [PossP	nire	hiru	disko]	-ak]	desagertu	dira	
	book	and	I.gen	three	disc	art	disappear	aux	
	'The [three discs of mine] and [two books of yours] that you mentioned								
	yesterday h	ave disapp	peared	ľ					

In sum, we've got evidence for raising of *both* S & O genitives to a position higher than QP; given that Basque genitives are independent of the occurrence of a given D, I will assume that both genitives target the specifier of Possessive-Phrase, as represented schematically in (19):

(19) $[_{DP} [_{PossP} S O [_{QP} XP [_{NP} t_s t_o N] Q] Poss] D]$

The proposal in (19) deserves some scrutiny: double genitives have been described in the literature, but they usually involve two different structural positions, one for each genitive (cf. English); in other languages, not only do double genitives involve two different forms but the higher structural position for genitives may also go hand-in-hand with N-raising to a functional projection (cf. Lindauer (1998) for German and De Wit (1997) for Dutch). The Basque situation differs in two respects: first, it seems as though both Basque subject and object genitives are entirely isomorphic and might target the same functional projection; second, the noun remains in situ as noun-adjective sequences show in (20):

(20) a. zure $[_{QP} [_{spec} bost] [_{NP + Adj}$ erretratu txiki polit]] hauek five portrait small pretty you.gen these 'These five beautiful small pictures {of/by} you' b. zure $\left[OP \right]_{NP + Adj}$ txiki erretratu polit] [o gutxi]] hauek portrait small pretty few these 'These few beautiful small pictures {of/by} you'

Put it differently, the order *N-Adj-Adj* remains constant with respect to prenominal or postnominal quantifiers; this lack of N-raising in Basque squares well with the impoverished noun morphology given there is no number or gender concord inside noun phrases.

3.2 Arguments for a Multiple Specifier Approach

The argumentation reduces to two types of facts: on one side, Richards' (2001) theory of multiple A-specifiers predicts the properties displayed by the combination of subject-object genitives; on the other side, a multiple specifier approach to genitives predicts the existence of *Person Case Constraint* effects in the case of two [+person] genitives, a prediction that turns out to be correct.

3.2.1 Multiple A-specifiers and DP Internal Word Order in Basque

The proposal advanced in section 2 presupposes a derivation like (19) for DPs with both subject and object genitives. We may assume, further, that the head *possessive* in Basque has a feature composition like the one in (21):

(21) posssesive, (n-)ugenitive *, uq-features (poss has no lexical content)

where * means strong, and forces displacement of the relevant argument DPs.¹ I will leave aside whether the possibility of multiple genitive checking is due to a parametrized lexical property (Ura 1996) of a given functional head (*possessive* in the case at hand) or whether it has a different source (Boeckx 2003).

Basque multiple genitives are consistent with Richards' theory of multiple specifiers. He gives wide empirical evidence from both A- and A'-movement to establish that movement to multiple specifiers of a single head obeys superiority and, hence, systematically creates crossing paths. With respect to A-movement, he mentions superiority effects from the analysis of idiom chunks, A-scrambling in Japanese, object-shift in Germanic languages, multiple agreement systems, and so on.

Basque genitives, which represent A-raising of both subject and object to the same head, seem to provide additional support. Below I discuss (a) superiority and object-scrambling; (b) lack of scope ambiguity inside DPs; and (c) interaction of possessors with subject and object genitives.

Superiority. First of all, as predicted by Richards' theory, the resulting structure obeys superiority; the subject occupies the outer specifier and c-commands the object and the SO-X-N order is the unmarked and most usual one:

(22)	Capa-ren _i	bere	buruaren _j	bost [t _i t _j	irudi]-ak	[SO-X-N]
	.gen	his	head.gen	five	picture.art	
	'Capa's five p	ictures	of himself'			

¹ The displacement property may be due to an EPP-feature of *possessive*, à la Chomsky (2001).

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As pointed out by Eguzkitza (1993), it is true that Basque allows [OS...N] word orders. But these seem to be derived by further moving the object to the left of the subject, a movement which has the effect of giving what is left behind it a highly restrictive reading, absent in the neutral word order. Eguzkitza's own examples and interpretations are given in (23):

(23)	a. Cortazar-en	Poe-ren	itzulpena		
	.gen	.gen	translation.art		
	'Cortazar's tr	anslation	of Poe'		
	b. Poe-ren _i Cortazar-en t _i itzulpena (Eguzkitza 1993: 170)				
	'out of all Poe's translations. [we pick] CORTAZAR'S translation				

Eguzkitza derived examples like (23b) via A'-topicalization to the [spec, D] position, an account that seems questionable. That [OS...N] orders are derived via subsequent object-scrambling is shown by two pieces of data: first, object anaphors cannot scramble around a genitive subject, as one can observe by comparing (22) to the ungrammatical (24):

(24) *[Bere buruaren i Capa-ren ti bost irudiak] ... $[=*O_{anaphor}-S-X-N]$

Second, a universal quantifier in subject position can bind a pronoun variable in SON orders, whereas the reverse is impossible; however, a (DP-internally) scrambled object with a universal quantifier can bind a pronoun variable in subject position (=25c):

(25)	a.	[idazle	bakoitzaren _i	bere _i	poema bate	n bi	bertsio]
		writer	each.gen	his	poem one.	gn two	version
		daude	liburuan				
		are	book.loc				
		'In the book	there are two v	versions	of one of h	is poems by	y every writer'
	b.	*[Bere _i	idazlearen	poema	bakoitzaren	_i bi	bertsio]
		its	writer.gen	poem	each.gen	two	version
	c.	?[poema	bakoitzaren _i	berei	idazlearen t	i bi	bertsio]
		poem	each.gen	its	writer.gen	two	version.art
		'In the boo	k there two ver	sions of	f one of his	poems by e	every writer'

(26) a. $\sqrt{\text{Subj-}\forall \text{ Obj-}vbl}$ b.* $\text{Subj-vbl Obj-}\forall$ c. $\sqrt{\text{Obj-}\forall \text{ Subj-vbl }t_{obj}}$

The movement of the object doesn't give rise to WCO effects in (25c), thus confirming that it is not A'-movement. In sum, the data in (24-25) show that object-movement is closer to A-scrambling than it is to A'-scrambling and they also suggest the object's usual position is to the right of the subject. Thus,

[OS...N] orders result from at least two movements/attractors: raising of both subject and object past QP *and* subsequent object-scrambling.

Lack of scope ambiguity inside DP. According to Richards (2001), a related property of multiple A-scrambling in Japanese is that no quantifier ambiguities arise; in other words, multiple specifiers of the same head tend to reflect the same scope relations as in the base position. Basque allows very few cases of reverse scope but, in cases where this is possible in sentential subject-object scope interactions, virtually all speakers interpret the genitive subject as taking scope over the genitive object. This is illustrated in the contrast in (27):

- (27) a. Ume guztiek ipuin bi kontatu dituzte $(2 > \forall, \forall > 2)$ 'All children told two fairy tales'
 - b. Ume guztien ipuin biren kontaketa ikusi dugu ($\forall > 2, *? 2 > \forall$) 'We witnessed all children's telling of two fairy tales'

Possessor arguments and Superiority. Richards' theory can also give us a clue to understand some data from Eguzkitza (1993). This author regarded *possessor-subject-object* patterns (=28a) as grammatical but *possessor-object-subject* orders (=28b) as ungrammatical:

(28)	a. [DPMonzonen	Leizarragaren	Bibliaren	itzulpen-a]
	.gen	.gen	Bible.gen	translation.art
	b. * [DP Monzonen	Bibliaren	Leizarragaren	itzulpen-a]
	.gen	Bible.gen	.gen	translation.art
	'Monzon's (copy	of the) translat	ion of the Bible	e by Leizarraga'

Eguzkitza's account was formulated in terms of competition between P and O for the [spec, D'] position. However, Richards' approach suggests a more attractive analysis. If, as now standardly assumed by many, the possessor argument also originates inside NP (or a related projection) and c-commands both subject and object arguments, Richards' theory of multiple specifiers predicts that, if all the possessor, subject and object arguments are attracted to Possessive, their paths will cross and the resulting word order will be *possessor-subject-object*. This prediction is correct, as just seen, given that (28a) is the unmarked and default order. The derivation would then be something like (29):



The ungrammatical **P*-*O*-*S* order is simply the result of the moved arguments not respecting superiority.

3.2.2 PCC Effects as Evidence for Multiple Checking

The proposal made so far makes an interesting prediction: assuming that Jeong's version of PCC is right, if both S and O genitives raise to the same functional projection, we predict *Person Case Constraint* effects given that the same feature (i.e. person) cannot be checked twice. As expected, the PCC issue never arises when two DPs check their features in different projections (=30a) but is at stake in some well-known cases (=30b):

(30)	a. nik	zu	ikusi	zaitut		
	I.E	you	see	2A.R.1E		
	ʻI sa	w you'				
	b. *Zul	K	ni	etsaiari	saldu	naiozu
	Υοι	ı.E	I.A	enemy.D	sell	1A.R.3D.2E
	'Yo	u sold r	ne to	the enemy'	(Ormazabal	& Romero 2007: 316)

In examples like (30a), no conflict arises given the standard assumption that subjects and objects check their case and ϕ -features against different functional heads (T and v); examples like (30b), on the other hand, are usually referred to as violations of Bonet's *Person-Case Constraint*:

(31) Person-Case Constraint if DATIVE, then ACC/ABS = 3^{rd} person (Bonet 1994: 36)

This constraint is under scrutiny in current theory: Ormazabal and Romero (2007) have convincingly shown that the constraint is basically syntactic in nature, independent of case and morphological realization, and propose to derive it from the impossibility of having two animate objects agreeing with the verbal complex. Since we don't deal with object agreement proper but with a configuration where subject and object check the same feature, more abstract approaches seem relevant: Boeckx (2003) and, specially, Jeong (2004) argue that in situations of multiple feature checking, multiple case checking is licit given that case is an uninterpretable feature on the goal (and can be checked in a symmetric way); multiple person checking is, however, illicit since it is only interpretable on the goal and dependent on asymmetric checking (closest c-command) which can only take place once. As a result, as Jeong puts it, there cannot be two [+person] or [+animate] DPs in the same domain:

(32) *General PCC*

Two DPs cannot be [+person]/[+animate] if they check that feature against the same functional head (T/v) (Jeong 2004: 419).

In a similar vein, Rezac (2008) argues that PCC effects arise when the same probe establish a person-Agree relationship with two goals: the first one blocks person agreement with the one, provided the first one c-commands the other.

Going back to (30b), and taking for granted with Jeong (2004: 418) that person entails animacy and lack of animacy entails lack of person (i.e. [+person] \rightarrow [+animacy]; [-animacy] \rightarrow [-person]) the only assumption one needs to explain its ungrammatical status is that agreeing datives are inherently marked as [+animate] in Basque,² even when they are 3rd person. In other words, we have two DPs, one [+person] and the other [+animate], checking their features against the same functional head v. There is no violation of the General PCC if the offending dative has no agreement marker in the auxiliary (and behaves as a plain PP):

(33)	Zuk	ni	etsaiari	saldu	nauzu
	You.E	I.A	enemy.D	sell	1A.R. 2E
	'You s	sold me	to the enemy'		

On general grounds, we don't expect the PCC to be an issue in the case of two genitives being realized in different domains and agreeing with different probes/heads. This would be the case of English or Spanish genitives in (34):

(34) a. My {description, portrait, vision, examination} of youb. Tu {descripción, necesidad, retrato} de mí (Spanish)'Your {description, necessity, portrait} of me'

The higher genitive is generally associated with a functional projection (*possessive*), whereas the lower genitive is associated with a lower head (N or n). However, in the case of Basque, given that both subject and object genitives are in the specifier of the same functional projection *possessive*, the prediction is that both DPs cannot be [+person]. A good test is given by first and second person arguments, which I assume are necessarily [+person]. The ungrammaticality of the examples (35c and 35d) confirm that the proposal is correct:

(i) *Gutuna Parisi igorri diot
Letter.A Paris.D send aux
'I sent the letter to Paris' (cf. *I sent Paris the letter)

Ormazabal and Romero (2007) also assume that agreeing datives are inherently animate.

² There is good evidence for this, given that locative inanimate goals cannot appear as datives in ditransitive structures (Oyharçabal 2010):

a.	nire Jonen	(hiru)	erretra	tuak
	I.gen .gen	three	portrai	t.art
	'My (three)) picture	es of Jo	hn'
b.	Jonen	nire	(hiru)	deskribapenak
	.gen	I.gen	three	description.art
	'John's (thr	ee) deso	cription	s of me'
c.	*nire	zure	(hiru)	erretratuak
	I.gen	you.ge	n three	portrait.art
	'My (three)) picture	es of yo	u'
d.	*zure	nire	(hiru)	deskribapenak
	you.gen	I.gen	three	description.art
	'Your (thre	e) desc	riptions	of me'
	a. b. c. d.	 a. nire Jonen I.gen .gen 'My (three) b. Jonen .gen 'John's (thr *nire I.gen 'My (three) d. *zure you.gen 'Your (three) 	 a. nire Jonen (hiru) I.gen .gen three 'My (three) picture b. Jonen nire .gen I.gen 'John's (three) desc c. *nire zure I.gen you.ge 'My (three) picture d. *zure nire you.gen I.gen 'Your (three) desc 	 a. nire Jonen (hiru) erretra I.gen .gen three portrai 'My (three) pictures of Job b. Jonen nire (hiru) .gen I.gen three 'John's (three) description c. *nire zure (hiru) I.gen you.gen three 'My (three) pictures of yo d. *zure nire (hiru) you.gen I.gen three 'Your (three) descriptions

I outline the ungrammatical derivation in (36), where the head *Poss* cannot person-agree with a [+person] object if there is a closer c-commanding [+person] subject:



In short: examples combining first or second person and third person [-person] subject/object genitives are at best slightly unusual given the general oddity of Basque double genitives, but the combination of first and second person arguments (both [+person]) is sharply ungrammatical, which suggests that both genitive DPs are checking their person features against the same functional head (i.e. *possessive*).

Three conclusions can be drawn from the proposal in this article: (a) it suggests that UG allows the existence of heads whose case feature can be checked n-times, but φ -features can only be checked once (as argued by Jeong 2004); (b) interestingly, the head *possessive* has all the said properties despite having no morphological realization, which favors a syntactic approach to PCC phenomena; and (c) Basque also seems to personify a situation where raising of genitive DPs is pervasive: all DPs can, and *must*, raise to the specifier of Possessive.

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Xabier Artiagoitia Universidad del País Vasco / Euskal Herriko Unibertsitatea Department of Linguistics and Basque Studies Faculty of Letters Unibertsitatearen Ibilbidea 5 01006 Vitoria-Gasteiz xabier.artiagoitia@ehu.es

Language Isolates and Their History, or, What's Weird, Anyway?

LYLE CAMPBELL University of Hawai'i at Mānoa

1 Introduction

How many language isolates are there in the world? (How many language families are there?) Most linguistics do not know, and opinions vary greatly. The answers to these questions are complicated because they depend on different views about fundamental issues in historical linguistics. The goal of this paper is to attempt to answer the questions: How many language isolates are there? How can we advance knowledge of the history of language isolates? What methodological lessons does the study of specific isolates offer to understand better the history of language isolates in general and that of other specific isolates? What are the prospects for finding relatives for some language isolates, that is, for showing that they belong to larger genetic groupings than those known at present?¹

To begin, we need to ask, what is a language isolate? In the most common view, an isolate is a language which has no relatives, that is, that has no demonstrable genetic relationship with any other language. It is a language which has not been shown to be the descendent of any ancestral language which has other descendants (daughters). Thus, language isolates are in effect language families with only one member. The best known and most cited language isolates are Basque, Burushaski, and Ainu, though there are many others not so generally known.

Since language isolates are often contrasted with families of related languages, we also need to ask, what is a language family? As is generally known, a language family is a set of languages for which there is sufficient evidence to show that they descend from a single ancestral language and are therefore genetically related. The total number of language families in the world is the set of independent families for which no relationship can be demonstrated with any

¹ Portions of this paper are based on Campbell (2011).

other language family. And, as mentioned, a "family" can be composed of but a single language in the case of language isolates.

So, how many independent language families (including isolates) are there in the world? There are approximately 420 (Hammarström 2007, Campbell 2013).

2 Why Language Isolates and Language Families are not so Very Different

There are two senses in which language isolates are not very different from language families (of multiple members). First, some language isolates may have had relatives in the past which have disappeared without coming to be known, leaving these languages isolated.

For example, Ket in Siberia is the only surviving language of the Yeniseian family. Nevertheless, there were other Yeneseian languages, now extinct: Arin, Asan, Kott, Pumpokol, and Yugh (Vajda 2001). If these languages had disappeared without a trace, Ket would be considered an isolate. However, since data from these extinct languages was registered before they disappeared, Ket was not left an isolate, rather a member of a family of languages, albeit the only one surviving. Examples such as this show that language isolates could well have once been members of languages families whose other relatives disappeared before they could come to be known, illustrating why in this way language isolates are not so very different from languages families.

2.1 Did Basque Have Now Extinct Relatives?

This raises an interesting question: is it possible that Basque once had relatives and is thus not really a language isolate? This brings up a question about the relationship between Basque and Aquitanian. As Trask (1997:411) reports, "probably all Basque scholars now accept that Basque descended more or less directly from Aquitanian" (see also Trask 1995:87, 1997:35). However, is it possible that Aquitanian and Basque are related languages, two members of a language family, rather than Aquitanian being a direct ancestor of Basque?

It is possible that the claim of Basque as a direct descendant of Aquitanian is incorrect. The attestations of Aquitanian are from c. 2000 years ago (see below); however, most languages known from 2,000 years ago have diversified and become families of languages: Romance, Finnic, Slavic, Germanic, Turkic, Mongolian, Polynesian, etc. It is likely that Aquitanian of so long ago would also have diversified into different languages, distinct from one another. However, if no other except Basque survived, Aquitanian could be the direct ancestor of Basque. Another possibility is that Aquitanian had a sister or sisters of its own, diversified from an earlier common ancestor and that Basque descends from a sister of Aquitanian rather than directly from Aquitanian itself. The attestations of Aquitanian allow for this second possibility. Although these attestations are sufficiently detailed to confirm that modern Basque and Aquitanian are related, they also show sufficient differences from Basque to suggest the possibility not of a direct ancestor, but as a relative, that possibly Aquitanian and Basque are sister languages representing two branches of the original proto-language. The corpus of Aquitanian data is limited to about 400 personal names and 70 names of deities, found in texts written in Latin. There are no Aquitanian texts larger than these names. (See Michelena 1988, Gorrochategui 1984, 1995, Trask 1997:398-403.) Compare in Table 1 the Aquitanian words (from c.100 CE) with those of Basque on the one hand, and the Gothic words (from 382 CE) with those of English on the other.

 Table 1: Comparison of the relation between Aquitanian and Basque with

 that between Gothic and English

Aquitanian	Basque	Gothic	English
arixo	haritz	(faírguni) ²	oak
atta	aita	fadar	father
belex	beltz	swarts	black
bon-	on	goÞs	good
sembe-	seme	sunus	son
hanna	anaia	broÞar	brother
seni-	sehi/seiñ	magus	boy
oxson	otso	wulfs	wolf
siri(co)	suri	hweits	white
ausci	euska(ra)		'Basque'

It is easy to see that in spite of clear similarities between Aquitanian and Basque, there are also marked differences. It is also clear that the similarities and differences between the cognates from Gothic and English are quite similar to those between Aquitanian and Basque. However, Gothic cannot be considered a direct ancestor of English – the two belong to distinct branches of Germanic. Their differences and similarities, when compared with those between Aquitanian and Basque, turn out to be very similar in nature. Given this similarity, it should be asked, could the relationship between Basque and Aquitanian be that of related languages as exists between Gothic and English, and not like that between Latin and Spanish, where an ancestral language and its descendant are involved?

2.2 Could Basque Have Modern Relatives?

In the other sense in which language isolates and language families are not so different from one another, some languages which were thought to be isolates

² Gothic has no attested form for 'oak'; *fairguni* 'mountain' is generally believed to have in it the root for 'oak', from Proto-Indo-European **perkw*-.

have in reality proven to be members of small families of related languages. For example, Japanese would be a language isolate if Ryukyuan languages (of Okinawa) had not been shown to be distinct languages, related to Japanese. Thus Japanese belongs to a family of languages (often called Japonic) and is no longer an isolate. Similarly, Etruscan, long cconsidered an isolate, was shown to be related to Lemnian. Lemnian is known from a stella and ceramic fragments from the Greek island of Lemnos, dating from c.400 BCE (cf. Steinbauer 1999:357-66).

Some other cases of small families no longer considered language isolates because related languages have come to be known are:

Atakapan Texas and Louisiana (two languages: Atakapa, Akokisa)

Jicaquean (Tol) Honduras (two languages: Tol, Jicaque of El Palmar)

- Lencan El Salvador, Honduras (two languages: Chilanga, Honduran Lenca)
- Xinkan Guatemala (four languages: Chiquimulilla, Guazacapán, Jumaytepeque, Yupiltepeque)
- Hurrian (Hurro-Urartean) Northeast Anatolia, from the state of Mitanni, known from the second and first millennium BCE.

Cases such as these lead us to ask, is it possible that Basque constitutes a small family of languages? Basque would not be considered an isolate if Aquitanian proves to be a separate language, not an ancestor of Basque but genetically related to it. This is quite possibly the case. Also, when two or more 'dialects' are not mutually intelligible, by standard criteria they are considered separate languages. Basque would become a small family if its dialects have diversified so much that some are no longer mutually intelligible. This appears to be the case. Since Proto-Basque (c.600 CE, Lakarra 1995:193) enough time has transpired for Basque to have diversified. As Trask (1997:5) affirms, "the differentiation [between the dialects] is sufficiently distant that speakers of different areas can have significant difficulty understanding one another when using the vernacular form of Basque."

The classification of Basque dialects varies, with disagreements about how many dialects there are and how to classify them; but the following are recognized:

Bizkaiera (Vizcaíno, Viscayan)	Gipuzkera (Guipuzcoano)
Nafarrera garaia (High Navarro)	Aezkera (Aezcoan)
Salazarera (Salacenco)	Erronkariera (Roncalese)
Lapurtera (Laburdino, Labourdin)	Nafarrera behera (Low Navarro)
Zuberoa (Suletino, Souletin).	

It is generally conceded that at least Zuberoa (Suletino, Souletin) is not mutually intelligible with the others. Given this, some consider Basque no longer an isolate, but a small language family. The 2005 edition of *Ethnologue* (Ethnologue.com) listed three Basque languages, though the 2014 edition has one, noting "some inherent intelligibility among regional varieties except Souletin."

The point is not to insist that Basque formerly had relatives (questioning the status of Aquitanian) nor that it has relatives now (assuming lack of mutual intelligibility), but rather to show that Basque easily could cease to be a language isolate, and therefore that language families and isolates are not so very different.

3 Further Clarification of the Concept 'Language Isolate'

It is necessary to distinguish language isolates from unclassified languages, languages so poorly known that they cannot be classified, though sometimes listed as isolates. An unclassified language is one for which there is not enough data (documentation/attestation) to know whether it has relatives – these languages lack sufficient data for them to be compared meaningfully with other languages and therefore their possible kinship remains unknown. Isolated languages are not grouped in larger genetic classifications because for them there do exist data and comparisons of these data with other languages do not reveal linguistic kinship.

There are two sorts of unclassified languages. The first are extinct languages which are too poorly attested to be grouped with any other language or language group. Some examples include:

Adai, Louisiana Aranama-Tamique, Texas Camunico, Northeast Italy (survived to 2nd half of 1st millennium BCE) Eteocretan, Crete, 4-3 centuries BCE. Ibrerian, Iberian Penninsula (2nd half of 1st millennium BCE to 1st half of 1st millennium CE). Indus Valley, India and Pakistan, 2500-1900 BCE. (Based on undeciphered inscriptions, whose status as a real writing system is disputed, cf. Farmer et al. 2004). Kara, possible language of Korea, only from 13 toponyms. Kaskean, Northeast Anatolia 2nd millennium BCE. Kogurvo possible language, NE China, Manchuria, Korea, 1-8 centuries CE, known only from toponyms and a few words. Ligurian, Northeast Italy, few words, 300 BCE-100 CE. Maratino, Northeast Mexico Minoan Linear A, undeciphered, 1800-1450 BCE. Mysian, Western Anatolia before the 1st century BCE. Naolan, Tamaulipas, Mexico. Northern Picene, Adriatic coast of Italy, 1st millennium BCE. Pictish, Scotland 7-10 centuries CE, few inscriptions. Puyo, Manchuria (with Koguryo?), few attested words.

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Quinigua, Northeast Mexico. Raetic, Northern Italy, Switzerland, Austria, 1st millennium BCE. Sicanian, Central Sicily, pre-Roman epoch. Solano, Texas, Northeast Mexico. Sorothaptic, Iberian Peninsula, pre-Celtic, Bronze Age. Tartessian, Spain, 1st millennium BCE.

The second kind are the extant languages not classified for lack of data, languages not described sufficiently to compare them with other languages in order to determine whether they may be related. Examples include:

In Africa: Bung, Lufu, Kujargé, perhaps Mpre, Oropom, Rer Bare, Weyto.

- In Asia and the Pacific: Sentinelese (Andaman Islands), Bhatola (India), Waxianghua (China), Doso (Papua New Guinea), Kehu (Indonesia Papua), Kembra (Indonesia Papua), Lepki (Indonesia Papua).
- In South America: Amikoana, Arara, Cagua, Carabayo, Chipiajes, Coxima, Ewarhuyana, Himarimã, Iapama, Kaimbé, Kamba, Kambiwá, Kapinawá, Karahawyana, Kohoroxitari, Korubo, Miarrã, Natagaimas, Pankararé, Papavô, Pataxó-Hãhaãi, Tapeba, Tingui-Boto, Truká, Tremembé, Uru-Pa-In, Wakoná, Wasu, Yarí, etc.

It should be noted that some of these unclassified languages could also be language isolates, but without evidence we cannot know.

4 How Many Language Isolates are There, Really?

With the clarification that the unclassified languages are not language isolates, we return to the question, how many isolates are there in the world. The list, compiled from consensus reports from specialists in each region, is:

na• [10]	
	a
Bangi-me	Centúúm
Iadza	Jalaa
Kwadi	Laal
/lekejir (Shabo)	Meroitic Extinct
Ongota (Birale)	Sandawe
: [9]	
vinu	Burushaski
Korean	Elamite Extinct
lattian Extinct, poorly know	Nihali
Kusunda	Nivkh (Gilyak) (two languages?)
umerian Extinct	
ralia [7]	
Enindhilyagwa (Andilyaugwa)	Kakadju (Gaagudu)
	ca: [10] Bangi-me Iadza Iwadi Mekejir (Shabo) Ongota (Birale) : [9] Minu Korean Iattian Extinct, poorly know Iusunda Jumerian Extinct ralia [7] Enindhilyagwa (Andilyaugwa)

Laragiya Extinct? Ngurmbur Extinct?	Minkin Extinct Tiwi		
Umbugarla			
Oceania [14]			
Abinomn. Indonesia Papua)	Abun. Indonesia Papua		
Anem. New Britain	Busa (Odiai). New Guinea		
Elseng Indonesia Papua	Hatam Indonesia Papua		
Isirawa New Guinea	Kol New Britain		
Kuot (Panaras) New Ireland	Massen Indonesia Panua		
Mpur Indonesia Papua	Odiai Papua New Guinea		
Pele-Ata (Wasi) New Britain	Pvi New Guinea		
Sulka New Britain	Taian (Ganun) Panua New Guinea		
Valë (Nagatman) New Guinea	Vawa New Guinea (two languages?)		
Vala Papua New Guinea	Vuri (Karkar) New Guinea		
Furone: [1+]	I un (Karkar), New Oumea		
Pasque (Some would include Tartess	ion and Ibarian artificat languages of		
Spain probably better considered	unalogified due to insufficient		
information)	unclassified due to insufficient		
Information.)			
North America: [20]	Courses systimat Onegon		
Adal, extinct, Texas, Louisiana	Chitime the antinet Leminian		
Chimariko, extinct, California	Unitimacha, extinct, Louisiana		
Esselen, extinct, California	Haida, Alaska, British Columbia		
Karankawa, extinct, Texas	Karok, California		
Kootenai, Idaho, Montana, BC	Natchez, ext., Mississippi, Louisiana		
Salinan, extinct, California	Siuslaw, extinct, Oregon		
Takelma, extinct	Timucua, extinct, Florida		
Tonkawa, extinct, Texas	Tunica, ext., Mississippi, Louisiana		
Washo, California, Nevada	Yuchi, Georgia, Oklahoma		
Yana, extinct, California	Zuni, New Mexico		
(See Golla et al. 2008.)			
Mexico [6]			
Coahuilteco, ext., Texas, NE México	Cotoname, extinct, NE México		
Cuitlatec Extinct, Guerrero	Huave, Oaxaca		
Purhépecha (Tarascan)	Seri, Sonora		
(See Campbell 1997)			
South America [55]:			
Aikaná, Brazil	Andoque (Andoke), Brazil, Peru		
Awaké, Venezuela, Brazil	Baenan, Brazil		
Betoi, Colombia	Camsá (Sibundoy), Colombia		
Candoshi, Peru	Canichana, Bolivia		
Cayuvava, extinct. Bolivia	Chiquitano, Bolivia		
Chono, Chile	Cofán (A'ingaé), Colombia, Ecuador		
Culle, extinct. Peru	Gamela, extinct, Brazil		
Guató Brazil	Irantxe (Iranche Münkü) Brazil		
Sunto, Diulii	manne (manene, manna), Diazii		

Itonama, Bolivia	Jeikó, Brazil
Jotí (Yuwana), Venezuela	Kaliana (Sapé), Venezuela
Kapixaná (Kanoé), Brazil	Kirirí, Brazil
Koayá (Kwaza, Koaiá), Brazil	Kukurá (Cucura, Kokura), ext., Brazil
Máko (Máku), Brazil	Mapudungu, Chile
Matanauí, Brazil	Mochica (Yunga, Chimu), Peru
Movima, Bolivia	Munichi (Otanabe), extinct, Peru
Natú, extinct, Brazil	Ofayé (Opayé), Brazil
Omurano, Peru	Otí, extinct, Brazil
Pankararú, extinct, Brazil	Puquina, extinct, Bolivia
Rikbaktsá, Brazil	Sabela (Auca), Ecuador
Tarairiú, Brazil	Taruma, Brazil, Guyana
Taushiro (Pinche), Peru	Tequiraca (Auishiri), Peru
Ticuna, Colombia, Brazil, Peru	Trumai, Brazil
Tuxá, extinct, Brazil	Urarina, Peru
Wamoe, Brazil	Warao, Guyana, Surinam, Venezuela
Xokó, Brazil extinct	Xukurú, extinct, Brazil
Yagan, Chile	Yaté (Fulniô), Brazil
Yuracaré, Bolivia	Yuri (Jurí), extinct, Colombia, Brazil
Yurumangui, extinct, Colombia	(See Campbell 2012)

Thus, the total number of isolates in the world is **136**. There are c.420 independent language families (including isolates), for which it is not possible to demonstrate a genetic relationship with any other language family. Isolates make up 32% of all "language families," about one-third of the world's linguistic diversity. Seen from this perspective, isolates are not at all weird; they have as their "cohorts" over one-third of the "language families" of the world.

How do we explain the general attitude that language isolates are weird, so unusual that they are suspicious, and the frequent feeling that languages with no relatives should not be tolerated? I suspect these feelings stem from lack of understanding about how many isolates there are and of how little isolates differ from other languages families, as seen above.

5 How Can We Advance Our Knowledge of the History of Language Isolates?

How can we learn about the history of a language without relatives? One attitude about Basque has been that if it has no relatives then it has no history. De Saussure (1916:298, see Michelena 1995:101) said that "we cannot derive anything from Basque because, being an isolate, it does not allow any comparison." Meillet (1925:11-2, see Michelena 1995:101) said that "if a language is an isolate, it lacks history...so if we cannot find a way to demonstrate a relationship between Basque and some other language, there will never be any

hope of finding out anything about its history." These attitudes make us ask, how can we learn about the history of languages without relatives? Must we accept the claim that an isolate is a language without history? What lessons does the study of Basque and other isolates offer us to understand better how to investigate the history of language isolates in general? As we will see, these attitudes are mistaken –isolates indeed have history and there are means of studying their history. The means that can be employed to learn about the history of isolates include:

Internal reconstruction	Philological study of attestations
Toponyms	Personal Names, names of deities
Historical reports	Comparative reconstruction based on dialects
Evidence from loanwords Wörter und Sachen	Language contact and areal linguistics

These are taken up in turn.

5.1 Internal Reconstruction

Internal reconstruction is the best known and most used tool to investigate the history of isolates. Excellent examples of its deployment are Michelena (1988, 1995), Lakarra (1995, 2006), and Trask (1997). For example, Lakarra (1995) on the reconstruction of the roots of Pre-Proto-Basque is a valuable application of internal reconstruction to obtain significant historical understanding of a language isolate. Here I offer a single example of a single word, to illustrate what can be gained. Basque 'wine' is reconstructed as *ardano. It has regional variants ardo, ardao, arno, and ardu (Lakarra 1995:195), but even with standard Basque ardo in isolation and ardan- in compounds, internal reconstruction takes us close to the *ardano reconstruction – evidence internal to Basque reveals the change of -n-> \emptyset (loss of intervocalic n), see below.

5.2. Philological Investigation of Attestations

Michelena (1988) and Gorrochategui (1984, 1993, 1995) have made very valuable studies of the older attestations of Basque. These include older citations of Basque forms, toponyms, personal names, deity names, and historical reports.

5.3 Comparative Reconstruction

A less well known but extremely valuable tool is the comparative method applied not to separate related languages, but to regional dialects. Successful and instructive cases include: Basque (Gorrochategui and Lakarra 1996, 2001, Michelena 1988, 1995, Trask 1997); Ainu (Vovin 1993); Huave (Suárez 1975); and Tarascan (Friedrich 1971). These studies show that obviously Meillet, de Saussure, and others were mistaken in insisting that nothing can be known of the history of a language isolate if it has no relatives, and that isolated languages do not lend themselves to any comparison. (See above for Basque dialects.)

5.4. Loanwords

Another source of evidence on the history of isolates is loanwords. For example, from the semantic content of the more than 300 ancient loanwords from Latin into Basque it is clear that the Romans had much influence in the areas of laws, administration, technology, religion, and refined culture. Moreover, the relative age of many of these loanwords in Basque is known from phonological traits. Many were borrowed before the changes in Romance of the 5 long and short vowels to a system of just 7 vowels, as in Basque *gertu* 'certain, ready' [cf. Spanish *cierto*] < CERTU; *joko* 'game' [cf. Spanish *[juego*] < JOCU), and before the palatalization of velar consonants before front vowels, as seen in Basque *gertu* 'certain, ready' < CERTU; *gisu* 'lime' < GYPSU) [cf. Spanish *gis* [xis] (formerly [šis] from [žis]), and before the voicing of intervocalic stops, as in Basque *bake* 'peace' < PACE) [cf. Spanish *paz*]. (Michelena 1988, 1995, Trask 1997).

Loanwords can indeed provide considerable historical information about isolates, as in Basque. In another case, from Mesoamerica, we know something of the history of Huave (isolate) and its speakers from words borrowed from Mixe-Zoquean (MZ). Some examples are:

- Huave *pom* 'copal (incense)' < PMZ (Proto-Mixe-Zoquean) **poma* [necessary in Mesoamerican ritual]
- Huave *koy* 'rabbit' < PMZ **koya* [calendric name]
- Huave *patsi* 'lizzard' < PMZ **patsi* [calendric name]
- Huave *piki* 'feather' < PMZ **pik* [important in pre-Columbian trade] (*i* = barred "i")
- Huave *kawak* 'chicozapote, mamey' < PMZ **ka'wak* 'chicozapote fruit' (the ' = glottal stop)
- Huave yati 'anona, chirimoya [soursop]' < Zoque yati, ati.

Several of these loans show cultural influence from Mixe-Zoquean on Huave, loans that reflect cultural concepts in ancient Mesoamerica. They support the hypothesis that the ancient Olmecs – the first highly successful agricultural civilization in Mesoamerica – spoke a Mixe-Zoquean language. Mixe-Zoquean influenced many other languages in the area (Campbell and Kaufman 1976).

5.5 Areal Linguistic Traits

Another source of information about the history of isolates is areal linguistics. A linguistic area (*Sprachbund*) is a geographical region in which, due to language

contact, languages of the area share structural traits, not through inheritance, but due to borrowing/diffusion. Areal linguistic traits reveal historical contacts and help to explain certain changes in the languages involved, including in isolates, as exemplified by the following areal traits in Basque owed to contact with neighboring languages:

- (1) *s* is apico-alveolar in most varieties, but is apico-post-alveolar for most French Basque speakers (Trask 1997:84), due to French influence.
- (2) The Basque phoneme written <j> is [ž] in Zuberoa, presumably due to influence from French. It is [x] or [X] in Gipuzkoa and East of Biscaya, from influence from Spanish. (Trask 1997.)
- (3) Loss of intervocalic (lenis) *-n-* and *-l-* is apparently an areal trait, shared also with Portuguese, Galician, and Asturian. (Trask 1997.)
- (4) Basque u has become \ddot{u} in Zuberoa, probably due to influence from French.
- (5) Basque initial *h* is lost in most dialects (not in Zuberoa). This loss is probably due to influence from Spanish and French. (Trask 1997.)
- (6) Basque epenthesized a vowel before initial *r*, e.g. *errege* 'king' (borrowed from Latin *rege*) and *erloju* 'clock' (borrowed from Spanish *reloj*). This feature is shared also with Aragonese and Gascon (Lakarra 1995:198.)
- (7) An older trait possibly due to areal influence, older Basque, Aquitanian, and Iberian all basically lack *p*. (Michelana 1995:112, Trask 1995:78, 87.)

These facts also provide information about the history of Basque.

5.5 Wörter und Sachen

Wörter und Sachen strategies also provide information on the history of isolates. These are strategies for detecting past language-and-culture relations.

One strategy involves the **analyzability of words** (their morphological complexity) – words that can be analyzed into transparent parts are believed to be more recent than words which have no internal analysis. It is believed that words which can be analyzed into parts were created more recently than words which have no such internal composition, thought potentially to be older forms (Campbell 2013:434-6). For example, Basque *garagardo* 'beer' is analyzable morphologically: *garagar* 'barley' + *ardo* 'wine'; however, *ardo* 'wine' has no evident morphological analysis; therefore, it is inferred that the word for 'wine' is probably older than the word for 'beer'. Similarly, Basque *gari* 'wheat' is inferred to be older than *garagar* 'barley', since *garagar* is a reduplicated from of the word for 'wheat' and thus morphologically analyzable. And, the word for 'wheat' too must be older than that for 'beer', since the 'barley' component of 'beer' is analyzable as *jan* 'eat + *arbi* 'turnip'; however, *arbi* 'turnip' has no such internal structure; it is inferred that the 'turnip' word is older than the 'radish' word.
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Another *Wörter und Sachen* strategy involves the **analyzability of toponyms**. It is also inferred that place names that can be analyzed into component parts probably came to be known more recently than those which have no such internal analysis. Thus, for example, it is inferred that *York* is older than *New York*, since the latter is composed of identifiable pieces, but not the former. In Basque, since the names of several rivers in the French Basque area have no clear etymology (not analyzable into parts), it is inferred that they are old names, for example *Atturri* (Adour), *Bidasoa, Biduze, Errobi*. The names of several rivers of Biscaya, on the other hand, are analyzable, for example *Ibaizabal* from *ibai* 'river' + *zabal* 'wide', and *Artibai* from *arte* 'between(?') + *ibai* 'river'. It is inferred that these latter names are not as old in the language as the former.

A third *Wörter und Sachen* strategy involves words which bear **non-productive (irregular) morphemes**; these are assumed to be possibly older than words composed only of productive morphemes. In Basque, for example, the morph *-di* is frozen, not productive, and its presence in the animal names *ardi* 'sheep', *zaldi* 'horse', *idi* 'ox', and *ahardi* 'sow' suggests that these animals have been known for a long time. For example *zaldi* 'horse', with non-productive *-di*, appears older than *zamari* 'horse', which is confirmed as a loanword (from Latin SAGMARIU 'pack-horse'). In general, though, it is possible only to conclude that words containing the non-productive morphology are old, but nothing can be inferred about the age of words lacking such forms. For example, for *otso* 'wolf' and *ahuntz* 'goat', lacking the irregular morphology, it is not possible to say anything of their relative age in the language.

In sum, based on these resources just seen, much is known of the history of Basque. This demonstrates that we can learn about the history of isolates.

6 What Can We Predict About the Possible Distant Genetic Relationships for Some of These Language Isolates?

What prospects are there for coming to reliable classifications that would include some of the language isolates in larger genetic groupings than those currently known? In answer to this question, we can cite relatively recent successful demonstrations where it has been possible to show a relationship for some languages previously considered isolates, for example:

Harakbmut-Katukinan ? (Adelaar 2000)
Lule-Vilela (Lule and Vilela) (Viegas Barros 2001)
Western Torres Island and Pama-Nyungan (Alpher, O'grady, and Bowern forthcoming)
Tikuna-Yurí (Tikuna and Yurí) (see Campbell 2012)

Judging from these successful instances, it can be expected that with more data and dedication, following adequate methods (see Campbell and Poser 2008), more cases of genetic relationship involving some language isolates will be discovered.

Nevertheless, it is not to be expected that there will be many of these. In particular in the case of Basque it has already been shown that the proposals that have been made do not support the assumption of a genetic relationship between Basque and any other language or language family (Lakarra 1996, 2006, Trask 1995).

7 Conclusions

From the above considerations, the conclusions that follow are:

(1) There is nothing unusual about isolates; there are 136 isolates in the world.

(2) Language isolates make up about one third of the language families in the world's total of c.420 independent families (including isolates).

(3) Language isolates are not very different from languages which have relatives. Isolates could easily have had relatives now lost or could diversify into small families of related languages.

(4) Language isolates, which have data, should not be confused with unclassified languages, which are not classified for lack of data.

(5) We have made progress in the search for relatives of Basque and other language isolates in that we have proven that many hypotheses of distant genetic relationship are not supported by the evidence, and much more is known now of the methods necessary to demonstrate a genetic relationship among languages (see Campbell and Poser 2008).

(6) In spite of doubts about discovering anything about the history of isolates, there are several resources (tools, techniques) which can help to recover considerable historical information about these languages; these include: internal reconstruction, philological investigation of earlier attestations, comparative reconstruction based on the dialects, evidence from loanwords, language contact and areal linguistics, and *Wörter und Sachen* strategies.

(7) It can be expected that with more data and dedication, employing adequate methods, new genetic relationships will be discovered for some language isolates. However, it is not to be expected that there will be many such cases, and this is highly unlikely in the case of Basque.

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Lyle Campbell University of Hawai'i at Mānoa Department of Linguistics Moore Hall 569, 1890 East-West Road Honolulu, HI 96822

lylecamp@hawaii.edu

Putting and Taking Events in Mandarin Chinese

JIDONG CHEN California State University at Fresno

1 Introduction

Placement events involve the caused change of location of an object, putting it at or removing it from a location (i.e. a "putting" or a "taking" event). These events, typically described in English by a simplex verb such as *take*, as in *She took the box from the bookshelf*, are typically encoded in Mandarin with a verb compound such as *na2-xia4-lai2* 'take-descend-come', as in (1):

(1)	Tal	cong2	shu1jia4	shang4	na2-xia4-lai2
	she	from	bookshelf	on ¹	take-descend-come
	na4	ge4 he2	2zi. ²		
	that	CLF box	x		
	'She fi	om the boo	kshelf took o	down the	box (towards herself).'

The first verb (V_1) of the verb compound, *na2* 'take', encodes the general action of removing, the second verb (V_2) , *xia4* 'descend', encodes the Path of motion, and the third verb (V_3) , *lai2* 'come', indicates Deictic information (i.e. towards the Agent in [1]). Verb compounds like *na2-xia4-lai2* are known as directional verb compounds, which typically describe motion events and involve a verb indicating the Path of motion.

This paper investigates the lexical semantics of Mandarin placement predicates from the perspective of event encoding and event categorization. The data explored in this study are the verbs used in elicited descriptions of 63 Put&Take video clips (Bowerman, Gullberg, Majid, andNarasimhan, 2004) plus three warm-up items, depicting a wide range of caused putting and taking events by 10 adult native speakers of Mandarin (mean age 28 years). In §2, I give an overview of the grammatical encoding of the semantic components of a placement event in a clause – Figure, Ground, Motion, and Path. In §3, I discuss the lexical semantics of verb compounds and their component verbs. I

¹ The gloss for *shang4* 'on/top' is adopted for convenience of discussion as there is no exact counterpart in English.

 $^{^{2}}$ The numbers mark tones. Abbreviations used in the glosses in this paper include: PFV = perfective, CLF = classifier, GEN = genitive/possessive case marker.

first examine Path verbs since Path is the key component of a motion event. Mandarin Path verbs are often in the second or third position in a directional verb compound and they constitute a closed set. I then illustrate the event categories selected by verbs that have been used in the V_1 slot of a directional verb compound and specify the crucial semantic features for these distinctive categories.

2 Encoding Placement Events

A placement event, as a particular type of motion event, is analyzed as having four basic semantic components, Motion, Ground, Figure, and Path (Talmy, 1985, 2000).³ In Mandarin the information about Motion and Path is encoded in the predicates (see §3 for details). The Ground and Figure components are encoded as arguments or adjunct coverb phrases in the clause.⁴

The Ground information includes the location from which the Figure moves (i.e. Source) and at which the Figure ends up (i.e. Goal). The Source information always occurs in a preverbal position as an adjunct coverb phrase, e.g. *cong2 shui3 li3* 'from water inside' (= from the water), as in (2). The coverb *cong2* is a preposition-like morpheme and it must be used together with a spatial particle such as *li3* 'inside' or *shang4* 'on' after the Ground NP. It is the spatial particle that explicitly indicates the spatial relation between the Figure entity and the Ground entity.⁵ It is ungrammatical to leave the spatial particle out, e.g. **zai4 di4* 'at ground' (cf. *zai4 di4 shang4* 'at ground on' in [2]). To encode the spatial relations between the Figure and the Gound that is typically encoded with a preposition such as *in* and *on* in English, Mandarin utilizes two components, a coverb, as a general locative marker, and a locative particle.

(2) *Tal* ba3 zhuan1tou cong2 shui3 li3 na2-chu1-lai2. she BA brick from water inside take-exit-come 'She took the brick from the water.'

³ I follow Talmy's (Talmy, 2000) theoretical framework in analyzing motion events and adopt the following terms to refer to:

Figure = the object that undergoes a change of location

Ground = a reference with reference to which the path, site, or orientation of the Figure is characterized

Source = origin of the motion of the Figure

Goal = orientation of the motion of the Figure

Agent = the causer of motion

Path = trajectory or Deixis of motion

⁴ Li and Thompson (1981) use "coverb" to refer to a group of morphemes that may function as a verb in some contexts but that can also behave like functional words in other contexts in Mandarin. Typical coverbs include morphemes like *zai4* 'at', *cong2* 'from', *gen1* 'with', *cong2* 'from', *chao2* 'facing', *yan2* 'along', and *li2* 'be apart from'.

⁵ Morphemes like *li3* 'inside' or *shang4* 'on' were called "locative particles" (Li and Thompson, 1981). Other locative particles are *xia4* 'under', *wai4* 'outside', *qian2* 'front', *hou4* 'back', *pang2* 'side', and *zhong1jian1* 'middle'.

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The Goal information always occurs at a post-verbal position either as an adjunct coverb phrase such as *zai4 di4 shang4* 'at ground on' in (3) or as an NP of the complex predicate such as *ta1 de tou2fa1 li3* 'her hair inside' (= the inside part of her hair) as in (4).

(3)	Tal	ba3	mu4kuai4	dao4	zai4	di4	shang4.
	he	BA	wood.block	pour	at	ground	on
	'He pour	red th	e wooden blocks	on the grou	und.'		

(4) *Tal ba3 hual chal-jin4 le tal de tou2fa li3.* she BA flower insert-enter PFV she GEN hair inside 'She inserted the flower into her hair.'

The Figure, i.e. the entity that undergoes the movement, is encoded as the argument of the predicate (as in [1]). It also occurs as an NP following the morpheme *ba3* (henceforth the BA NP), as in (2), (3), and (4). The morpheme *ba3* was a full verb in classical Chinese, meaning 'take, hold, handle' (e.g., Bennett, 1981; Wang, 1954), but it has become grammaticalized and its original status as a full verb has weakened in modern Chinese. Constructions containing the morpheme *ba3* are commonly referred to as "the BA construction", in which the referent of the BA NP usually receives a reading of being disposed of, dealt with, manipulated or handled, and, thus, affected by the action denoted by the VP in the clause. This meaning gives the BA construction the label "disposal construction" (Chao, 1968; Li and Thompson, 1981; Wang, 1954).⁶

In the elicited descriptions of placement events, 75% (472 out of the total of 630) of the constructions consists of BA constructions. This dominance may be due to three factors. First, the "disposal or manipulation" meaning of the BA construction corresponds to the manipulation meaning and the caused change of location of the entity in a placement event. Second, Mandarin is argued to favor temporal iconicity (Haiman, 1985; Tai, 1985) and the order of the grammatical components in the BA construction conforms indeed to this principle. That is, the surface order of the syntactic units matches the temporal order of the placement events - holding or handling the object and then placing it at or removing it from a location. This temporal sequence is realized syntactically with the morpheme ba3 followed by the Figure NP that is followed by the placement verb. The historical meaning of ba3 as 'take, hold, handle' is still detectable in the BA construction. The counterparts of ba3 in a number of south eastern Asian languages have preserved their full verb status and are frequently used with other placement verbs to form a serial verb construction to describe placement events (Enfield, p.c.). Finally, ba3 is syntactically required to allow more than one constituent to occur in a postverbal position. Mandarin restricts the number of constituents post-verbally

⁶ The status of ba3 is controversial: it has been argued to be a case marker (Huang, 1982), a focus marker (Sun and Givón, 1985), or a secondary topic marker (Tsao, 1996).

and when more than one constituent is placed in the post-verbal position, the sentence becomes ungrammatical, e.g. **tal chal-jin4 hual tal de tou2fal li3* 'she insert-enter flower her hair inside', where two phrases, *hual* 'flower' and *tal de tou2fal li3* 'her hair inside' occur after the verb compound *chal-jin4* 'insert-enter'. When *ba3* is used, however, the NP encoding the Figure follows *ba3* directly and thus leaves only the Goal phrase post-verbally, as in (3) and (4).

3 Lexical Semantics of Placement Verbs

The meanings of Motion and Path are encoded in compound placement predicates in Mandarin. In this data set, 67% of all the verb tokens are verb compounds and the remainder consists of simplex verbs. All the simplex placement verbs are also used as the V₁ of a verb compound.⁷ It is worth noting that not all the elicited verbs of manipulation (V₁) by themselves encodes the core meaning of a placement, i.e. caused change of location, such as *diao1* 'hold in mouth', *jia2* 'hold tightly'. The caused motion meaning is conveyed by the compound as a whole, i.e. when such a verb of manipulation is combined with a V₂ indicating Path of motion. This resembles the so-called English caused motion construction (e.g., Goldberg, 1995) such as *John squeezed the ball into the box*, where the verb *squeeze* by itself does not have a motion meaning. Therefore, in these cases the constructional meaning of verb compound, rather than the verb alone, gives rise to the caused motion reading. In what follows, I discuss the composition of verb compounds and the lexical semantics of the high-frequency simplex placement verbs.

3.1 Productivity and the Semantic Composition of the Directional Verb Compounds

Verb compounding is a very productive process in Mandarin, involving the combination of two or three free verbs in a fixed order, e.g. *na2-xia2-lai2* 'take-descend-come', as in (1).⁸ The first verb (V₁) usually encodes the manipulation of an object (e.g. putting or taking), the second verb (V₂) the Path of the motion, and the third verb (V₃) the Deictic relation between the Agent (or the speaker) and the direction of motion of the Figure object.⁹ A directional verb compound (V₁V₂ or V₁V₂V₃) clearly represents a placement event as composed of two crucial semantic components, each encoded by one verb. Each component verb is a full verb by itself and can be used freely outside verb compounds. The ordering of the component verbs is fixed and

⁷Simplex placement verbs were used only for putting events in the data. When a simplex verb was used, it was always immediately followed by a coverb locative phrase with *zai4* indicating the Goal, e.g. *zai4 di4 shang4* 'at ground on' (= on the ground), as in (3).

⁸ Mandarin verb compounds encode not only motion events but also change-of-state.

⁹ Two verbs encoding Path were found in V_1 position in this data set: *shen1* to extend, to stretch' and *diao4* to fall'. In the context of these verbs, the role of V_2 is to provide details about the Path followed by the Figure. See §3.4 for details.

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iconic — the verb expressing the manipulation of an object (such as placing or taking) usually precedes the verb expressing the Path of motion.

The productivity of verb compounding was attested by the diversity of directional verb compounds used in the descriptions of placement events: A total of 59 types of verb compounds were produced (token frequency 423). This productivity is also revealed by the diversity of the verbs (V₁) that can combine with the Path verbs. A total of 37 types of V₁ were used by the ten speakers. These verbs were combined flexibly with one or two Path verbs which form a closed set in Mandarin.

3.2 Path Verbs: V₂ and V₃ of the Directional Verb Compound

Path is the key component of motion. In Mandarin Path information is typically encoded with one or two verbs (V_2 or V_3) in a directional verb compound. The high frequency of verb compounds indicates that Path is often spelled out explicitly in the description of placement events.

Path verbs include verbs that indicate the trajectory of the motion such as *shang4* 'ascend' (up), and *xia4* 'descend' (down), and deictic verbs that indicate the orientation of motion such as *lai2* 'come' and *qu4* 'go'. The trajectory Path verbs can combine with the deictic verbs to form compounds. Table 1 shows the two groups of verbs and their combinations.¹⁰

Table 1. Mandarin Path Verbs and Their Combinations

(Note: Notations such as V_2 or V_3 indicate the position of a Path verb in a directional verb compound with three component verbs.)

V ₃	lai2 'come'	<i>qu4</i> 'go'
V ₂		
shang4 'ascend'	shang4-lai2	shang4-qu4
	'ascend-come' (come up)	'ascend-go' (go up)
xia 'descend'	xia4-lai2	xia4-qu4
	'descend-come' (come down)	'descend-go' (go down)
jin4 'enter'	jin4-lai2	jin4-qu4
	'enter-come' (come in)	'enter-go' (enter)
chul 'exit'	chu1-lai2	chul-qu4
	'exit-come' (come out)	'exit-go' (go out)
hui2 'return'	hui2-lai2	hui2-qu4
	'return-come' (come back)	'return-go' (return)
guo4 'pass'	guo4-lai2	guo4-qu4
	'pass-come' (come over)	'pass-go' (go over)
zou3 'be.away'	_	_
qi3 'rise'	qi3-lai2	_
	'rise- come' (come up)	

¹⁰ The verb *zou3* by itself means 'walk', but when it is used as the V_2 in a compound it has only a gramamticalized meaning of 'be away'. For example, *na2-zou3* 'take-walk' means 'take away'.

Note that neither a trajectory Path verb nor a deictic verb by itself encodes the meaning of placement. They have to combine further with a verb of manipulation to describe the placement events.

The two deictic verbs, lai2 'come' and qu4 'go', are optional – only 37% (158/423) of the verb compounds contain a deictic verb. Among these verb compounds, lai2 'come' is dominant (97%). Lai2 'come' indicates the direction of motion of the Figure object towards the Agent of the action or towards the speaker who describes the event. For example, lai2 is used in na2-xia4-lai2 'take-descend-come', as in (1), since the box is removed from the bookshelf (a higher location) to a lower location where the Agent is standing and the motion is oriented toward the Agent.

3.3 Verbs Expressing Manipulation: V₁ of the Directional Verb Compounds

Two general placement verbs, fang4 'put' and na2 'take', are the most frequent V_1 of directional verb compounds. They are general in the sense that they have relatively little meaning beyond a schematic meaning of "manipulate a Figure object to cause motion/change of location". Events that were described with fang4 'put' or na2 'take' in this data set form a subset of the putting and taking events that are typically described with *put* or *take* in English (Bowerman, Majid, Gullberg, and Narasimhan 2004). Many placement events that fall into the extensional categories of English put and *take* are obligatorily encoded in Mandarin with placement verbs that convey more specific information than simply the bare schema of putting or taking. I call these verbs "specific verbs". The general placement verbs fang4 or na2 are often not applicable or not the most favored to describe the events depicted by the specific verbs. When a specific verb is used there is often a high degree of agreement among the speakers. The subsections below illustrate the extensional patterns of the general placement verbs fang4 and na2 and that of the specific verbs. Table 2 summarizes the crucial semantic distinctions that Mandarin speakers make in describing placement events.

3.3.1 Fang4 'put'

The verb *fang4* 'put' describes a large group of placement events such as 'putting cup on table', 'putting box up on shelf', and 'putting book on floor'. 14 of the total of 36 putting events were described with *fang4* with a 100% agreement on the use of this verb for most of the clips. These events involve putting a large range of inanimate Figure entities with different physical properties, i.e. cup, rice, box, book, apple, stone, pen, and rope, at various kinds of locations such as table, shelf, floor, tree branch, and hole. Although the current set of stimuli does not include any animate Figure entities, *fang4* can also be used for such cases, e.g. putting a baby into cradle. The resultant orientation of the Figure can be either standing (such as cup on table) or lying

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(such as book on floor). The verb *fang4* was also used to describe placing an object with an instrument, e.g. putting a banana on table with long tongs. Given such wide range of uses, *fang4* 'put' is obviously a broad 'put-type' verb with no entailments regarding the specific physical properties of Figure or Ground, the resultant orientation of the Figure, and Manner of manipulation.

3.3.2 Na2 'take'

The verb na2 'take' describes a large range of events of removing a Figure from a Ground: 48% of all the taking events (13 of the total of 27) were described with na2, with an average of 85% agreement among the speakers. These events consist of removing different types of inanimate Figure entities such as box, orange, stone, rope, poster and stone from various kinds of locations such as table, self, box, tree branch, as well as from an animate Ground (e.g. taking a coke can from someone).

Interestingly, for 6 out of 27 taking events, some speakers described these events with specific verbs such us ba2 'pull' for taking cucumber out of a recorder case, to focus on a tight-fitting relation between the Figure and the Ground. In these specific contexts, na2 is clearly less frequently selected, if not considered inappropriate by Mandarin speakers.

3.3.3 Verbs of Dressing and Undressing

Specific dressing or undressing verbs typically describe putting clothes on or taking them off. Mandarin has three such verbs, *chuan1* 'put on', *dai4* 'put on', and *tuo1* 'take off'. These verbs were used by all the speakers across the same set of events – events of putting on or removing clothes – with 100% agreement. Sample descriptions are shown in (5) and (6).

(5)	Yi2	ge4	ren2	ba3	wai4tao	chuang1-shang4	le.
	one	CLF	person	BA	coat	put.on-ascend	PFV
	'A pers	son put	on a coat	.'			

(6) *Yi2* ge4 ren2 ba3 wa4zi tuo1-xia4-lai2 le. one CLF person BA sock take-descend-come PFV 'A person took off her socks.'

The two putting-on-clothing verbs, *chuan1* and *dai4*, are selected according to the body part (i.e. the Goal) or the entities involved: *chuan1* is used only for putting on clothing on the trunk of the body, e.g. putting on a coat, putting on trousers; *dai4* is used for putting on accessories such as hat, earrings, necklace, bracelet, glasses, or ring. These entities typically land on the joints or the extremities of the body such as wrist, finger, or ears. The verb *tuo1* has a general meaning of removing clothing off of body parts and is applicable to the removing of any kind of clothing (including small accessories) from any part of the body. The general verb *fang4* 'put' cannot be used for putting

clothing or accessories on body parts. In contrast, the general verb *na4* 'take' may be used for removing small accessories from body part, e.g. taking off hat (from head).

3.3.4 Verbs Specifying Spatial Relations between Figure and Ground

The relation between Figure and Ground plays a role in determining the extensional categories of the placement verbs. Two putting verbs, *sai1* 'stuff' and *cha1* 'insert', and two taking verbs, *ba2* 'pull' and *chou1* 'pull, draw', describe putting a Figure in or taking it from tight-fitting containment. The verbs *sai1* is used only for soft (usually fluffy) objects, and *cha1* only for rigid objects, as in (7) and (8).

- (7) Yi2 ge4 ren2 ba3 bu4 sai1-jin4
 one CLF person BA rag stuff-enter qi4che1 pai2qi4-guan3.
 car exhaust-pipe
 'A person stuffed a rag into the exhaust pipe of the car.'
- (8) *Na4* ge4 ren2 ba3 na4zhu2 cha1-jin4 zhu2-tai2. that CLF person BA candle insert-enter candle-stand 'That person inserted the candle in the candle stand.'

The verbs *ba2* 'pull' and *chou1* 'pull, draw' both describe removing a Figure from a tight-fitting container; *chou1*, in particular, is used for pulling a long object from a tight-fitting container. This is illustrated in (9) and (10).

(9)	Na4	ge4	ren2	ba3	na4zhu2	cong2
	that	CLF	person	BA	candle	from
	zhu2tai2		shang4	ba2-	xia4-lai2.	
	candle.st	and	on	pull-	exit-come	
	'That pe	rson i	nserted the	cand	le in the car	ndle stand.'

(10) *Ta1* cong2 dai4zi li3 chou1-chu4 huang1gua1. he from bag inside pull-exit cucumber 'He pulled a cucumber from the bag.'

Mandarin distinguishes tight-fitting relation from adhesive relationship. The verb *tiel* 'stick' describes attaching a Figure, which is subject to gravity, to the Ground with adhesives such that it stays on the Ground, as shown in (11).

(11) *Yi2 ge4 ren2 ba3 hua4 tie1 zai4 qiang2 shang4*. One CLF person BA poster stick at wall on 'A person put a poster on the wall.' Mandarin also distinguishes removing a Figure from a lower location, as represented by the verb *jian3* 'pick' in (12).

(12) *Ta1* cong2 di4 shang4 jian3-qi3 yi1 ben3 shu1. she from floor on pick-rise one CLF book 'She picked up a book from the floor.'

Nine of the ten speakers used *jian3* 'pick' to describe the picking event, and only one speaker used na2 'take'. When probed whether na2 was also appropriate to describe this event, all the speakers agreed that na2 was applicable. It seems that even if the general taking verb na2 is available and appropriate to describe such an event, it is not preferred; rather a specific verb is favored as it conveys more information than just manipulation.

3.3.5 Verbs Specifying Manner

Two taking verbs, *tao1* 'draw, dig' and *zhua1* 'grasp, hold tightly', specify the Manner in which the Agent removes a Figure from a Ground, as in (13) and (14).

(13)	Nal	ge4	ren2		cong	2 kou3dai4	li3
	That	CLF	perso	on	from	pocket	in
	tao1-chi	ı1	yi2	mei2		ying4bi4.	
	take-exit	t	one	CLF		coin	
	'That pe	rson t	ook a	coin	from ł	ner pocket.'	

(14) *Tal cong2 zhuol shang4 zhual-qi3 yil ba3 dou4zi*. she from table on grasp-rise one CLF bean 'She took a handful of beans from the surface of the table.'

The verb *tao1* describes taking out a Figure in a scooping manner, usually after searching in a Ground object that is deep, e.g. the pocket as in (13) which encloses both the Figure object (coin) and the Agent's hand. The verb *zhua1* 'grasp, hold tightly' describes the Agent opening her hand, taking hold of the Figure, and grasping it in the hand.

3.3.6 Verbs Specifying Intentionality and Control

Mandarin distinguishes intentional (controlled) vs. accidental placement, as reflected in four specific verbs – diao4 'drop', reng1 'throw', sa3 'spill', and dao4 'pour'. The events picked out by these verbs cannot be described with a general verb *fang4* 'put', and the speakers show a high degree of agreement on the use of each verb for the relevant stimuli.

The verb *diao4* describes unintentional placing or dropping of a Figure, e.g. 'dropping book accidentally on floor'. Deliberate dropping, in contrast, is

described with *reng1* 'throw', e.g. tossing a book on floor. This contrast is shown in (15) and (16).

- (15) *Yi1 ben3 shu1 diao4 dao4 di4 shang4 le.* one CLF book fall to ground on PFV 'A book fell on the ground.'
- (16) *Ta1 ba3 shu1 reng1 zai4 di4 shang4.* she BA book throw at ground on 'She threw the book on the ground.'

The verb *sa3* is typically used for accidentally spilling liquids, as in (17). It is also appropriate to describe accidental dropping of solid objects consisting of fine grains or particles, like sand, rice, flour, sugar or seeds.

(17)	Yi2 ge4 ren2	ba3 zhuo1zi s	hang4 de	beilzi	na2-qi3-lai2,
	one Clf person	BA table of	n GEN	cup	take-rise-come
	shui3 cong.	2 bei1zi li3 sa.	3-chu1-lai2	le.	
	water from	cup in spil	ll-exit-come	PFV	
	'A person tool	the cup from the	ne table, and	l water spil	led out from
	the cup.'				

The verb *dao4* 'pour' typically describes the Agent either pouring liquid or dropping solid objects (e.g. wooden blocks) into a Ground object. Whereas in English such events are encoded with three English verbs, *pour*, *dump*, and *flip*, in Mandarin *dao4* covers all the events categorized by these three English verbs. This suggests that Mandarin does not distinguish placing liquid versus solid objects into a container; nor does it care about the Manner of pouring, e.g. flipping blocks off notepad into bowl.

3.3.7 Verbs Encoding Instrument of Placement

In the elicited data, six verbs encode instrument with which the placement action is conducted. These verbs are used for both putting and taking events: bao4 'hold in arm(s)', ling1 'carry by hand(s)', ti2 'carry by hand(s)', xian2 'hold in mouth', diao1 'hold in mouth', and jia2 'hold tightly (in instrument)'. The first five verbs typically entail a body part engaged in the placement action – arm(s) or arm-like instrument for bao4, hand(s) or hand-like instrument for ling1 and ti2 (which are synonyms), and mouth for xian2 and diao1 (which are synonyms). The verb jia1 entails holding a Figure tightly inbetween the instrument, e.g. holding a banana with long tongs.

3.4 Verbs encoding Path as the V₁ of the Directional Verb Compounds

Recall that Path is usually encoded with a second or third verb in a directional verb compound. There are, however, two verbs in this data set that entail Path,

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and that occur in the V₁ slot of directional verb compounds, *diao4* 'fall' and *shen1* 'extend'. The verb *diao4* 'fall', describes accidental dropping of a Figure (cf. §3.3.6), and entails a downward motion as effected by gravity. This verb can combine with a Path verb that explicitly spells out downward motion entailed in *diao4* 'fall', e.g. *diao4-xia4* 'fall-descend', but it cannot combine with Path verb that entails a conflicting Path, e.g. **diao4-shang4* 'fall-ascend'.

The verb *shen1* 'extend, stretch' can describe either putting or taking events. It entails a Figure's stretching out, which as a result ends up in a Ground object, e.g. 'putting head into and taking it out from a bucket' or 'taking one's hand from a hole on a tree', as in (18) and (19).

- (18) *Tal ba3 tou2 shen1-jin4 le tong3 li3.* He BA head extend-enter PFV bucket in 'He extended his head into the bucket.'
- (19) *Tal* ba3 shou3 cong2 shu4dong4 li3 shen1-chu1-lai2 le. she BA hand from tree.hole in extend-exit-come PFV 'She took her hand from the hole on the tree.'

The verb *shen1* is used only for events where a Figure extends itself and ends up in the space of a container. In other words, the part that moves is an integral part of the Agent that instigates the movement. When being probed whether *fang4* 'put' could be used to describe events as depicted by (18) or (19), most of the speakers rejected it. It appears therefore that the use of *shen1*, instead of *fang4* or *na2*, is specific to putting or removing a part of the Agent body.

3.5 Summary

I have shown the lexical semantics of the verbs that are typically the V_1 s of a directional verb compound in the elicited descriptions of placement events in Mandarin. Two general placement verbs, *fang4* 'put' and *na2* 'take', have large extensional categories, but their use is not unconstrained and Mandarin requires specific verbs to encode certain kinds of events. Six groups of specific verbs are identified according to certain shared distinctive semantic features, as summarized in Table 2.

Table 2 shows that crucial semantic distinctions are made based on the Goal of the placement (e.g. dressing verbs), the spatial relationship between a Figure and a Ground object (e.g. tight-fitting), Manner of placement, intention and control of the Agent, and Path of motion. All of these verbs occur as the V_1 of compound, but some are also used by themselves, as in (3). The compound as whole, rather than any of the component verbs alone, expresses the motion reading.

Table 2. Sun	nmary of the	high-frequency	specific	placement	verbs	in	the
elicited descu	riptions of pla	acement events					

Groups	Verbs	Glosses	Distinctive semantic features
(un)dressing	tuol	take off	Figure: Clothing
verbs	chuan1	put on	Figure: Clothing; Goal: body trunk and feet
	dai4	put on	Figure: Clothes; Goal: extremities or joints
			of body (e.g. hand, head, wrist)
Verbs	ba2	pull	Relation between Figure and Goal (tight-
specifying			fitting); direction of motion (out)
relationship	chou1	pull, draw	Relation between Figure and Goal (tight-
between		(from long	fitting); direction of motion (out)
Figure and		container)	
Ground	chal	insert	Relation between Figure and Goal (tight-
			fitting); direction of motion (in); Figure
			(rigid)
	sai l	stuff	Relation between Figure and Goal (tight-
			fitting); physical property of Figure (soft)
	tiel	paste	Relation between Figure and Goal (clinging)
	jian3	pick	Relation between Source and Goal: From a
			lower location to a higher location
Verbs	taol	draw, dig	Manner of placement
specifying	sa3	spread	Manner of placement
Manner	zhua l	grasp, hold	Manner of placement (grasping)
		tightly	
Verbs	diao4	fall	Lack of control and intention
specifying	sa3	spill	Lack of control and intention
control and	dao4	pour	Intention and control
intention	rengl	throw	Intention and control
	tui l	push	Intention and control
Verbs	bao4	hold in arm	Instrument (arm or arm-like instrument in a
encoding			holding posture)
Instrument	lingl	carry in	Instrument (hand or hand-like instrument)
		hand	
	ti2	carry in	Instrument (hand or hand-like instrument)
		hand	
	diao l	hold in	Instrument (mouth)
		mouth	
	xian2	hold in	Instrument (mouth)
		mouth	
	jia2	hold tightly	Instrument (tight-fitting between Figure and
			Instrument)
Verb	diao4	fall	Path (downward)
encoding	ahor 1	extend,	Doth (forward)
Path	snen1	stretch	

4. Conclusion

This paper demonstrates the Mandarin-specific organization of the semantic components in the domain of placement events and the semantic extensional patterns of the general placement verbs and the specific verbs. It shows that Ground (Source/Goal) and Figure are encoded as arguments or adjunct coverb phrases and that Path and Motion are frequently encoded with directional verb compounds. A directional verb compound is composed of two or three free verbs in the form of V_1V_2 or $V_1V_2V_3$, with each verb encoding certain aspect of the motion event. The verb compounds as a whole convey the motion meaning of the placement verbs in the V_1 slot, an open set of verbs, encompass general placement verbs *fang4* 'put' or *na2* 'take', a range of specific verb that make fine-grained semantic distinctions, and two verbs that entail the Path of motion. The verbs in the V_2 or V_3 slot form a closed set of two types of Path verbs: Trajectory verbs and deictic verbs.

This study contributes to the crosslinguistic study of typology of motion events. It supports the refined typology of motion events as proposed by Slobin (2004) that Mandarin, different from the satellite-framed languages (such as English and German), belongs to the "equipollently-framed languages". In this pattern, Path and Manner are expressed by equivalent grammatical forms (i.e. two or three free verbs in the compound).

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Jidong Chen California State University at Fresno Department of Linguistics 5245 North Backer Avenue M/S PB92, Fresno CA, 93740-8001

jchen@csufresno.edu

Orthography Shapes Semantic and Phonological Activation in Reading

HUI-WEN CHENG and CATHERINE L. CALDWELL-HARRIS *Boston University*

Introduction

Reading is a process of retrieving graphic, semantic, and phonological information from printed words. Psycholinguists are increasingly aware that different orthographies encode semantics and phonology with different amounts of transparency. The activation of semantic and phonological information during reading may thus differ across orthographies. However, priming studies have produced mixed results on this question, leading some researchers to claim that Chinese orthography produces the same pattern of phonological activation as does English orthography (e.g., Perfertti and his colleagues 1992, 1998, 2008). The present study approaches this issue using a novel task that may avoid some of the methodological problems of priming studies: semantic substitution errors made by native Chinese readers.

The transparency of symbol-sound correspondence has been used to categorize alphabetic orthographies (Liberman et al. 1980). Shallow orthographies, like Spanish and Serbo-Croatian, have relatively consistent and transparent letter-phoneme correspondences. Deep orthographies, like English and Arabic, have relatively inconsistent and opaque letter-phoneme correspondences. The Orthographic Depth Hypothesis (ODH) states that when reading printed words, shallow orthographies activate more phonological information, whereas deep orthographies activate more graphic information (Katz and Frost 1992). In other words, phonological recoding is more important for shallow orthographies, while visual-based direct access strategy is more important for deep orthography. Using naming tasks, Frost et al. (1987) showed that the role of phonological recoding is more important in English than in Hebrew. They also reported a relatively strong effect of semantic facilitation in Hebrew, a small but significant effect in English, and no facilitation

in Serbo-Croatian. Similarly, Tabossi and Laghi (1992) found stronger semantic priming effects in English than in Italian for naming words aloud. These findings were challenged by Baluch and Besner (1991), who proposed that the cross-orthography differences might result from the inclusion of nonwords in the stimulus lists, since nonwords encourage the use of a prelexical naming strategy. These uneven and conflicting findings indicate that additional research on semantic activation is warranted.

It is well known that Chinese orthography has a relatively opaque symbol-sound correspondence. If included in the continuum of orthographic depth, Chinese would be placed at the deep end. Although 80% to 85% of Chinese characters consist of a semantic radical and a phonetic radical (Kang 1993; Zhou 1978), phonetic radicals are not reliable cues for pronunciation (Zhou 1980). In contrast, semantic radicals are usually directly related to character meaning (Wang 1997). Therefore, there was an assumption that reading Chinese is solely meaning-based (e.g., Weekes et al. 1998, Zhou and Marslen-Wilson 1996). This view was refuted by studies of Perfetti and his colleagues, who showed that phonological activation appears strongly at the early stage of Chinese visual word recognition (Perfetti and Tan 1998, Perfetti and Zhang 1991, Perfetti and Zhang 1995). For example, in 2 primed-naming experiments, graphic, phonological, and semantic priming effects occurred at 43ms, 57ms, 85ms respectively, and all priming effects were at least 50ms (Perfetti and Tan 1998). Based on these studies, Perfetti and his colleagues proposed the Universal Phonological Principle (UPP) to argue that phonological activation is obligatory across writing systems. However, Chen and Shu (2001) were only able to replicate Perfetti and Tan (1998) in graphic priming effects, but not in semantic and phonological priming effects. Wu and Chen (2000) also reported that with several attempts, they still could not have similar results as Perfetti and Zhang (1991). Moreover, other research found that phonology plays no role or a less important role in Chinese reading (Chen et al. 1995, Liu et al. 2006, Shen and Forster 1999). Given the lack of consensus in semantic and phonological activation in reading Chinese, additional research is necessary to increase the understanding of the process of Chinese reading.

This study will investigate whether Chinese orthography differs from English orthography in terms of the *relative activation* of semantic versus phonological information. Do Chinese characters evoke greater activation of semantic information compared to phonological information? Do they trigger greater activation of semantic information than English orthography? Moreover, few studies have examined Chinese reading and alphabetic reading with the same experimental design. The present study fills these gaps in the literature by examining a previously unstudied phenomenon: semantic substitutions that occur during reading outloud tasks.

Semantic substitution errors are errors made by substituting the target word (e.g., yell) with another word which is semantically related to the target word (e.g.,

shout) (Abu-Rabia and Taha 2004, Béland and Mimouni 2001). It is a type of error that deep dyslexic English readers, but not normal English readers, usually make (Barry 1984, Coltheart 1980). However, in a study conducted in China and Taiwan to examine the processing of Chinese simplified and traditional scripts, we observed Chinese readers making semantic substitution errors when reading aloud never-seen-before Chinese passages from a computer screen. This paper aims to report this finding. It has been argued that the occurrence of semantic substitutions in alphabetic readers with deep dyslexia results from the deficit of phonological retrieval (Laine et al. 1990). Given that Chinese orthography encodes phonological information in an opaque manner, we speculate that it is this characteristic that leads to weak phonological activation which in turn yields semantic substitutions.

1 The Current Study

Two experiments were conducted to investigate how frequently native Chinese speakers make semantic substitution occurs while reading aloud from novel (i.e., never seen before) passages.

1.1 Experiment 1

Experiment 1 was a passage read-aloud task performed by native Chinese speakers in China and Taiwan.

1.1.1 Materials

The stimuli consisted of 12 Chinese short passages selected from magazine articles published in China or Taiwan. They varied in three levels of difficulty: humorous stories, general current affairs, and technical scientific reports. The length of the passages ranged from 103 to 210 Chinese characters (mean = 176.5, SD = 28.36).

1.1.2 Participants

Participants were 29 Chinese college students (mean age = 22.3 yrs), 25 Chinese middle school students (mean age = 12.7 yrs), and 25 Taiwanese middle school students (mean age = 13.2 yrs). The Chinese students were recruited from Beijing and the Taiwanese students were recruited from Taipei. They were all normal native Chinese readers without any reading disabilities.

1.1.3 Procedure

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Participants were given no opportunity to preview the passages before they were asked to read aloud. In other words, the time when they read one passage aloud was also the first time they saw the passage. All passages, 6 passages in simplified script and 6 passages in traditional script in a counterbalanced design, were presented to every participant on a computer screen one at a time in random order¹. Participants were told to read each passage aloud at their normal reading rate. They pressed the space bar as soon as they finished each passage reading, allowing reading times to be automatically recorded. An experimenter sat next to the participants and marked the verbal errors on hard copies of the reading texts.

1.1.4 Results

Although participants in Experiment 1 read in their familiar script as well as in their unfamiliar script, only the data from reading familiar script were analyzed. Thus, the data reported here consists of Chinese students reading in simplified script and Taiwanese students reading in traditional script. The rationale is that we do not want to count the semantic substitution errors resulted from the unfamiliarity of script. When reading an unfamiliar Chinese script, the common scenario is that a reader would try to guess the characters which he cannot recognize based on the context, which often results in a semantic substitution error.

The errors made by the participants during the read aloud task were categorized into 3 main categories: pure substitution errors, combined substitution errors, and miscellaneous errors as defined below.

(I) Pure Substitution Errors: The replaced words have only one kind of linguistic relation with the target words, either semantic, phonological or orthographic.

(i) Semantic substitution errors: The replaced words are related to the target words in meaning, without sharing any phonological or orthographic relationship. They could be similar in meaning (e.g., replacement of 由 $you2^2$ 'from' with 從 cong2 'from'), be thematically related, or be taxonomically related (e.g., replacement of 問 wen4 'to ask' with 說 *shuo1* 'to say').

(ii) Phonological substitution errors: The replaced words are related to the target words in pronunciation. They share at least 2 phonemes (e.g., replacement of \mathcal{H} guang1 'light' with $\underline{\beta}$ guang3 'wide'; replacement of $\underline{\mathbb{M}}$ feng1 'wind' with $\overline{\beta}$ fang1 'square'). There is no semantic or orthographic relation between the replaced words and the target words.

(iii) Orthographic substitution errors: The replaced words are related to the target

¹ This task is part of our another study which investigated the effect of simplified and traditional Chinese scripts on reading Chinese. Therefore, participants were asked to read in the 2 different Chinese scripts.

² The number following the pinyin of each character refers to the tone of the character.

words in form. They share at least one character component (e.g., replacement of 運 *yun4* 'transport' with 連 *lian2* 'link'; replacement of 問 *wen2* 'to ask' with 間 *jian1* 'between'). There is no semantic or phonological relation between the replaced words and the target words.

(II) Combined Substitution Errors: In this type of error, the replaced words have 2 or 3 kinds of linguistic relation with the target words.

(iv) Semantic + Phonological substitution errors: The replaced words are related to the target words in meaning and pronunciation (e.g., replacement of \Re *kel* 'classifier for round objects' with (*ge* 'classifier for anything'). There is no orthographic relation between the replaced words and the target words.

(v) Semantic + Orthographic substitution errors: The replaced words are related to the target words in meaning and form (e.g., replacement of Ξ *zhi4* 'to' with 到 *dao4* 'to'; replacement of 線 *xian4* 'thread' with 絲 *si1* 'thin thread'). There is no phonological relation between the replaced words and the target words.

(vi) Phonological + Orthographic substitution errors: The replaced words are related to the target words in pronunciation and form (e.g., replacement of 忱 *chen2* 'sincerity' with 枕 *zhen3* 'pillow'). There is no semantic relation between the replaced words and the target words.

(vii) Semantic + Phonological + Orthographic substitution errors: The replaced words are related to the target words in meaning, pronunciation, and form (e.g., replacement of \subseteq *an1* 'ammonia' with \subseteq *dan4* 'nitrogen').

(III) Miscellaneous Errors: Miscellaneous errors including the following error types.

(viii) Insertion: A word was inserted into the passage during reading aloud.

(ix) Inversion: The order of two words was switched.

(x) Omission: A word presented in the passage was omitted during reading aloud.

(xi) Morphological substitution errors: The replaced word is derived from the target word or vice versa (e.g., replacement of *person* with *personality*). This type of error only occurred to native English readers in Experiment 2, but not to native Chinese readers in Experiment 1 and 3.

(xii) Function-word substitution errors: A function word (e.g., *the*) is replaced with another function word (e.g., *a*). This type of error, like morphological substitution errors, only occurred to native English readers.

Based on the classification described above, the percentage of error types was calculated and appears in (1). The most frequent category of error made by the Chinese readers is semantic substitution. It included 57% of the errors, indicating that native Chinese readers frequently make semantic substitution errors. Given that in English reading, semantic substitution is a characteristic mainly of English deep dyslexic readers, it was important to determine whether

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the observed semantic substitution errors were representative of the majority of readers or were confined to a subgroup or type of passage. A 3 (group) X 3 (level of readers) X 3 (level of passages) ANOVA was conducted to examine this question. The factor of group refers to Chinese college students, Chinese middle school students, and Taiwanese middle school students. Based on the reading rate in a silent reading task, all the participants were classified into 3 levels of readers: excellent readers, good readers, and poor readers. The 3 levels of passages were humorous stories, general current affairs, and technical scientific reports. None of the 3 factors had a main effect. This result indicated that semantic substitution errors occurred for all passage difficulty levels, and regardless of whether participants read simplified or traditional script, were college students or middle school students, or were good or poor readers. Moreover, over 90% of Chinese participants (72 out of 79) made semantic substitution errors. We therefore concluded that semantic substitution is a robust effect for native Chinese readers.

(1) Percentage of error type from the Chinese group's data



1.2 Experiment 2

Native English speakers in Experiment 2 also performed a read-aloud task to serve as a comparison group to the native Chinese speakers in Experiment 1. The purpose of this experiment was to confirm that making semantic substitution errors when reading never-before-seen passages aloud is a particular phenomenon

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for native Chinese readers but not for native English readers. We speculated that the occurrence of semantic substitution errors resulted from retrieving words from memory. When performing a read-aloud task, the eyes can proceed ahead of the word being pronounced. It is likely that decoding words resulted in a clear representation of meaning and a vague representation of pronunciation. When it was time to pronounce a specific word in the sentence, the phonological trace of that word may have been insufficiently activated to allow the native Chinese readers to produce the target word. Therefore, they selected a semantically related word from memory and sounded it out.

1.2.1 Materials

The stimuli were the English translation version of the same 12 Chinese short passages used in Experiment 1. The English passages were translated by a Chinese-English bilingual and edited by an English monolingual to ensure English-language naturalness. The length of the English passages ranged from 69 to 155 words (mean = 114.8, SD = 24.87).

1.2.2 Participants

Participants were 20 native English speakers without reading disabilities (mean age = 19.2 yrs). These participants will be referred to as the English readers or simply the English group.

1.2.3 Procedure

This experiment employed the same procedure as in Experiment 1.

1.2.4 Results

The errors that native English readers made were categorized into the same error categories as Experiment 1, and compared to the data of Chinese college students from Experiment 1. The distribution of error types between the 2 groups of college students is shown in (2). The biggest proportion of the errors made by Chinese college students were semantic substitution errors (54%), whereas the biggest proportion of the errors made by native English readers were miscellaneous errors $(67.5\%)^3$. Only 1.1% of the native English readers' errors were semantic substitution errors than native English readers (p < .01; 0.282 vs. 0.012 errors per person per passage). The 2 language

 $^{^3}$ The miscellaneous errors that native English readers made were mainly morphological errors (37.6%) and omission (32.3%).

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groups did not differ in per-passage reading times, indicating the comparability of the 2 groups.

(2) Percentage of error type from Chinese college students' and American college students' data



2 General Discussion

The major function of orthographies is to allow readers to access the meaning and pronunciation of spoken languages, and thus orthographies in the world encode semantic and phonological information. Our goal in the current paper is to demonstrate that the degree of transparency of semantic and phonological information is encoded differently from orthography to orthography. Alphabetic orthographies, for example, usually convey clues to pronunciation in a relatively more consistent and transparent manner than other orthographies. Does this difference in orthographies lead to different reading processes? This is the primary research question of the current study. Specifically, the present study investigated whether semantic and phonological information are processed in the same manner when reading English, an alphabetic orthography versus when reading Chinese, a morphosyllabic orthography. Different from previous studies using priming paradigms to explore this issue, we carried out a series of read aloud experiments and examined the occurrence of semantic substitution errors.

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Semantic substitution is a characteristic of English deep dyslexic readers (Coltheart 1980). When reading word lists, English readers with deep dyslexia, but not normal English readers, tend to substitute a target word (e.g., yell) with another semantically related word (e.g., shout). One shocking finding of this study is that the native Chinese readers in China and Taiwan frequently made semantic substitution errors when reading never-before-seen Chinese texts aloud. Semantic substitution errors covered over 50% of errors made by the Chinese group. When reading the same passages in their native languages, the native Chinese readers in China made 20 times more semantic substitution errors than the native English readers. Over 90% of the Chinese group made semantic substitution errors. Regardless of whether they were college students or middle school students, of whether they were good readers or poor readers, whether they read traditional Chinese characters or simplified Chinese characters, or whether they read humorous stories or technical scientific reports.

We attribute occurrence of semantic substitution errors in read aloud tasks to the unique characteristic of Chinese orthography. Chinese characters are generally composed of a semantic radical and a phonetic component. Semantic radicals frequently provide reliable clues to the meaning of characters, yet phonetic components seldom provide reliable clues to the pronunciation of characters. In other words, semantic information is encoded in a more transparent and consistent manner than phonological information in Chinese orthography. The Orthographic Depth Hypothesis proposes that the transparently and consistently encoded information in an orthography is more strongly activated during reading. This suggests that semantic information is strongly activated when reading Chinese, while phonological information is weakly activated. A plausible consequence is that the mental activation of meaning is more robust and persists for a longer duration in short term memory. As we know, visual reading proceeds ahead of oral reading. It is likely that when a native Chinese reader needs to retrieve information from short term memory to pronounce the next character in the sentence, the mental representation of pronunciation of the targeted is too weak to allow verbalization. The reader may thus have some probability of verbalizing an alternative word (or morpheme) which conveys similar meaning. Because a specific meaning can be conveyed by several different characters, there are chances that the character that the reader retrieves is a semantically related character instead of the target character, yielding a semantic substitution error.

3 Implications and Clarifications

There has been a heated debate on whether reading processes are universal or language specific (Geva 2008). The current study appears to most strongly support the language-specific view, given our finding that native Chinese readers and native English readers processed semantic and phonological information

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differently in read aloud tasks. But clearly semantic and phonological information are both required for the two groups of readers to achieve the ultimate goal of pronouncing outloud written material. We advocate the co-existence of universal and language-specific reading processes. Chomsky's (1981) "Principles and Parameters Theory" could be applied to reading. There are some universal principles that are required in reading across languages, and there are also some parameters which vary based on the properties of each orthography. Reading in all the world's orthographies involves semantic, phonological, morphological, syntactic, and discourse information. The relative importance of each type of information is different in accordance to the linguistic structure of each language. For example, phonological processing plays a more important role in shallow orthographies like Spanish than in deep orthographies like English.

Is Chinese orthography pictographic, ideographic, or logographic? A pictographic orthography has pictorial graphs resembling physical objects. An ideographic orthography has graphs representing ideas or concepts. A logographic orthography has graphs representing a word or a morpheme. There are pictographs (e.g., \exists 'sun' and \exists 'moon') and ideographs (e.g., 上 'up' and 下 'down') in Chinese orthography, but they only constitute 3% of Chinese characters according to Kanxi Dictionary (DeFrancis 1984). Chinese is logographic in the sense that each Chinese character represents a morpheme. However, each Chinese character also represents a syllable, a phonological unit. Moreover, 97% of Chinese characters known as semantic-phonetic compound characters comprise a semantic radical as well as a phonetic radical. Most Chinese characters (either the characters per se or the semantic radicals) provide somewhat reliable semantic information. In contrast, they usually do not provide reliable cues to the pronunciation of the whole character. Our findings revealed this characteristic of Chinese orthography salient. They nevertheless do not indicate that Chinese orthography is purely logographic.

Current findings can not be explained by "whole character" or other types of teaching methods. There are misconceptions about methods used to teach Chinese orthography, and whether native Chinese readers have an awareness of the internal structure of characters. Many people believe that each Chinese character is taught as one unit without reference to components. Learners thus would not be aware of the internal structure of a character, and would map the whole character to its meaning directly without exercising the symbol-sound correspondence. The first author of the current study received her primary school education in Taiwan and some of her friends received their primary school education in Mainland China. According to their personal experiences, primary school teachers in Taiwan as well as in Mainland China usually direct students' attention to semantic radicals when teaching new semantic-phonetic compound characters, although they rarely mention phonetic components. This is an understandable teaching strategy because semantic radicals are usually reliable cues to the meaning of the

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whole character, yet phonetic components rarely provide reliable information for the pronunciation of the whole character. However, this teaching method does not entail native Chinese readers' lack of awareness of phonetic components. In fact, when encountering a novel character, every Chinese will try to look for clues to the pronunciation from the character components (Chan and Wang 2003, Chen and Yuen 1991, Shu and Wu 2006). One saying describing this strategy goes, "有 邊讀邊,沒邊讀中間" ('if there is a component on either side, pronounce the characters as the pronunciation of the side component, otherwise, pronounce the character as the pronunciation of the middle component'). Many studies have shown that native Chinese readers are aware of phonetic components, and are able to make use of them to figure of the pronunciation of novel or pseudo characters. For example, Chen and Yuen (1991) argued that "all Chinese readers, by default, rely on the phonetic component to read the pseudocharacters". Shu and Wu (2006) claimed that their study "provides clear evidence that children are sensitive to the partial information a phonetic provides for character pronunciation, and OPC [i.e., orthography-phonology correspondence] knowledge is also important in learning and memorizing novel compound characters." It is well known that children are capable of figuring out the generalization rules in their native language without explicit instructions. This phenomenon might be also applicable to the case of learning to read in one's native language. Although native Chinese readers are not explicitly taught to use phonetic components to retrieve phonological information, they still develop the awareness of phonetic components and make use of them when they need help with pronunciation. Therefore, our findings cannot be attributed to the "whole character method" in teaching Chinese reading.

To sum up, we argue that the occurrence of semantic substitution in native Chinese readers' performing read-aloud tasks is elicited by the unique informational structure of Chinese orthography. As explained above, our findings do not result from unique discourse reading skills or the "whole character method" in teaching Chinese reading. Moreover, our findings do not indicate that most native Chinese readers are deep dyslexic, Chinese orthography is logographic, or there is no universal rule in reading process. We interpret our findings as evidence of the salient role that semantics plays and the relatively weak activation of phonology in reading Chinese.

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Hui-wen Cheng Boston University Program in Applied Linguistics 96 Cummington St., Rm 246 Boston, MA 02215

hwcheng@bu.edu

Catherine L. Caldwell-Harris Boston University Department of Psychology 64 Cummington St Boston, MA 02215

charris@bu.edu

Writing in the World and Linguistics

PETER T. DANIELS Independent Scholar

Introduction

It seems to me that the study of writing is about where the study of language was before the development of linguistics over the past century-and-a-bit. Everyone we know knows how to write, and therefore everyone we know thinks they know about writing. This paper looks at how writing has been presented to the general public, and how it has been treated in linguistics since the first real textbook of 1933.

I then turn to how writing has been studied by specialists—beginning considerably earlier than modern linguistics—noting the transition from antiquarianism to serious investigation, and then the very gradual incorporation of the study of writing into mainstream linguistics: through tentative articles by general linguists, to a change in attitude in textbooks, to a sudden spate of books on writing by linguists (few if any of whom can be considered specialists).

Finally, I deal with some problems in the treatment of writing by general linguists who all too readily try to apply models of language to questions of writing without taking note of the fundamental distinction between language and writing. These problems include the adaptation of terminology from one field to the other without considering the implications, the assumption that writing change must be just like, or totally unlike, language change, and questions of the relation of writing to language.

1 Popular Treatments of Writing

1.1 Maps

If I were going to make a map to accompany a conventional history of writing, it might look like Figure 1 (Daniels 2007). The numbers 1–17 mark the "alphabets" that are likely to be mentioned (parenthesized items perhaps not so likely), in roughly chronological order, with the three lettered entries perhaps earning a note.

Writing in the World and Linguistics



Figure 1. A representation of the "standard" history of writing.

7 Roman	14 Ogham
8 Coptic	15 Arabic
9 Gothic	(16) Syriac
10 Armenian	(17) Indian
11 Georgian	E Elamite
12 Slavonic (Glagolitic	I Indus Valley
Cyrillic)	C Chinese
13 Runes	
	 7 Roman 8 Coptic 9 Gothic 10 Armenian 11 Georgian 12 Slavonic (Glagolitic Cyrillic) 13 Runes

The striking dust jacket of the British hardcover edition of Nicholas Ostler's *Empires of the Word* (2005) <u>http://www.nicholasostler.com/nicholas/books</u> forms a world map with geographical areas as blocks of type in the font of the area. The designer was advised by the author, who selected the content of the passages used as well as the scripts. I thought this was a unique and innovative idea, but it turns out it was anticipated—in 1741.


Figure 2. Hensel 1741, map 1.

Figure 2 is one of a set of four maps (those for Africa and the Americas are rather rudimentary!) that purports to present the Lord's Prayer in the local language and script. On the map of Europe, the languages included are Portuguese, Spanish, Catalan, and Basque; French and Occitan; Italian and Latin; Danish, Belgian, German—and "ancient Saxon"; Irish, "Picto-Scotian," and Anglo-Saxon (but no English); to the north and east are several more samples that warrant magnified examination.

In Asia (Figure 3) we find Hebrew, Arabic, and Syriac; Armenian and Georgian; Persian, a rather fanciful "Indo-Brahman," and Tamil ("Malabarica"); unreliable-looking Chinese, and what seem to be pure invention for Uzbek and Japanese. Under "Scythico-Tataric" are displayed "characters previously unknown to us that were exhibited at Strassburg." This got me wondering what sort of representation writing has had in modern atlases. (How languages are depicted in atlases is the topic for a whole other treatment.) The earliest I have found is in the notorious Peters Atlas of 1989 (Peters 1990:116–17), which purported to uniquely represent the true relative areas of all land masses (while unmercifully distorting the shapes of those land masses). The display contains a main world map and five subsidiary ones each occupying one quarter its area; the large one shows direction of writing (left to right, right to left, top to bottom) color-keyed to each nation—



Figure 3. Hensel 1741, map 2.

suggesting that this is the most interesting or the most important thing to note; the five smaller maps show the countries that use scripts whose origin is, respectively, Chinese (there is even a tiny dot for Singapore), Indian, Greek, Latin, and Arabic.

Not until almost twenty years later did maps of writing show up in historical atlases. They do not seem to be found in serious atlases intended for the scholarly community, but they have now appeared in two popular atlases that are widely available as "bargain books" at major bookstore chains in new editions and formats every few years.

Dorling Kindersley's *Atlas of World History* (Black 2005) combines its treatment of writing with that of numbers and calendars (32). The Old World portion of the map condenses a great deal of information in the form of labeled arrows, shaded geographic areas, and text blocks into a single graphic, including threecharacter samples of a few scripts. There is, moreover, another map, in the Ancient Near East section (223), repeating much of the same information with somewhat thinner arrows.

Its main competitor, also called *Atlas of World History*, is the latest in a long line (Haywood 2009). Its presentation (§1.07), which is not in the 1997 or 2002 editions, is rather more sophisticated—arrows are replaced by a genealogical tree below, to show more holistic information. The map's shading shows the extent of

writing at seven periods, 3000 BC to AD 1500. The many more writing samples are placed in tablets of four or five characters; the color-codings of the tablets correspond to those of the tree (which has at least one mistake, branching Mongolian writing off of Tibetan, and curiously it omits Hebrew—though Hebrew is mentioned in the accompanying text). The very presence of Tibetan, Mongolian, and modern Indic scripts is unusual in popular treatments of writing. The text makes two rather questionable assertions: "Elamite and Indus valley pictographs derive from Sumerian pictographs" (sheer speculation) and the Chinese Oracle Bone script "was also used for record-keeping" (this is likely but unevidenced).

1.2 Trees

The genealogical tree in fact seems to be a fairly recent device in the study of the history of writing. The earliest comprehensive one I have found (Figure 4) is from my teacher I. J. Gelb's celebrated volume published in 1952 but largely written in the late 1930s. It shows relationships of descent and places their starting points on forty equally spaced rows representing four thousand years of innovations—a chronological nicety that has not often been imitated. I return to this chart later.

David Diringer went from a simple typographic tree in his first edition giving barely more information that the names of the chapters on each group of scripts to a graphic rendition with branches and leaves in his third edition (Diringer 1948:573; 1968, vol. 2: frontispiece).

Figure 5 is surely the apotheosis of the writing family tree (or trees), though chronological precision is sacrificed to comprehensiveness (Kulundžić 1957). The original is about 24 by 17 inches; years ago I photocopied it in eight fragments and pieced them together, and it took six scans to capture the whole thing. The whole left side of the main tree is devoted to South and North Indic scripts.

The treetrunks, from left to right, are as follows: Egyptian, Cretan, Pre-Columbian, Hittite Hieroglyphs (all with their branches lopped off); Alphabetic Writing; Cuneiform, Easter Island, Mohenjo Daro/Harappan, and Chinese. The vertical scripts are placed in vertical tablets. Some of the branches would be placed differently today—the main tree itself should grow from the Egyptian; Kharosthi is accorded no connection with Brahmi; deriving Armenian and Georgian from Pehlevi is an older theory (also followed by Diringer and reflected in Gelb's chart, though in the text of the book Gelb discusses only the letternames of those two alphabets); Ugaritic is omitted but perhaps would have been placed (like Old Persian) on the Cuneiform tree according to outer form rather than near the source of the West Semitic branch at the lower right—as might be immediately obvious from the most recent attempt at a genealogical tree (Haarmann 1994: 342), were it not so graphically complex. All the arrows indicating descent and influence are rectilinear and in some places even spiral; there is no hint of chronological information; and Ugaritic is again omitted! In case the diversity within Europe was not set forth clearly enough, further detail is added on the facing page.

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Figure 4. Gelb 1952, endpapers.

1.3 Popular Books

Admittedly these script family trees are taken from the scholarly literature. In recent years there has been an explosion of popular books on writing—by journalists, or in coffee table books, or worst, in coffee table books by a journalist.

Peter T. Daniels



Figure 5. Kulundžić 1957, foldout inside back cover.

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My remarks on Jean 1992, Man 2000, Sacks 2003, and others are available on line (Daniels 2000a; 2007:55 n. 2). Sacks's *Language Visible* was reissued in paperback—and almost immediately, beside it on the shelf was the identical book with a new title, *Letter Perfect*. The prize for most mistakes per square inch (and some of them are real howlers) goes to Steven Roger Fischer, whose claims to have deciphered both the Phaistos Disk and the Easter Island script have not been validated (Fischer 1999, 2001, 2003). Andrew Robinson is a special case. His *Story of Writing* (1995) is uninformed from a scholarly point of view and does contain its share of mistakes. But then he researched two small biographies of decipherers, (Robinson 2002b, 2006), and *Lost Languages* (2002a) is far better. Some ten years ago, in the wake of *The World's Writing Systems*, I was asked to do a volume in the new "Very Short Introductions" series from Oxford. A few months later, the editor came back and very apologetically reported that "Marketing" had decreed that there was "no market" for a book on writing systems. But now, Andrew Robinson's has just appeared as number 208 (Robinson 2009).

The late Albertine Gaur was Keeper of Indian Manuscripts in the British Museum (and then the British Library), and her volumes are illustrated almost entirely with items from that collection (Gaur 1992, 1994). She is of course impeccably reliable within her field, but not so much so in other areas. She makes the curious claim that there was no calligraphy in India—taking, of course, a sociocultural view of the term (Gaur 2000:126)—but it is clear from many specimens illustrated in books like Losty 1982 that Indian artists and scribes were as concerned with beautiful writing as were artists and scribes anywhere else.

Christin's massive volume (Christin 2002) is not a comprehensive history, but many of its chapters treat unusual topics; but it suffers from atrocious translating. The French original is very useful (as well as beautiful), but the English version can be in many places misleading.

Fortunately, there is now a pretty good book for the general public (Gnanadesikan 2009). Unfortunately it is published by an academic publisher, so it won't get the distribution or marketing it deserves.

1.4 Encyclopedias

Midway between popular and scholarly treatments of writing systems are major encyclopedia articles, and I can point to only two or three that merit study. First is "Writing" by Peter Giles, in 29 long columns of the 1902 Tenth Edition of the *Encyclopædia Britannica* (a ten-volume supplement to the peerless Ninth, Giles 1903). It contains only two tables—and the first one shows some of the most obscure scripts known: Carian, Lycian, Iberian, and Berber. The second table shows the principal scripts mentioned in the text: Brahmi, Kharosthi, Oldest Æthiopic, Sabæan, Naskhi (Arabic), Tema 500 BC, Sindjirli 800 BC, Moabite Stone, Phooenician (Cyprus), Greek Inscrip. of Thera, Oldest Latin Forum Inscription. The celebrated Eleventh *Britannica* of 1911 often contains abridgments of articles from the Ninth and Tenth, and that is the case here: "Writing" was split into "Alphabet" and the unsigned "Writing" (Giles 1910, 1911; Daniels 2005). To the table it added Cyrillic and Glagolitic. Our topic did not fare so well in the 14th edition, which was continually updated from 1929 to 1973. I have not seen the 1929 original, but from 1930 at least, the pedestrian article "Alphabet" (Atkinson 1930ff.) made no reference to the reprinted accompanying table to which an uncomprehending editor must have added the caption "the presumed development of the modern European alphabet from the Brahmi letters of India"—and dropped the label "Kharosthi" from the second column. The article was condensed in the early 1960s by Joshua Whatmough, and persisted until 1973 (Atkinson and Whatmough 1961?ff.).

Theoretical articles by I. J. Gelb began to appear about 1960, and in the 15th edition of 1974, they were gathered under "Writing, Forms of" along with a new review of "Alphabet" history by David Diringer (who did not live to see its publication), in the last and first volumes respectively (Gelb 1973ff., Diringer 1973ff.). There is also a surprisingly extensive and generously illustrated article on "Calligraphy" by many authors (Nash, et al. 1973ff.); the articles "Paleography" (Urry 1973ff.) and the long one on "Epigraphy" (Puhvel 1973ff.) are not illustrated. In 1985 the Britannica was reorganized and the three writing articles along with others were gathered under "Writing." In 1988 Gelb's portion was replaced, and Diringer's portion was lightly edited, by David Olson. The treatment of Indian calligraphy by Donald M. Anderson is simply dropped, as is "Ancient Epigraphic Remains" (Mittelberger 1973ff.). "Epigraphy" and "Paleography" are included in "History, the Study of," and that is where the Britannica stands today. (The DVD version cannot be used for these topics, because most of the illustrations and the script tables accompanying many of the "Languages of the World" articles have not been included, at least as of the 2009 edition.)

The other highly commendable encyclopedia article is "Alphabet" that first appeared in Collier's in 1966 and was carried until the work ceased publication in the late 1990s. It is a full 19 pages, and it's by my phonology professor at Cornell, James Gair. (Gair 1966ff.) Gair is a specialist in Indo-Aryan, specifically Sinhala, and that major branch of writing systems is not neglected here. This article is accompanied by another 7 pages on "Pictographs and Ideograms," by Elizabeth Bowman, who coincidentally had held my job at the Assyrian Dictionary of the Oriental Institute, University of Chicago, in the 1950s (Bowman 1966ff.). I myself have contributed seriously abbreviated articles on "Alphabet," "Writing Systems," and the 26 letters of the English alphabet to the junior high school–oriented *World Book Encyclopedia*

2 Books by Specialists

2.1 Pre-Modern Books

At this point we should pause to review the sources of information the encyclopedia-writers could draw on (most of the volumes mentioned in §2.1 can be consult-

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ed through books.google.com). Hensel's maps have script tables around the edges: Europe (Figure 2), *upper left*, (litteræ) Scythicæ, Græcæ, Marcomannorum, Runicæ, Mæsogothicæ, Pictohibernicæ; *lower left*, Latinæ, Germ., Angl.-Sax.; *upper right*, Rutenicæ; *bottom*, Hunorum, Sclavonico-cyrillica, Glagoliticoillyrica, Hetrusco-eugibina; Asia (Figure 3), *left*, (litteræ) Hebræorum, Syrorum, Arabum et Persorum; *bottom*, Armenicæ, Iberi-Georgicæ, Malabarica, Palmyrena—we do not know the sources of his information, but they are fairly accurate. Except for "Palmyrena": that script would not be deciphered until 13 years later.

(The first edition of the *Britannica* in 1768 punted: under "Alphabet" in volume 1 are merely cross references to "Language" and to "Characters," and in a different sense to "Decyphering"; volume 2 carries long essays on GRAMMAR and LANGUAGE with no mention of alphabets, and displays of CHARACTERS used in such fields as astronomy and chemistry, but nothing on letters; and there is no entry for "Decyphering" at all.)

The *Encyclopédie*, on the other hand, published in the second volume of plates no less than 25 plates of scripts from throughout Eurasia—including several Indian scripts, Tibetan, Manchu, the 214 Chinese radicals (with explanations), and even three varieties of Japanese kana (Caracteres et alphabets 1763).

In England, the antiquarian Thomas Astle (1784) collected many examples of Latin and English paleography; he includes only one display of non-roman alphabets. He refers the reader to the *Encyclopédie* for "many other oriental alphabets."

Responsibility for this sort of information shifted to printers around the turn of the 19th century. Greek and Hebrew were available as a matter of course at 18thcentury printers'. William Caslon in 1785 offered two sizes of Syriac and one of Arabic, along with Armenian, Samaritan, Gothic, Coptic, Æthiopic, Etruscan, and four sizes of Saxon. The Syriac sample is the Lord's Prayer, but words are illicitly divided between lines; Giambattista Bodoni sets the same text a few years later, with accuracy. Bodoni also showed Turkish, Tartar, Persian, Armenian, Palmyrene, Servian, Illyrian, Gothic, Tibetan, Georgian, Brahmin, Malabar, German, and Russian (and those are only the selected pages that have been placed on the website for de Jong, Purvis and Tholenaar 2009–10).

In 1824, the English printer John Johnson created the two exquisite, tiny volumes of *Typographia*, including more than 200 pages devoted to the history and variety of writing (2:260–480, encompassing what may have been the first account in English of Champollion's decipherment of the Egyptian hieroglyphs, 334–48). The page on the niceties of Syriac (317) is quite accurate. Many of his prose descriptions are taken directly from the commentaries on the *Encyclopédie*'s plates. A number of pages show large letters set vertically used the type (apparently carved in wood) created for Edmund Fry's *Pantographia* (1799), which was widely cited but carried quite a few fanciful entries; though the Mandaic (after the *Encyclopédie*) is accurate (284, cf. Johnson 1824, 2:318).

The founding document of Semitic epigraphy is Ulrich Friedrich Kopp's *Bilder und Schriften der Vorzeit* 'Images and scripts of the past' (Kopp 1819–21). This work also discusses Germanic antiquities and even a bit of Chinese, but the

bulk of volume 2 is devoted to Semitic alphabets. It includes a series of dated Phoenician coin legends arranged chronologically (pl. opp. 212), the development of Phoenician letters (215–18), and summary charts of all the known Semitic scripts as well as two from India (377–98).

The earliest work on writing that could be considered theoretical was by Peter Stephen Duponceau, a Frenchman who came to this country in 1777 as secretary to Baron von Steuben because of his fluent English and German, became a lawyer, and became a pioneer in studying Native American languages (Smith 1983, Robins 1987). His *Dissertation on the Nature and Character of the Chinese System of Writing* (1838) seems to have been completely overlooked in its time. It was published in January 1838—but in Philadelphia. The importance of the work is this (Daniels 2009b): It seems to be the very first place that the tripartite typology of writing systems was enunciated. Writing systems could be based on the segment, the syllable, or the word (what we now would call the morpheme).

The elements of language are words, syllables, and the simple sounds represented by the letters of our alphabets. Those three elements are all produced by the vocal organs; and, as all writing is made to be read by all who understand the language to which it belongs, and to be read aloud as well as mentally by all in the same words, and in the same order of words, it seems clear that the written signs must represent or recall to the mind some one or other of those three elements; and hence we have three graphic systems, distinct from each other, but formed on the same general principle-the elementary or alphabetic, the characters of which, called *letters*, represent singly the primary elements of speech, which are simple sounds; the syllabic, that represents syllables which, for the most part, have no sense or meaning, but only serve as elements in the composition of polysyllabic words; and lastly, the *lexigraphic*, which by means of simple or combined signs, represent the words of a language in their entirety; and this last mode seems to be more particularly applicable to monosyllabic languages, in which every syllable has a sense or meaning connected with it, which supplies a method for the formation of the characters, the multiplicity of which otherwise might create confusion. (Du Ponceau 1838:xxiii [here and below, underlining emphasis added])

Duponceau also recognized the fact that Chinese characters are not "ideograms," a sort of what has been called a "universal character" (Eco 1995), but that each one stands for a word (that is, a morpheme); and not only for its meaning, but its sound as well. But the work seems to have had no effect at all, until it was discovered by Berkeley's own Chao Yuen Ren more than a century later (Chao 1940).

Let us pause in the middle of the nineteenth century. Maximilian Schele de Vere of the University of Virginia, who would later become a pioneering investigator of Americanisms, dedicated the last 54 pages of *Outlines of Comparative Philology* to a "Brief History of the Art of Writing" (1853). Curiously, his reports on cuneiform writing (then just in the process of decipherment) and Egyptian are considerably more up to date and accurate than are his remarks quoted here and his pages on the Greek alphabet and its descendants:

The history of written language, so far as its outward form is concerned, is not unlike that of <u>spoken language</u>: it <u>proceeds</u>, like the latter, from the most complicated to the most simple. (383)

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Of all the Eastern modes of writing, the <u>Sanscrit</u> is, of course, the most important, because, like the idiom it represents, it <u>presents to us the original form from which the</u> <u>Greek and Roman, the Germanic and Slavonic, are derived.</u> (401)

The finest collection ever of exotic type specimens was assembled by the printer and shorthand theorist Karl Faulmann in 1878 for the Austro-Hungarian Imperial and Royal printing house (1880a). It has remained in print ever since. He put his magnificent collection of types into action in an "illustrated history of writing" (1880b); unfortunately he was no scholar, and he repeated the most fanciful assertions about the history of writing. Here (420) he relates the shape of Arabic *h* directly to Syriac *s*, three different Egyptian hieroglyphs, and Syriac *g*.

▶ h ist das syrische w s, das ägyptische w h (Hintertheil), in der Mitte ist es als ϕ der Muskel, ägyptisch -, auch die singuläre Form von $-\frac{2124}{2116}$ sa (Kraut), daneben tritt ϕ , das syrische g, als h auf, am Ende ist es wieder das Hintertheil.

A pendant to this genre is the *Notices sur les caractères étrangères* edited by the Assyriologist Charles Fossey (1927) on the occasion of the 17th International Congress of Orientalists in Oxford in 1928, greatly expanded for the 21st Congress in Paris in 1948. It displays the fonts available at the Imprimerie Nationale with brief descriptions by a host of French specialists. Similar, though smaller in compass and with unsigned descriptions, is the type catalogue issued by the Government Printing Office in Berlin (Bundesdruckerei 1969).

2.2 Scientific Books

Fortunately, just three years later, the first scientific book on writing made its appearance, in two volumes subtitled "Semitic Alphabets" and "Aryan Alphabets"—where the latter simply means 'Indo-European' (Taylor 1899; Daniels 2002). This work was the standard reference on writing systems for more than half a century. Indeed the statement by Edward Clodd, in *The Story of the Alphabet* (1900:5), is typical: "Canon Isaac Taylor's 'History of the Alphabet' is necessarily charged with a mass of technical detail which is stiff reading even for the student of graphiology"; and, regarding the scripts of India, "those who care to pursue a subject yielding to few in dryness will find it summarized in the tenth chapter" of Taylor's work.

But Taylor is important not only as a source of data and careful discussion of hypotheses about the descent and spread of writing systems. He also, apparently independent of Duponceau, became the first scholar of influence to use the tripartite typology of writing systems that would be repeated for more than a hundred years:

- 1) Verbal signs, which stand for entire words;
- 2) Syllabic signs, which stand for the articulations of which words are composed;
- 3) Alphabetic signs, or letters, which represent the elementary sounds into which the syllable can be resolved. (Taylor 1899, 1:6)

And he embraces the notion of evolution, explicitly invoking Darwin, noting

It is owing chiefly to the discovery and application of modern principles and methods that Epigraphy and Palæography can claim to be reckoned among the exact Sciences. ... Of these principles the most important is the doctrine of Evolution. ... Discarding the obsolete notion of arbitrary invention or creation, we seek for self-acting causes adequate to produce the results which are detected by minute research. ... Slow differentiation by minute variations ... proves historically to have been the method by which the transformations of alphabets, as well as of languages, of animals, of plants, and even of the surface of the globe itself, has been effected. (2:363)

After World War II there was a spate of single-author volumes comprising historical surveys of the world's writing systems. David Diringer's (1948) is the best known, James-Germain Février's (1959) is the one whose evaluations I find most judicious, Marcel Cohen's (1958) is the most ambitious, Johannes Friedrich's (1966) is the most concise, and Hans Jensen's (1969) has the fullest bibliography to date. I can't honestly recommend the two most recent (Haarmann 1990; Coulmas 1996).

2.3 Linguistics Textbooks

The field of descriptive linguistics can be said to have begun after Taylor's time. The discovery that unwritten languages, in Africa particularly, and then in North America, were amenable to the same analytic techniques as the familiar languages led early linguists to realize that, as Ferdinand de Saussure put it, writing exists for the sole purpose of representing language—though his two translators have rendered the statement rather differently:

Language and writing are two distinct systems of signs; the second exists for the sole purpose of representing the first. The linguistic object is not both the written and the spoken forms of words; the spoken forms alone constitute the object. (Saussure 1959:23) A language and its written form constitute two separate systems of signs. The sole reason for the existence of the latter is to represent the former. The object of study in linguistics is not a combination of the written word and the spoken word. The spoken word alone constitutes that object. (Saussure 1983:24)

In *An Introduction to the Study of Language* (1914), Leonard Bloomfield's only concern with writing was to note that standard orthography is not adequate for the study of language, and a phonetic alphabet is needed. But by the time of his canonical *Language* (1933), he had adopted Saussure's position: "Writing is not language, but merely a way of recording language by means of visible marks" (21); "For the linguist, writing is, except for certain matters of detail, merely an external device, like the use of the phonograph" (282).

The textbook for my introductory linguistics class, in 1969, agrees but with some nuance:

A written language is typically a reflection, independent in only limited ways, of

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spoken language. As a picture of actual speech, it is inevitably imperfect and incomplete. ... Linguistics must start with thorough investigation of spoken language before it proceeds to study written language. (Gleason 1961:10f.)

Gleason seems to leave room for the investigation of written language as a different object from spoken language.

Written communication must be sharply distinguished from spoken. The common tendency to use "language" to refer to either indiscriminately has so frequently given rise to serious confusion, not merely among lay people, but also among professional linguists, that many are reluctant to use it of any written code at all, even with explicit qualification. Many linguists consider all forms of writing entirely outside the domain of linguistics and would restrict the discipline to the consideration of spoken language only. (408)

Bloomfield's most devoted disciple does not envision written language as a field of study:

Though writing is not the linguist's primary concern, he is interested in it, as any educated member of our society of course is Writing is itself of tremendous importance in human life, and the nature and history of writing can only be clearly understood in terms of the workings of language. (Hockett 1958:539).

The most orthodox and most ardent American Descriptivist uncompromisingly sets forth the Saussurean view:

Once we have made the effort required to turn our attitude right side out, and realize that, in language, speech is fundamental and writing (despite its undeniable importance in modern life) <u>only a secondary derivative and representation of speech</u>, then whole new vistas are opened up to us. (Hall 1964:9)

The function of writing is to give a partial representation of speech. For native speakers of a language, the purpose of a writing system is <u>simply mnemonic</u>, to call to mind something that they already know. (33)

2.4 Linguistic Studies of Writing

Hall, though, was one of several American Descriptivist linguists who turned their attention to the study of writing systems (Hall 1960 = 1963). Hall attempted to apply emic theory to writing systems—but this approach is doomed, because phonemes, morphemes, and the rest relate to subconscious mental structures, the organization of nonsignificantly varying smaller units into significant units, whereas writing systems are necessarily created consciously and need not and do not follow emic principles (Daniels 1991). (There is also the question of what would count as a grapheme in any particular language—are small a and capital A two graphemes, or is there a grapheme of capitalization? Is each Chinese character a grapheme, or the components it is compounded from, or even the individual brush strokes?)

The Voegelins (Voegelin and Voegelin 1961), Hill (1967), and Herrick (1974)

are among those in this school who essayed studies of the typology of writing. Bolinger (1946) and Berkeley's own Malkiel (1968) contributed articles on uses of writing that go beyond the simple representation of language.

The only current linguistics textbooks I have access to are those available on amazon.com with the "look inside" feature. One has a clear statement of the nature of written language, different from anything seen in the textbooks of my time: "The language used in writing typically differs from the language used in speaking, reflecting and communicating the different conditions under which language is produced and its various purposes" (Fasold and Connor-Linton 2006:17)

Although the assertion "many cultures" is incorrect, the page excerpted here summarizes the understanding of script origins due to me, presented below:

Segment-sized units have a far less important role in poetry or writing systems than do, say, syllables It might seem bizarre to say that the segment plays little role in writing systems, since very many languages have alphabetic writing systems and such systems are clearly based on segments. However, ... a phoneme-based writing system seems to have been 'invented' (or rather, gradually evolved) just once in the history of human literacy. Now, many cultures have evolved their own writing systems independently, and, in all other cases, they are based either on pictures representing whole words ... or on the syllable. (Radford, et al. 2009:119)

But between Gelb's *Study of Writing* of 1952 (lightly augmented reissue in 1963) and his death 33 years later, there were no books devoted to the theory of writing. Geoffrey Sampson (1985) was first into the lists, then John DeFrancis (1989); and there have been three textbooks—two by Florian Coulmas (factually unreliable: (Coulmas 1989, 2005; Daniels 2006b), and one by Henry Rogers (2005).

And the 1990s saw three encyclopedic works—two corporate, and one by a single author (Coulmas 1996). The scope of the German work (some of the content is in English) is wider than is usually seen in writing books (Günther and Ludwig 1994–96). It treats a limited number of scripts from a variety of viewpoints, including literacy and education. *The World's Writing Systems* (Daniels and Bright 1996) is devoted mainly to orthography, supplemented with historical information as needed. Nakanishi's slim volume (1980) remains a useful survey of scripts currently in use, with many historical notes. I have made even smaller surveys, in the Blackwell *Handbook of Linguistics* (with tables) and the Cambridge *Handbook of Literacy* (without tables) (Daniels 2001, 2009a).

3 Theory of Writing

But to come back to a general linguistics textbook, Edward Finegan is well known for his study of written versus spoken language, so it is no surprise that his textbook includes a subchapter on that topic; but the history of writing that precedes it contains (at least in the first edition) several incautious statements, embracing a monogenesis, stimulus-diffusion model; an absurdly wide timeframe for the invention of cuneiform writing; and a counterintuitive "Middle Eastern syllabary" notion:

To use a *written* symbol to represent a sound is a great achievement To use one symbol to represent another, as writing does, required a staggering leap of the imagination. (Finegan and Besnier 1989:359) For all that is known, it was probably made only once in human history. ... [It] took place

[in] Mesopotamia sometime between 3500 and 2600 B.C. (359f.)

The first alphabet was developed by the ancient Greeks from a <u>Middle Eastern syllabic</u> system that they had borrowed around 800 B.C. (372)

Where did this come from? It came from Gelb. He continues to use Taylor's tripartite typology:

1. Word-Syllabic:	Sumerian (Akkadian)	Egyptian	Hittite (Aegean)	Chinese
2. Syllabic:	Elamite	West Semitic (Phoenician)	Cypriote Phaistos?	Japanese
	etc.	(Hebrew) (Aramaic)	Byblos?	
3. <i>Alphabetic</i> :		etc. Greek		
1		Aramaic (vocaliz Hebrew (vocaliz	zed) ed)	
		Indic		
		etc.	(Gelb	1952:191)

But he takes the typology to represent teleology—just as the inventors of the isolating/agglutinating/inflecting typology took it to represent language evolution and "improvement"—and sets up the "Principle of Unidirectional Development": "Writing ... must pass through the stages of logography, syllabography, and alphabetography in this, and no other, order" (1952:201). The Latin tag *Natura non facit saltus* 'nature does not make leaps', after Leibnitz, was also quoted by Taylor. The teleological view is even symbolized in the genealogical chart (Figure 4)—where the line from Proto-Sumerian Pictographic through Egyptian, Proto-Semitic, Proto-Phoenician, Phoenician, Greek, Etruscan, Latin, Medieval Developments is a straight line right down the middle, with all other scripts as sidebranches.

But, in order to make the Principle of Unidirectional Development work, Gelb has to assign the West Semitic alphabetic scripts to the "syllabic" category, and the Indic syllabic scripts to the "alphabetic" category—because he well knew that West Semitic developed out of Egyptian and Indic developed out of West Semitic.

Before Gelb, "alphabet" referred to two rather different kinds of script—those that notate only consonants, and those that denote both consonants and vowels. Thus here we have a passage in the Square Hebrew "alphabet" (it happens to be in

Biblical Aramaic) and its translation into English. But Gelb insists that the Hebrew script is a "syllabary with indeterminate vowel."

בה-שעתה נפקו אצבען די יד-אנש וכתבן לקבל נברשתא על-גירא די-כתל היכלא די מלכא ומלכא חזה פס ידה די כתבה: ומלכא חזה פס ידה די כתבה: bh-š`th npqw 'sb`n dy yd-'nš wktbn lqbl nbršt' `l-gyr' dy-ktl hykl' dy mlk' wmlk' hzh ps

ydh dy ktbh. In the same hour came forth fingers of a man's hand, and wrote over against the candlestick upon the plaster of the wall of the king's palace: and the king saw the part of the hand that wrote. (Daniel 5:5)

Before Gelb, "syllabary" referred to two rather different kinds of script. In Japanese and Cherokee ($\langle v \rangle = [\tilde{a}]$), the consonant-vowel symbols are entirely arbitrary: there is no resemblance across vowel rows, or within consonant columns.

Japanese (hiragana)		Cherokee					
あるいi うu えe お)	D a	R e	Тi	δ <i>0</i>	$O^{\mu}u$	l v
かkaきki くkuけkeこ	:0	\$ga, ∂ka	I• ge	Y gi	A go	J gu	Egv
さsaしshiすsuせseそ	0	olv ha	P he	<i>Эhi</i>	ŀ ho	Γhu	$\mathfrak{V}hv$
たta ち chiつ tsu て te と	0	W la	δle	P li	G lo	M lu	२ <i>lv</i>
なnaにniぬnuねneの	10	♂ ma	01 me	H mi	3 то	у ти	
は ha ひhi ふ fu \land he ほ	10	θ na, t hna, G nah	Лne	h ni	Z no	ચ <i>nu</i>	0° nv
まma み mi む muめ me も	no	T qua	භ que	О qui	∛° qua	oW qui	ıE quv
やya ゆyu よ	0	о д s, U sa	4 se	Ьsi	Ф so	F su	R sv
らraりriるruれreろ	0	$\mathbf{L} da, \mathbf{W} ta$	S de, Ъ te	eЛdi,Лti	Λ do	S du	$\delta^{\circ} dv$
わwa を	vo	& dla, Z tla	L tle	C tli	ิษ <i>tlo</i>	 tlu	P tlv
<i>к</i> - <i>n</i>		G tsa	V tse	h tsi	K tso	ð tsu	C [*] tsv
		G wa	& 9 we	0 wi	V wo	9 <i>wu</i>	6 wv
		හි ya	₿ ye	Ъyi	fi yo	G yu	B yv

In Indic scripts and Ethiopic, the consonant plus /a/a is the base form of the letter, and the vowels other than /a/a re shown by additions to or modifications of the letter. Each symbol denotes a CV syllable.

Devanagai	ri (Sanskrit)						
प <i>pa</i>	पा <i>pā</i>	पि <i>pi</i>	पी <i>pī</i>	पु <i>pu</i>	पू <i>pū</i>	प् $p\#$	प्र pta
त <i>ta</i>	ता <i>tā</i>	ति <i>ti</i>	ती <i>tī</i>	तु <i>tu</i>	तू <i>tū</i>	त् <i>t</i> #	त्प tpa
Ethiopic							
۵ <i>bä</i>	ቡ <i>bu</i>	Ո. <i>bi</i>	ባ ba	ቤ be	ብ <i>bı, b</i>	ቦ bo	ብአ b'ä
<i>አ 'ä</i>	<i>ኡ 'u</i>	ኢ 'i	<i>አ 'a</i>	<i>ኤ 'e</i>	λ 'ι, '	<i>አ 'o</i>	እበ 'bä

But since these scripts are clearly descended from forms of the Aramaic alphabet, Gelb could not call them syllabaries—because he insisted that the alphabet is the apotheosis of scriptal evolution. He therefore relabeled this type as "alphabets" where the consonants and vowels have systematically different representations or, "difficult problems" (186).

We can now revisit Gelb's tree (Figure 4) once again, and read what the labels down the center actually say: Proto-Sumerian pictographic, Egyptian pictographic, Proto-Semitic syllabary, Proto-Phoenician syllabary, Phoenician syllabary, Greek alphabet, Etruscan, Latin, Medieval developments. Indic and Ethiopic branch off "Aramaic" and "South Arabic syllabary" respectively, but they are not labeled as either "syllabary" or "alphabet." Neither are any of the other offshoots of Aramaic, where Avestan, Armenian, and Georgian are alphabets in Gelb's terms, and the others are his "syllabaries."

How do I deal with these counterintuitive typological labels (Daniels 2000b)? The beginning of the answer came when I realized that even though the Cherokee and Cree writing systems have always been treated together because they are considered syllabaries with similar user-communities, typologically they are quite different. Cherokee, as we have seen, is a pure syllabary. But Cree Syllabics is systematic: the four signs for each consonant row are rotations or reflections of each other; the specific rotations and reflections are consistent through each vowel column.

Cree			
$\triangleleft a$	∇e	Δi	$\triangleright o$
< pa	V pe	$\wedge pi$	> <i>po</i>
\subset ta	U te	\cap ti	\supset to
b ka	۹ ke	Ρki	d ko
し cha	ר che	∩ chi	J cho
$\Box ma$	$\exists me$	Γ <i>mi</i>	$\perp mo$
_ <i>na</i>	ne ס־	σni	no مـ
5 sa	Ч se	r' si	so لم
ya ל	Ч ye	<i>≥ yi</i>	ל yo

And this difference reflects the very different creators of the two systems. Cherokee writing was devised by Sequoyah about 1821, who observed the Americans around him communicating by marks on paper; and he wanted the same thing for his language and people. What he eventually devised was a CV syllabary. Cree syllabics, on the other hand, was devised by a missionary in the 1840s who was familiar with Isaac Pitman's phonetically based shorthand, and arranged his symbols accordingly.

Moreover, whenever someone has invented a script out of nothing—only being aware that other people had this thing called writing—the result is a nonsystematic syllabary (Schmidt 1980). When someone versed in phonetics or phi-

lology invents a script, the result usually displays phonetic awareness.

So after we recognize more than one type of "syllabary," we are licensed to recognize more than one type of "alphabet," and the counterintuitivity of Gelb's labels disappears. On the model of the word "alphabet," which reflects the names of the first two Greek letters, *alpha beta*, I borrowed the term *abjad* from Arabic (it incorporates the first four Arabic letters; Daniels 1990). In parallel, I borrowed the term *abugida* from Ethiopic, where it likewise comes from the first four consonants and the first four vowels of the usual arrangement of the symbols. *Abjad* has gained some currency, but *abugida* is lagging behind "alphasyllabary," which was introduced by William Bright (1992) some two years after *abugida* was, perhaps because of his prominence in Dravidian linguistics circles (Bright 2000). I object to "alphasyllabary" because it gives the impression that the type is some sort of hybrid of alphabet and syllabary—whereas the point of the new typology is to establish not three, but five types of writing (Daniels 2009c, 1992).

When we look at the history of writing in these terms, we see immediately that no syllabary ever gave rise to a script of any other type. We see that on just one occasion an abjad gave rise to an alphabet (which then ramified all over Europe), and on two occasions, likely not independently, an abjad gave rise to abugidas (one of which ramified all over South and Southeast Asia).

There are two sources for syllabaries: independent invention, as we have seen, and abstraction from a logosyllabary. And there is one source for the abjad—a missing link left out of this list.

For logosyllabaries, let us look at the three ancient inventions of writing that we know to be independent. For the first one, thanks to the hardy writing material used, namely "tablets" of clay with characters impressed in them, we can actually observe the process. On the earliest ones, pictograms (that simply means little, stylized pictures; the term says nothing about what is represented by the icon) stand for morphemes—the content words of the Sumerian language, their sound and meaning at once. Over a fairly short time, the pictures had been abstracted into mere patterns impressed in the clay with the corner of a stylus, yielding the wedge-shaped marks that give the script its name of cuneiform.

In China, maybe 1500 years later, something very similar must have happened; but by the time of the earliest surviving Chinese texts, the Oracle Bone Inscriptions of about 1250 BCE, another step had been taken, and characters now are exhibiting a compound structure: there is a "semantic" component suggesting the meaning, and a "phonetic" component suggesting the sound. (Indeed 2000 years ago, when the characters were systematized and codified, the phonetic indications were quite exact.)

Finally, in the Yucatan peninsula of southeastern Mexico, by 900 CE the Maya were using a full-fledged writing system. We cannot yet interpret any of the earlier symbol-systems found in Mexico, so we do not know whether any of the Maya's predecessors had full writing, though graphically they exerted notable influence. Its relation to its language is remarkably similar to the relation of cuneiform to Sumerian, and the origin of the characters is not unlike that of Chinese.

Writing in the World and Linguistics

Why should these three languages, Sumerian, Chinese, and Mayan, have hosted the invention of writing, and not the languages of other urbanized cultures such as those that spoke Indo-European, Semitic, or Quechuan languages?

Because in each of these languages, morphemes are basically monosyllabic.

People all over the world leave pictographs. Diringer (1968) has almost a dozen plates of them. For all we know, each of those pictographs stood for a specific word. But only with Sumerian, Chinese, and Mayan did pictographic logography turn into writing (where "writing" is defined as "A system of more or less permanent marks used to represent an utterance in such a way that it can be recovered more or less exactly without the intervention of the utterer"). Why only in these three cases (and probably Indus Valley, where the language is probably Dravidian (Parpola 2008))?

Because in these languages, morphemes are just a syllable long. Writing a picture representing a word's meaning also represents its sound—and it was soon, or eventually, realized that other words, whose meaning was not so easy to picture, with the same or similar sound, could also be represented by the picture. Thus Sumerian *ti* means 'arrow', so a picture of an arrow could be used to represent the homophonous word *ti* 'life'. In Chinese, k'iu 'fur coat' could yield k'iu 'to seek'.

And why is it syllabaries that appear when nonliterate people get the idea of writing from somewhere, and invent writing out of nothing? Because there is something basic about syllables in the brain: "segments" are acoustically a fiction; young children can segment words into syllables more readily than into phonemes; phonetic data in the mental lexicon are organized by syllable structure & identity; adults illiterate in an alphabet are unable to manipulate phonemes.

So, if syllables are so ingrained, why did we ever move from syllabaries to abjads, alphabets, and abugidas?

My answer is: by accident (Daniels in press). By a chain of accidents. Note that I have not mentioned Egyptian, which is often claimed to be a fourth independent invention of writing. But if I am right about the relevance of syllabic morphemes in that process, then Egyptian is not a candidate, because Egyptian does not exhibit monosyllabicity—rather, its morphology is very like that of its relative Semitic. It has roots containing (usually) three consonants, and these roots are inflected by varying their vocalizations. A root may be one or two syllables and may be extended by a variety of derivational affixes, to which inflectional affixes are then added.

And since the lexical morphemes changed their shape with derivation and inflection, what remained constant in each sign was the consonants. This gave the Egyptians the idea that what is to be written is consonants (rather than syllables). Therefore, Egyptian hieroglyphs do not denote syllables, but only consonants one, two, or three consonants per glyph, as well as some glyphs used only for their semantic value.

But if we ignore the surface differences—the pretty pictures versus the patterns of wedges; the denotation of consonants rather than syllables—then Egyptian and Sumerian writing work quite similarly. One sign denotes one morpheme,

and because the vowels are not written, it denotes that morpheme no matter what its vocalization pattern. It is this property that suggests that the first would-be Egyptian scribe learned just a little bit of how Sumerian writing works—you use one pictogram per word—and got the idea to do the same with their own language. And they developed in the same way—with logograms, purely phonetic writing, phonetic complements, and semantic determinatives.

We have only recently discovered writing-like notations on so-called "tags" excavated at Abydos (Baines 2004). They resist interpretation in terms of later hieroglyphic writing, but could they not be seen as providing the graphic basis for a writing system in imitation of the Sumerian?

More than a thousand years later, a misunderstanding similar to the Sumerianto-Egyptian one resulted in the West Semitic abjad. Somehow, someone somewhere got the idea to limit each symbol to just one consonant—and less than 30 sufficed for their entire language. We used to think it was Semitic-speaking mine workers in the Sinai who left the first examples of this form of writing, but not long ago a pair of inscriptions was discovered at Wadi el-Hol, in Egypt proper, dating about the same time (Sass 1988; Hamilton 2006). They use what appears to be the same signary but cannot be interpreted as either Semitic or Egyptian. Thus who it was that invented the abjad, and what language it was first used for, remains up in the air.

Again a thousand years, again a misunderstanding, and the abjad turned into the alphabet at Greek hands, as well summarized in an excellent textbook:

All Phoenician letters stood for consonants, but some of these consonants did not exist in Greek. Thus, the letter *?alep* stood for the glottal stop, which the Greeks did not have in their language. On the principle that the first sound of the letter's name was the sound of the letter, they apparently concluded that this particular letter stood for the vowel sound [a], and they called it *alpha*. By making the same mistake with several other consonant letters, they arrived somewhat by accident at a complete alphabet marking all the phonemes of their language." (Anderson 1989:387)

It was thus a chain of three mistakes that led to our most widespread type of writing system: Sumerian > Egyptian; Egyptian > West Semitic; Phoenician > Greek.

There are also various chains of faithful transmission of alphabets, abjads, and abugidas: Greek > Etruscan > Latin (Roman); Greek > Coptic, Armenian, Georgian, Gothic, Cyrillic, Glagolitic; Aramaic > Manichæan > Sogdian > Uyghur > Mongolian > Manchu; Aramaic > Pehlevi > Avestan; Brahmi throughout South and Southeast Asia; Arabic throughout Islamic civilization (Daniels 2000c). Sometimes improvements are made as they are used for new languages—often by the addition of new letters for new sounds (Daniels 2006a)—but sometimes scripts remain the same and it seems as though they couldn't possibly record their new languages, but they do.

And finally, there are instances of transmission of scripts to cultures that had grammatical traditions—and in each of these cases, there are improvements of the fit of the script to the new language: Aramaic > Kharosthi; Aramaic and Kha-

rosthi > Brahmi; Brahmi > Tibetan; Tibetan via hPags pa > Korean (Han'gŭl) (Daniels 2007).

(The best of them might be considered to be the Korean alphabet, where segmental letters are arranged into syllabic clusters—and the base shapes of the letters are taken to represent the shapes of the articulators used in making them, and the phonetically related sounds are denoted by additions to the base shapes.)

I conclude with a rather more complicated map (Figure 6) than the one I started with. We look not just at the shapes of the letters that spread across the globe, but at the ways the scripts represent their languages and the ways those ways were transmitted from culture to culture. The orange arrows represent the original three misunderstandings. The red arrows represent the gradual expansion and adaptation of scripts to new languages. The blue arrows hint at the use of basically the same script for many languages. The green arrows represent the deliberate alterations of scripts by grammarians. This is, I think, a more accurate picture of writing in linguistics and the world.



Figure 6. A representation of the "functional" history of writing

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Peter T. Daniels 254 Palisade Ave. Jersey City, NJ 07307

grammatim@verizon.net

When is Orthography Not Just Orthography? The Case of the Novgorod Birchbark Letters

ANDREW DOMBROWSKI University of Chicago

Introduction

In the corpus of the Novgorod birchbark letters (BBLs), a tendency to use the Cyrillic letters { $0, b^1$ } and { e, b^2 } completely interchangeably emerged during the 12th-13th centuries. Occurring in 31% of the documents dated to the first quarter of the 12th century, this practice became practically ubiquitous (up to 92% prevalence) by the middle of the 13th century (Zaliznjak 2004:25). This orthographic merger applies to all etymological *0, *e, *ŭ, and *ĭ, including, crucially, etymological *ŭ and *ĭ that are expected to have been lost during the jer shift (also known as *weak jers*).³ For this reason, this merger has most frequently been analyzed as purely orthographic (Živov 1984/2006:93-96, Zaliznjak 2002, Zaliznjak 2004:23-24). Nuorluoto 2007, however, proposes that this merger (at least as applied to stressed vowels) reflects intermediate stages in the sound change *ŭ > /o/. However, this proposal nevertheless partially relies on orthographic principles (Nuorluoto 2007:181).

In this paper, I argue instead that this merger (which can be termed the jerletter merger for brevity) is entirely explicable in terms of the underlying phonology of the Old Novgorod dialect. In particular, I propose that the outcome of the jer shift in the Old Novgorod dialect was affected by a Finnic substratum. According to this proposal, language shift from Finnic to Slavic (roughly contemporaneously with the jer shift in Slavic) resulted in the imposition of Finnic phonotactic constraints onto Novgorod Slavic, which in turn resulted in the frequent preserva-

¹ This letter is known as the back jer, and originally denoted a back lax vowel [u].

² This letter is known as the front jer, and originally denoted a front lax vowel [1].

³ Etymologies and transcriptions of Cyrillic orthography are given according to the orthography customary in Slavic linguistics. IPA correspondences are as follows: $\dot{c} = [tf]$, c = [ts], $\ddot{s} = [f]$, $\breve{u} = [u]$, $\breve{i} = [u]$.

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tion of etymological *ŭ and *ĭ in weak position. This analysis sheds new light on the role of language contact in the history of Russian as well as demonstrates the value of historical dialectology for resolving orthographic problems.

1 Orthographic Merger of {о, ъ} and {е, ь}

1.1 Description

In a sizeable portion of the BBL corpus, the Cyrillic letters $\{0, b\}$ are used interchangeably to denote etymological *o and *ŭ, while the Cyrillic letters $\{e, b\}$ are used to denote etymological *e and *ĭ. In other varieties of Old Russian (OR), it is commonplace for the sound changes *ŭ > /o/ and *ĭ > /e/ (in strong position) to be reflected in the orthography, usually through the use of the letters $\{o, e\}$ to reflect /o/ and /e/ from etymological jers. The orthographic merger found in the BBLs differs from the more common pattern in OR in two salient ways. First, it applies to all instances of *ŭ and *ĭ, not just to strong jers. Second, it is a complete merger, in which the four letters involved are used essentially interchangeably. This results in orthography strikingly distinct from that found elsewhere in Old Russian, as illustrated in the examples below.

The examples below include both orthographic and phonetic representations for the lexemes in the Novgorod BBLs and in OR before and after the jer shift. The forms given for OR are not drawn from specific sources, but are rather representations of how the given lexemes would be likely to represented given preexisting knowledge about OR orthography and phonology (c.f. Borkovskij 1963, Živov 1984/2006, Vlasto 1986, Živov 2006). The phonetic representations given for the Novgorod dialect are in all instances approximations based on the proposals outlined in this paper. As such, they are provided primarily for the sake of expository clarity. The BBLs reflect approximately 400 years of development and multiple sociolects; as such, the phonetic representations here are necessarily simplified. They are primarily designed to reflect the underlying phonology of the documents from the 12^{th} to early 14^{th} centuries that merge {0, b} and {e, b}, and should not be interpreted as applying to all documents attested in the BBL corpus.

	Novgorod	OR before jer shift	OR after jer shift
Cyrillic	четъ	чьто	чьто, что
Transcription	četŭ	čĭto	čĭto, čto
Phonetic	[tʃɛˈtɔ] / [tsɛˈtɔ]?	[tʃɪˈtɔ]	[tʃtə]

(1) *čito 'what':

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It should be noted that this representation of 'what' is not the only variant attested in the BBLs; instead, it has been chosen to clearly represent the degree to which the representation of vowels in the BBLs can differ from that found elsewhere in OR. The BBLs attest all logical possibilities of vowel representation in this lexeme as well as variation due to the merger of *č and *c (a merger termed *cokan'e*) in north Russian, the jer shift, and other consonantal assimilations.⁴ OR after the jer shift can optionally preserve the older orthography with the jer vowel intact; this is due both to the frequency with which older texts were copied and to the higher prestige associated with older orthographic practices (c.f. Živov 1984/2006:96). The use of a full vowel letter for the first vowel in *čito is quite unexpected, insofar as jer vowels preceding a stressed syllable with a non-ier are the first to be lost in the jer shift (Borkovskij 1963:98). The two variants given for the phonetic representation of 'what' in the Novgorod dialect, with different initial consonants, reflect the above-mentioned merger of *č and *c. In this merger, [ts] is the most likely outcome, but the possibility of other reflexes, like [tc], cannot be ruled out.

Example (2) below gives a more representative illustration of this variation:

	Novgorod	OR before jer shift	OR after jer shift
Cyrillic	поклоно, поклонъ	поклонъ	поклонъ, поклон
Transcription	poklono, poklonŭ	poklonŭ	poklonŭ, poklon
Phonetic	[pɔˈklɔnɔ]?	[pɔˈklɔnʊ]	[pɔˈklɔn]

(2) *poklonů 'bow'

The two forms cited above for Novgorod comprise the clear majority of attested forms of this common word (frequently used in greeting formulas), although some further variation is also attested.⁵ The correspondence between word-final vowels in this case is particularly clear because this lexeme does not appear to have the nominative singular ending /-e/ that is uniquely characteristic of the Old Novgorod dialect.

Example (3) further demonstrates the extent of possible variation within a given lexeme:

⁴ The full list of orthographic variants for the nominative / accusative case of 'what' is as follows: *čit[o], cito, ceto, čto, cto, sto, co, četo, cit-, čtŭ, što, čo, co, če, četŭ, c[t]o* (Zaliznjak 2004:818).

⁵ The full list of variants is as follows:*poklonŭ*, *poklon*, *poklono*, *poklo*, *pklonŭ*, *pklono*, *poklon*, *poklon*, *poklon*, *poklon*, *fpo}poklonŭ*, *fplo} poklono*, *fpo]k[lo]nŭ*, *poklonĭ*. Many of these variants are abbreviations and should not, therefore, be interpreted as indicative of phonological developments.

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	Novgorod	OR before jer shift	OR after jer shift
Cyrillic	ВЪЗЬМИ, ВОЗЬМИ, ВЪЗЕМИ, ВОЗЕМИ, ВОЗМИ, ВОСМИ	ВЪЗЬМИ	ВЪЗЬМИ, ВОЗЬМИ ВОЗМИ
Transcription	vŭzĭmi, vozĭmi, vŭzemi, vozemi, vozmi, vosmi	vŭzĭmi	vŭzĭmi, vozĭmi, vozmi
Phonetic	[vɔzɛ'mi]?	[vʊzɪˈmi]	[vəz ^{j1} mi]

(3) *vŭzĭmi 'take-2SG.IMPV'

The table in (3) includes all forms attested for this verb form in the BBL corpus, with the exception of some fragmentary attestations (Zaliznjak 2004:718-719). Notable in (3) is the presence of forms where the weak jer is not represented (*vozmi*, *vosmi*). These forms basically parallel post-jer shift OR forms. The presence of examples like this illustrates the important point that at no point in time does the BBL corpus reflect a linguistically monolithic population (Vermeer 1997). Furthermore, at no point does the prevalence of the {0, b} ~ {e, b} merger exceed 92%. In other words, it is quite possible that the attested tokens of a given lexeme reflect multiple underlying phonological systems.

1.2 Chronology

The merger of the $\{0, b\}$ and $\{e, b\}$ letters occurs with varying frequency throughout the time span of the BBLs. In the earliest chronological layer, comprising documents from the eleventh century, it occurs in only 8% of documents. The frequency of this merger rises steadily throughout the twelfth century, reaching a prevalence of 68% in documents from the last quarter of the twelfth century. It is ubiquitous, occurring with approximately 90% frequency, during the thirteenth century before dropping off in the fourteenth century. Only 14% of documents from the latest, post-1400 layer of the BBL corpus display the merger (Zaliznjak 2004:25).

The chronological trajectory of the $\{0, b\} \sim \{e, b\}$ merger closely tracks three

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other "orthographic" practices, the most notable of which is the interchangeable use of the Cyrillic letters {e, \bullet } for etymological *e and *ě.⁶ The chronologies of these two practices correlate closely (r = .8). Another close match is found between the jer-letter merger and the use of the Cyrillic letter {0} for /f/ (r = .87). Yet another strong correlation is found between the jer-letter merger and the practice of writing /u/ after a consonant as Cyrillic {y} (r = .86), although the absolute levels of prevalence differ considerably. Zaliznjak 2004 also provides information pertaining to the chronological evolution of other orthographic practices in the BBLs (Zaliznjak 2004:25-33). No strong correlation can be observed between the jer-letter merger and any of the other eight evolving orthographic practices that Zaliznjak charts in the BBLs.⁷

Two points are especially worth noting with regard to the above chronology. Firstly, out of the three phenomena that correlate closely with the jer-letter merger, only two are obviously orthographic in nature. The interchangeable use of the Cyrillic letters $\{e, \mathbf{b}\}$ could quite possibly reflect underlying phonological developments. While a full discussion of this problem goes beyond the scope of this paper, it may be noted that although $*\mathbf{e} > /\mathbf{i}/\mathbf{i}$ is frequent in north Russian dialects, the shift of $*\mathbf{e} > /\mathbf{e}/\mathbf{i}$ is also well-attested both in East Slavic and in Slavic as a whole. This suggests that the thirteenth century may have been a period of intense linguistic change in the Old Novgorod dialect, rather than a period of intense change in orthographic practice. Furthermore, the twelfth century is not only the period in which the jer-letter merger increases to the point of ubiquity, but is also the period in which the jer shift has been independently hypothesized to have been carried out in Novgorod (Zaliznjak 2004:59-60). In order to fully evaluate the significance of this overlap, some background information about the jer shift and early Slavic orthography is necessary.

2 The Jer Shift and Orthography

2.1 The Jer Shift

The phonological inventory of Common Slavic included two phonemic high lax vowels, $[\sigma]$ and [1], known as the back and the front jers respectively in traditional terminology. After the establishment of Slavic orthography (and the major geographical dispersion of Slavic), a sound change took place that has been frequently termed the jer shift.

Broadly speaking, the jer shift involved the elimination of $[\upsilon]$ and [I] when

⁶ The Common Slavic phoneme denoted as \check{e} was phonetically realized as $[\mathfrak{x}]$ in Common Slavic, but was raised to $[\varepsilon]$, $[\varepsilon]$, or even [i] throughout East Slavic.

⁷ The strongest observable correlation is a slight negative correlation with the use of the Cyrillic letter $\{Ha\}$ to represent /ja/ (r = -.48). Besides that, correlations are negligible (r ranging from -.03 to -.29).

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phonotactically permissible. Jer vowels that were eliminated are traditionally known as weak jers. When phonotactic restrictions prevented deletion of the jer vowels, they shifted to other vowels (Bethin 1998:104-5). The phonotactic details are to a certain extent both language-dependent and context-dependent, but an influential approximation is known as Havlik's Law:, which can be stated as follows: a jer is weak in word-final position and before a non-jer vowel. A jer before a weak jer is strong. A jer before a strong jer is weak. This results in vowel-zero alternations within paradigms, e.g. Common Slavic **šīvīcī 'tailor-NOM.SG' & *šīvīca 'tailor-GEN.SG' > Ukrainian švec & ševca 'ibid'* (Bethin 1998:105).

The jer shift spread from the southwest northwards within Slavic, beginning in the 9th century in southwest Slavic. However, the jers were retained into the 13th century on the NE periphery (i.e., Novgorod) and possibly later on the NW periphery (Bethin 1998:104-5, Zaliznjak 2004:58). As already mentioned, the jer shift in Novgorod seems to have overlapped with the emergence of the jer-letter merger. Since the evidence provided by written sources is crucial for determining the chronology and progression of the jer shift, an understanding of early Slavic orthographic practice is crucial for any evaluation of the BBL evidence.

2.2 Early Slavic Orthography

Slavic orthography was developed after at least the early stages of differentiation of Slavic into East, West, and South Slavic. The use of Cyrillic to write Slavic spread along with Orthodox Christianity from the south to the north. However, the orthographic system designed for ninth century South Slavic was only an approximate fit for later East Slavic due to a range of systematic phonological isoglosses separating these branches of Slavic. Simultaneously, South Slavic orthographic rules (as well as morphology and syntax) were imbued with the prestige of the liturgical language itself.⁸

In this context, a complex norm arose governing the application of Cyrillic orthographic principles by speakers of East Slavic. "Norm" in this context should, of course, not be understood as the equivalent of a modern literary language. Although full standardization never occurred, the prevalence of orthographic corrections in manuscripts suggests a broadly normative approach to orthography (Živov 2006:65-69). The learning process involved the repetition of CV sequences reflecting liturgical pronunciation. On the basis of this, writers learned to make orthographic generalizations ranging from fairly simple and inductive to more elaborate, depending on register, education level, and the specific orthographic issue at hand (Živov 1984/2006:93-95, Živov 2006:48-55).

⁸ The relationship between the liturgical Church Slavonic language (based on East South Slavic) and Old Russian has even been analyzed in terms of diglossia (Uspenskij 1994). This analysis is far from universally accepted (cf. Kamčatnov 2005:49-56), but the very existence of this debate is nonetheless indicative of the underlying complexity of the sociolinguistic situation.

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As a result of this, both orthographic and linguistic information is relevant for the analysis of any unusual or interesting features observable in early Slavic sources. On one extreme, some phenomena are clearly explicable only in terms of orthography – for instance, variation in the style of writing given letters. On another extreme, some phonological features (like the devoicing of word-final consonants), are reflected directly in the written text, and are best explained in terms of phonology rather than orthography. The jer-letter merger potentially involves both criteria. While it has generally been analyzed in terms of orthography, as outlined above, I will argue below that the jer-letter merger actually reflects the underlying phonology of the Old Novgorod dialect.

3 Finnic Substrate and the Jer Shift

Independent evidence exists that a Finnic substrate played a significant role in the development of the northern dialects of Russian, including but not necessarily limited to the Old Novgorod dialect. Language shift from Finnic to Slavic has been hypothesized as an explanatory factor for the development of several phenomena observed in north Russian, ranging from phonological phenomena like *cokan'e* (the non-differentiation of the affricates [ts] and [tʃ]) to the emergence of nominative objects of infinitives (Timberlake 1974, Vermeer 2000, Čekmonas 2001).

In addition to a range of other evidence indicating a widespread Finnicspeaking population in early medieval north Russia, the BBL corpus contains the first written attestation of any variety of Finnic. BBL #292 is dated to the beginning of the 13th century and is written in an early form of Karelian (Haavio 1964). This suggests that a period of active bilingualism culminating in language shift from Finnic into Slavic was roughly contemporaneous with the emergence of the jer-letter merger.

While it is impossible to reconstruct the precise phonotactics of the variety of Finnic spoken in north Russia at that time, in general Finnic phonotactics do not tolerate complex consonant clusters of the type that the jer shift produced in Slavic (Laakso 2001:186). Since grammatical interference (or imposition, in the terminology proposed by van Coetsem 1988 and 2000) often results from language shift, it is logical to suppose that the influence of Finnic phonotactics may have affected the process of the jer shift in the Old Novgorod dialect. This resulted in the much more frequent preservation of weak jers, which is directly reflected in the jer-letter merger.

4 Conclusions

In the above sections, it has been proposed that the interchangeable use of the Cyrillic jer letters and {0, e} in the Novgorod BBLs reflects a different outcome of

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the jer shift triggered by the imposition of phonotactic constraints from a Finnic substrate. This proposal requires no new assumptions. Instead it relies only on the direct evidence of the BBL corpus, preexisting evidence suggesting widespread language shift from Finnic, and the generalization that language shift may often result in structural changes. This analysis does suggest a revision of the history of the jer shift in East Slavic, but this is not inherently problematic. The jer shift reached the northern periphery of East Slavic well after the emergence of other dialectal traits differentiating the Novgorod region from other varieties of East Slavic, and therefore variation in the outcome of the jer shift is not overly surprising. Furthermore, this proposal has some specific advantages, which are briefly sketched below.

First, the above analysis would result in a much more transparent and simple relationship between orthography and phonology in the BBL corpus. This is particularly advantageous because it is generally hypothesized that the writers of the BBLs were much less trained in elaborate orthographic principles than, for instance, scribes in monasteries. Other proposals have been made that link the jerletter merger to phonology, but these proposals still rely on the hypothesis that the jer shift in Novgorod basically paralleled that found elsewhere in East Slavic, albeit somewhat later (Nuorluoto 2007). In such an approach, instances of the jerletter merger applying to weak jers must still be explained through orthographic practices.

Furthermore, this proposal permits a principled and coherent chronology of the jer shift in Novgorod (and its reflection in the jer-letter merger observable in the BBLs). In the first stage, roughly corresponding to the 11th century, the orthographic merger is infrequent, which corresponds to the predictions that can be made from pre-existing knowledge about phonology and orthographic practices before the jer shift. In the emergence stage, corresponding to the 12th century, the jer shift takes place in Novgorod and the increasing prevalence of the jer-letter merger basically tracks the progress of the jer shift. By the 13th century, a stable situation emerges in which the jer shift has taken place but with much more frequent preservation of weak jers due to the influence of substrate Finnic phonotactics. The prevalence of the orthographic jer-letter merger declines in the 14th century and onward. This likely is due to an increasingly monolingual population in closer contact with the rest of Russian, as a result of which the jer reflexes found elsewhere in Russia prevailed.

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adombrow@uchicago.edu

Gesture-to-Speech Mismatch in the Construction of Problem Solving Insight

J.T.E. Elms California State University, Northridge

Introduction

Fifty years of research in problem-solving have established that people do not solve problems on the basis of their deep structure, but rather on the basis of their surface form (Hunt 1991, Pinker 2007:272-276, Kirsh 2009). In the case of verbal problems, verbal surface form dramatically outweighs logical problem structure in determining perceived problem difficulty, time to solution, number of errors, and ability to transfer solution experience from one problem to another (Hayes and Simon 1977, Kotovsky et al 1985). This finding motivates a new look at problem solving *as discourse* — focused not on how understood problems are solved, but rather on how problem-solving discourse is understood. Discourse analysis shows promise in this area because people routinely display their cognitive states to each other in speech and bodily signs, fully expecting interlocutors to understand and respond to these displays (Heritage 2005). Moreover, visible actions such as gesture and gaze have been shown to be closely coupled to language production and meaning-making by both speakers and hearers (McNeill 1992, 2005; Goldin-Meadow 2003; Kendon 2004; Streeck 2009).

The present report analyzes a case of problem-solving insight achieved in a dyadic problem-solving discourse task. The task required two participants to work together to solve a murder mystery based on a story by Raymond Chandler. One participant appeared to use propositional speech and gestural simulation as checks on each other while he hypothesized alternative interpretations for the actions of a murder suspect. Each hypothetical scenario began with a gestural metaphor for a named kinship relationship between suspect and murder victim. Irreparable cross-modal mismatch between speech and gesture led to generation of a new kinship metaphor. Merging elements from the two gestural scenarios while maintaining semantic congruence between speech and gesture did not merely precede, but actually constructed, problem-solving insight.

1 The Chandler Murder Mystery Task

To investigate problem-solving discourse in a systematic way, a standardized discourse elicitation task was constructed from a graphic novel adaptation of a short crime story by Raymond Chandler (2003 [1939]). A murder mystery was chosen as the problem domain because murder is an *ill-defined* problem — that is, a problem which cannot be solved by purely logical inference from the information given. In this respect, ill-defined problems contrast sharply with more frequently studied, *well-defined* problems such as mathematical puzzles, chess, Missionaries and Cannibals, or Tower of Hanoi. Because ill-defined problems require frequent redefinition of the problem itself in order to be solved, they are well-suited to studying the construction of meaning in discourse.

The task materials consisted of twelve 7-inch by 11-inch laminated cards, each of which presented scenes from the Chandler story in comic-book style with black-and-white illustrations, balloon dialog, and boxed narration. Each participant was given one scene-of-crime card, one detective-hiring card, and four clue cards. Card assignment and presentation order were randomized. Story elements were distributed across the cards so that each participant possessed half the information available for solving the mystery. Participants were asked to work together to discover what crime was committed, who did it, and why. Participants were not allowed to show each other their cards, but were otherwise free to work with their materials and each other however they wished. The elicited discourse was free-form and all gestures were spontaneous.

The problem-solving session lasted one hour and was video-recorded. Camera angle was chosen to capture the speech, gaze, gesture, and card manipulations of both participants concurrently with a temporal resolution of $1/30^{\text{th}}$ of a second.

The participants in the session shown here were professional problem solvers and coworkers in the technical support group of a mid-sized software company.

2 Insight into a Gesture-to-Speech Mismatch Attractor

One participant, whom I will call TOM, happened to experience a classic instance of problem-solving insight while on camera. (See Davidson 2003 for a review of the literature on problem-solving insight and a description of what it looks like.) The insight event lasted about 22 seconds and occurred in the final minutes of the session while TOM discussed Clue Card 9.¹ To better understand the meaning-making practices associated with this insight event, I excerpted all TOM's utter-ances involving this card for detailed transcription and microanalysis.

TOM's first mention of the card came 30 minutes into the session and focused on its final three panes (see (1) below). Detective Marlowe is on the phone with his client, a rich old man with an adopted stepson who is also the murder victim.

¹ Cards were labeled for identification with numbers taken from a random number table.



TOM's initial assessment of these panes is one of confusion, as shown in (2). At issue for TOM are highly abstract concepts involving kinship relationships and 1939 California inheritance law, which his gestures will try to make concrete.

The assessment in (2) is notable for including TOM's first direct gesture-tospeech mismatch of the session. Although other researchers have used the term in other ways, for my purposes here *mismatch* refers to inconsistency or contradiction between the semantic content of speech and the semantic content of a corresponding speech-linked gesture. Other forms of semantic divergence between speech and gesture don't count. The example in (2) shows the most direct form of mismatch, as I use the term: the lexical meaning of a word in speech ("three") is

(2)





1 Left hand (LH) holds partial card stack in view at face level

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2 Right hand (RH) signs 'two' (mismatch to speech), beats rapidly

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semantically inconsistent with the self-contained and quasi-lexical meaning of a simultaneously occurring, conventionalized hand sign for the number 'two.' There is nothing fancy about it.

More indirect forms of mismatch require more analysis to discern because they involve at least one setup step prior to the occurrence of the mismatch event. However, I count these as mismatch as well if semantic inconsistency or contradiction can be demonstrated when the setup step is taken into account.

In TOM's case, Clue Card 9 turned out to be a powerful mismatch attractor. On three separate passes through this material, he produced three speech errors (two with repair) and three gesture-to-speech mismatches. No other card triggered anything like this cluster of errors and mismatches.

Also intriguing are the reorganizations of person reference that occur in TOM's successive discussions of this material. Two different kinship relationships are proposed as alternative social identities for the "old man" and the "kid." TOM then imagines, using both speech and gestural resources, what these kinship relationships might imply for the social dynamics between father and son and the implications for inheritance. TOM ultimately enacts three scenarios:

- *Adopted son scenario* leads to irreparable mismatch and impasse
- *Stepson alternative* tested literally "on the other hand"
- *Stepson alternative merged with adoption outcome* constructs insight

Across these three scenarios, gesture follows a developmental trajectory from well-defined to stylized (distinct iconic handforms become metonymic, stroke amplitudes attenuate, boundaries between spatial index locations becomes less sharply drawn) and from more concrete to more abstract.

3 Adopted Son Scenario: Concrete Metaphor, Irreparable Mismatch

TOM does not construct his adopted son scenario until after he describes the contextual imagery of Clue Card 9 and reads all text aloud to his partner. At this point in the session, both participants have already agreed that the "kid" is indeed the murder victim. He is also a "big blonde bruiser" who "thinks he's hell with the women" and "drinks a lot, gambles a lot, and loses a lot." He owes \$50,000 in 1939 dollars (equivalent to \$636,400 in 2010) to his favorite gambling club.

With context established, TOM switches to hypothetical register. In (3) to (5) below, he redefines the "kid" as an *adopted son* and the "old man" as an *adoptive father*. The concurrent gesture is one of scooping something into the lap. It can be glossed metaphorically as simulating a concrete action: ADOPTING A CHILD IS SCOOPING SOMEONE INTO YOUR LAP.

The gesture in (3) to (5) also establishes links between particular regions in space and particular noun phrases — a practice known as *spatial indexing*. This is

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(3) 31:11:11

TOM: did the RH LH+1....+



- (4) 31:11:25
 - TOM: old man adopt RH ----{3 }+
 - 3 Scoop handform arcs up from rest at LoR periphery to MR near torso & down to lap, strikes UR thigh



(5) 31:12:27

TOM: the kid? RH +....+



achieved by TOM in two different ways. For the *agentive* noun phrase (NP) "old man" (plus the verb "adopt," which is included with "man" in the gesture stroke in (4) and might be read as man-who-adopts), the concurrent sweep of the gesture in motion through the region highlighted in yellow establishes this region as indexing the old man. But for the thematic *goal or patient* NP "the kid," it is the termination of the gesture stroke in the lap immediately prior to spoken utterance of the NP that establishes the region highlighted in purple in (5) as indexing the kid. In short, action in gesture mirrors agency in syntax, while the termination of a gesture at its target mirrors the thematic goal or patient in syntax. This pattern is seen consistently in TOM's gestures throughout most of the session.

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TOM then explores a possible consequence of the adoption: the old man comes into money because of it. The gesture here is an open, palm-up grasping handform in (6) that becomes a palm-up presentation handform with folded thumb, possibly holding something received, in (7). The stroke terminates at a location removed from the body at arm's length, near the end of the right chair arm. This gesture can be glossed as simulating the action metaphor: COMING INTO MONEY IS GRASPING CASH AT A DISTANCE.

It is the old man who is hypothesized to come into money in speech. Gesture enacts this agentive role by sweeping the grasping stroke through the yellow region previously established as indexing the old man concurrently with utterance of "come into." Gesture renders the agency of the old man explicitly and visibly, despite the fact that in speech the old man and his thematic role are implied solely by syntax and are never spoken aloud. The parallel use of gesture for "man adopt" in (4) and "[man] come into" in (6) tends to corroborate this interpretation. The gesture stroke in (6) terminates in the green-highlighted region in (7) just before utterance of the goal NP "money", establishing this region as a spatial index for money after the pattern of thematic role linkage for goal NPs seen in (4) and (5).

In (8), the subordinate clause "because of it" modifies the main clause of (6) and (7), "and come into money." Although it is fully realized in speech, gesture ignores it completely — there is not even a gesture hold! Instead, gesture skips to the next main clause beginning "and the old–" and completes an enactment for it.

(6) 31:13:01

TOM: >and come into< RH +....⊥{4 }+ LH +1.....+

4 Open grasp palm up becomes presentation handform palm up with folded RT as arm extends to RM front periphery above chair arm



(7) 31:11:25

TOM: >money< RH +....+





It would be difficult to justify a gloss for this gesture, were it not for the fact that we have a speech error here that is repaired in the preferred way (Schegloff et al 1977). The follow-on speech is neither independent of the aborted clause nor an elaboration of it that adds new information; it is a repair. As such, it is intended to replace the aborted clause with a minimum of change. From this we can infer the

(9) a. Error: >and the old-<
b. Repair: and the kid's gambling it away?
c. Inferred Original: and the old [man's gambling it away?]

probable content of the original clause aborted in (8), as shown in (9).

Now, the stroke in (8) enacts a throwing motion that starts in the money region and flings something laterally away across the chest. Given the content of the aborted speech in (9c), I gloss the gesture as simulating the action metaphor: GAMBLING IS THROWING MONEY AWAY.

In conformance with TOM's usual practice for agentive NPs, the stroke of the gesture passes through the region indexing the old man concurrently with the utterance of "old [man]" in speech. Agency in speech and gesture are semantically aligned: it is the old man who gambles (in the inferred, aborted speech) or throws money away (in the explicit gesture).

However, this assertion contradicts prior cards concerning who is doing the gambling: namely, the kid. This contradiction motivates the repair shown in (10) and (11). And just as speech is minimally repaired to replace "old [man]" with

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(10) 31:15:04

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TOM: (0.1) and
RH _____6____J
LH +1.....+
```

6 Throw retracts to new start position at UCtr torso, keeps vertical palm handform w/horizontal RT & fingers



(11) 31:15:24
TOM: the kid's
RH L{7 }+
gambling it away?
RH +.....+
7 Throw is rotated 90°,
sweeps down from UCtr
torso to UR thigh in lap

"kid", so is gesture minimally repaired to modify the agent of the throwing action. The throw is rotated 90°, from horizontal to vertical, so that the stroke can bypass the vertically elongated yellow region indexing the old man. The new downward stroke passes through the purple region that indexes the kid concurrently with utterance of the NP-plus-verb "the kid's," following TOM's usual practice for agentive NPs. This correctly aligns agency in gesture with agency in speech.

But the repair introduces a new problem elsewhere in the utterance: *gesture-to-speech mismatch*. It's all very well to throw money away on the ground rather than off to the side, but if the throw happens to collide with your lap en route, money is not being thrown away after all. The lexical meaning of "away" in speech contradicts the semantics of a throwing gesture that collides with a lap.

When TOM encounters this mismatch, he pauses for 2.5 seconds of what must be construed as think time. But no simple modification can fix the new problem. If he leaves things as they are, he has a gesture-to-speech mismatch on "away." If he keeps the repaired speech but rotates the gesture back to its original lateral trajectory, any throw with the right hand will pass through the vertically elongated space that indexes the old man. This would erroneously attribute agency for gambling (literally, for throwing) to the old man, and it would also create a new mismatch to "the kid's" in repaired speech. In short, we have a conflict between two gestural alternatives, *both* of which contradict the repaired speech in different ways. This is irreparable gesture-to-speech mismatch.

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There is nothing nonsensical about the repaired speech stream on its own. It is perfectly comprehensible and contradicts nothing in the story. Nevertheless, TOM concludes "that doesn't make sense" and abandons the topic for 22 minutes.

4 On the Other Hand: The Stepson Alternative

In the adopted son scenario, all gestures were made with the right hand. But in TOM's second pass through Clue Card 9, all gestures that accompany a hypothetical speech register are enacted literally "on the other hand" — the left. While in this mode, TOM again proposes new social identities for the "kid" and the "old man" — this time as *stepson* and *stepfather*. In the process, he invents a character who is never mentioned in the Chandler story: the old man's wife.

The gestures that enact the stepson proposal are not representational action simulations, but deictic (or pointing) gestures. Spatial indexes are nevertheless declared in TOM's usual manner. In (12), the gesture stroke co-occurs with utterance of the agentive NP-plus-verb "he married," which links the old man to the new region highlighted in yellow. The stroke terminates at TOM's temple just before utterance of the goal NP "somebody," which links this somebody — the old man's wife — to the region highlighted in blue. The stroke in (13) moves through the blue region concurrently with "who had this" in speech, consistent

(12) 54:57:18

TOM:	so he <u>mar</u> rie	ed
RH	L{8	}
LH	L{ 9	} +
RH LH	somebody (0. +	.6) .+

8 Lays cards face dn on chest9 Releases cards, LF1 forms pointer, lifts to L temple

(13) 55:00:07

- TOM: who had this ki:d LH \perp {10}}....J
 - 10 Pointer swings forward, LT raised (gun?), stops above L chair arm at arm's length from body at ML front periphery





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with gestural construal of "who" as an agentive NP, and it terminates in the purple region above the end of the left chair arm just prior to utterance of "kid," after TOM's usual practice for declaring a spatial index for a goal or patient NP.

It is important to note that these two gestures in sequence move a pointer from Region A (the old man as stepfather) to Region B (the imagined wife) to Region C (the kid as stepson). The manner of movement is unadorned; there is no attempt even to trace a route between regions. TOM is pointing out *connections* with his gestural actions, no more and no less. Crucially, when this sequence is viewed as a composite gesture chain, it *performs an abstracting function* that highlights the indirect nature of the relationship between stepfather and stepson, who are connected only through a third party. (The use of gesture to perform abstractive actions was first described by Streeck 2008:262 and 2009:137, 169-171.)

The use of abstract gesture strokes here does not preclude metaphor. Both post-stroke hold configurations can be construed as attributional metaphors for the linked NPs. In particular, when TOM in (13) points to the purple region above the left chair arm before uttering "kid," he relocates the kid out of his lap and places him an arm's length away. This change cannot be accidental, and I would gloss it as: STEPCHILDREN ARE KIN KEPT AN ARM'S LENGTH AWAY.

The gun-like handform used as a pointer in (13) may not be accidental, either, after 55 minutes of rumination on murder — especially when the gun points at the murder victim. It may be that, by raising a thumb on the pre-existing pointer of (12), TOM modulates the base handform with a secondary layer of meaning, to the effect that distant kin may be shot by their relatives in murder stories.

Throughout his enactment of the stepson alternative, TOM's whole body is skewed to the left, with most of his weight on the left hip, as shown in (14a). But the moment he completes the stepson proposal, he stands and reseats himself with his weight shifted back to the right hip, as shown in (14b). Gesture immediately resumes in the right hand as well and remains there for the rest of the session.

In this right-sided "main track" posture, TOM assesses the stepson alternative against the adoption scenario he abandoned 24 minutes earlier. Simultaneous consideration of the two scenarios is evident in his speech, which quotes the old man



(14) a. Stepson on the Left Hand

b. Adopted Son on the Right Hand

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as saying: "'ohe's botho my stepson and my adopted so:n." On "stepson" and "and," TOM strikes his upper right thigh with his cards at the same spot (in terms of felt impact) that previously indexed the kid as an *adopted* son. These actions prefigure his integration of the two scenarios three minutes later.

5 Constructing Insight: Merging the Stepson and Adoption Scenarios

In the final minutes of the session, TOM returns one last time to Clue Card 9. He first reprises detective Marlowe's statement about adopting one's way into money, then is visibly struck by positive affect and switches to hypothetical register as he assembles a solution. Spatially indexed person references from the stepson alternative are merged into the spatial index layout from the adoption scenario. Gesture concurrently traces a causal chain from one merged spatial index to the next in synchrony with speech. In this way, TOM constructs insight into the key plot twist of the Chandler story: namely, that a rich old man might commit murder in order to inherit money from his son.

The first gesture in this sequence establishes the upper right front region highlighted in yellow in (15) as indexing the old man, following TOM's convention for agentive NPs. (The agentive convention is used to establish spatial indexes for all NPs in this final sequence.) This region is identical to that first assigned to the old man as an *adoptive father* — as is clear from the fact that I've overlaid the current gesture in (15) with spatial index highlights from (7) using computer copy-and-paste. Despite an interval of 27 minutes between these two gestures, the fit is exact.



TOM: the old <u>ma:n</u>: could've orchestrated RH L{11 }:....+

¹¹ Vertical palm presentation handform dips & rises in MR front, beats in place

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The stroke in (16) co-occurs with "stepson" and maps the arm's-length position of the *stepson* region in purple from its original left-hand location to a mirrorimage position on the right. This metaphorically replaces a close relationship to an adopted son in the lap with a distant relationship to a stepson at arm's length. It also shows how the adoption and stepson spatial index layouts are being merged.

That this stroke in fact creates an index space for the stepson is confirmed by the error and repair that follow. The erroneous downstroke in (17) occurs in the stepson (purple) region on the "he" of "he will." In (18), speech is unchanged but gesture is repaired to a downstroke on "he" in the old man (yellow) region. This repair suggests that what TOM meant by "he" was the old man, not the stepson.

Counting the troublesome stroke in the stepson region of (17) as a gesture-tospeech mismatch is circular, however, without explicit corroboration from speech.

(17) 58:07:15



- 14 Downstroke MR front (Fr) periphery 2x
- 15 Downstroke MR Fr periph; mismatch to "he"=stepson

16 Arc in to MR front near torso, downstroke 2x



Mismatch in Problem Solving Insight

(18) 58:09:00

- **TOM:** he will (0.3) RH L{17}:::::J
 - 17 Downstroke at MR front near torso, rapid beats



After all, the co-occurring pronoun is lexically ambiguous and syntactically unbound to a referent at this point in the utterance.. Confirmation that reference to the old man is intended in speech does arise in syntax later, though, when "stepson's" is generated in (21) near the end of the clause. The use of "stepson's" in that position forces the preceding "he" to refer elsewhere, to the "old man."

TOM now traces the causal chain to its conclusion. The downstroke on "inherit" in (20) is more pronounced than others and appears to me to metonymically invoke the stroke in (11) that dumped money into the old man's lap as an icon for inheriting. The grasp in (22) moves the index for money (green) up from its original adoption position, but retains the arm's-length metaphor for cash at a distance.

Collectively, TOM's final three strokes perform an abstracting function by connecting the old man to money indirectly, through the stepson. Indirect connectivity makes the stepson an obstacle to wealth for the old man in a way that the adoption scenario, with its direct link between the rich old man and money, did not. In this way, gesture makes a motive for murder both tangible and visible.

TOM exclaims "sakes!" after working this out. He appears to have surprised himself with what his hands have told him. On this evidence, at least, thinking — and meaning — are not always all in your head.

(20) 58:02:04

- TOM: inherit RH L{18 }L
 - 18 RH lays cards face down on chest



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- (21) 58:02:04
 - **TOM:** the stepson's RH \perp {19 } \perp
 - 19 Presentation handform tips outward & arcs out to MR front periphery



- (22) 58:02:04
 - **TOM:** money. RH ⊥{20}}...⊥
 - 20 Open hand palm up reaches up to UR front periphery



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J.T.E. Elms California State University, Northridge 2730 Annandale Ln Simi Valley, CA 93063

jteelms@gmail.com

Semantically-Oriented Vowel Reduction in an Amazonian Language

CALEB EVERETT University of Miami

Introduction

Numerous phonetic studies, both recent (Clopper and Pierrehumbert 2008) and less so (Liberman 1963, Lindblom 1963), have demonstrated clearly that English speakers reduce vowels, both temporally and spectrally, in certain contexts. For example, findings in studies such as Fourakis (1991) have shown that vowels in words from portions of relatively fast speech are spectrally reduced when contrasted to their counterparts in the same words when uttered in segments of relatively slow speech. More interestingly perhaps, several studies (e.g. Munson and Solomon 2004, Scarborough 2006) have provided clear evidence that vowels are temporally and spectrally reduced when occurring in high frequency words.

Increased speaking rate and word frequency are not the only factors that correlate positively with vowel reduction, however. At least two other less straightforward but significant influences on vowel duration and vowel spectral composition have been evinced in the phonetic literature. The first of these is lexical density, i.e. the number of close phonological neighbors a given word has in the lexicon. Vowels in words with low lexical density, that is, words that have few corresponding words that differ according to only one phoneme, have been shown to exhibit a tendency towards spectral and temporal reduction (Munson and Solomon 2004). Put differently, vowels in words such as *choice*, which has a limited number of so-called phonological neighbors (e.g. *voice* and *chase*), tend to be reduced when contrasted to vowels in words such as *cat*, which has a relatively high number of phonological neighbors (*sat*, *scat*, *at*, *cot*, *kit*...). Munson and Solomon (2004) demonstrate that lexical density and word frequency interact, such that vowels in frequent words with few lexical neighbors are particularly reduced.

The intuitive and plausible motivation for the relationship between phonological density and vowel reduction (or expansion, depending on the perspective chosen) is that speakers have greater need to increase clarity when producing words that could more easily be confounded with a similar lexical item.

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Conversely, speakers are afforded the convenience of reducing vowels when producing words that are unlikely to be confused with other lexical items. In other words, ease of intelligibility seems to motivate vowel reduction in many cases.

In a similar vein, phoneticians have demonstrated that vowels are often reduced in another context in which intelligibility is naturally facilitated. Specifically, vowels are often reduced when they occur in words that are predictable semantically. This finding was first made in Lieberman (1963), and has been replicated most recently in Clopper and Pierrehumbert (2008). In the latter study it was found that vowels in monosyllabic clause-final words that are fairly unpredictable from the semantic context denoted in the clause are less reduced than vowels in the same monosyllabic words produced clause-finally in clauses whose semantics are more predictive of the final word in question. Interestingly, Clopper and Pierrehumbert (2008) found that the effect of semantic predictability on vowel reduction was not uniform across the three American English dialects considered in their study. For example, they found that the way in which speakers from Chicago and northern Indiana reduced their vowels differed from the manner in which southern speakers reduced theirs. Specifically, the northern speakers tended to reduce their vowels, along the F1-F2 plane, in the direction of the Northern Cities Chain Shift that characterizes their speech more generally. For more details on the vowel reduction patterns observed, I refer the reader to the original study. What is relevant for our purposes is that the findings in that study and in Lieberman (1963) suggest that, generally speaking, American English speakers reduce the vowels of words when those words are somehow semantically predictable from clausal context.

In order to better illustrate what is meant by semantic predictability in such cases, it is worth providing some of the stimuli utilized by Clopper and Pierrehumbert (2008). In that study, the researchers had speakers produce clauses such as those in clause-pairs (1) and (2).

- (1a) The chicken pecked corn with its beak.
- (1b) She is glad Bill called about the beak.
- (2a) The shepherds guarded their flock.
- (2b) Paul should have discussed the flock.

Note that in (1a) and (2a), the words occurring at the end of the clause are relatively predictable given the semantic context established by the preceding portion of the clause. In (1b) and (2b), however, the words are less predictable. For instance, one would not be surprised to find that the instrument used for cornpecking in (1a) is a beak, but one might very well be surprised that Bill called about a beak as in (1b). An analogous analysis holds for all of the clause pair stimuli utilized by Clopper and Pierrehumbert (2008).

Put simply, the fact that the vowels in clause-final words such as those in (1a) and (2a) tend to be reduced when contrasted with the clause-final words in (1b)

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and (2b) suggests that vowels in words with greater semantic predictability are generally reduced. One could argue that, as in the case of the increased reduction of vowels in words with low phonological density, this phenomenon is driven by the increased ease of intelligibility associated with such contexts. That is, it appears that heightened intelligibility motivates semantically-oriented vowel reduction.

While it is an interesting phenomenon, semantically-oriented vowel reduction has only been demonstrated in studies with English-speaking participants. The primary objective of the current endeavor is to establish whether or not there is cross-linguistic evidence for semantically-oriented vowel reduction. In order to do so, we will consider some recently-collected data from Karitiâna (K henceforth). K is a Tupí language spoken in southwestern Amazonia. It is a natural subject for the current study since the author regularly conducts phonetic research on the language, and since there are a number of recent phonetic studies available in the literature on the language (Everett in press a, 2008a, *inter alia*). An ancillary objective for this study is to contribute to the growing acoustic-phonetic literature on the language and on Amazonian languages more generally (see discussion in Everett in press b).

1 Relevant background on the language

Given that much has been published on the sound system of K, I choose not to represent the basics of the sound system here. The K examples below are transcribed using broad phonetic (IPA) transcription. The most typologically-remarkable facet of the sound system is an interesting phenomenon referred to by Everett (in press a) as 'variable velic movement', according to which the velum is lowered for a completely unpredictable duration in certain contexts. For example, the word for 'thing', /kina/, may surface as [kidnda], [kinda], or [kida] due to random perturbations in velic aperture duration. This variability of velic aperture duration contravenes the literature on nasality in ways described in Everett (in press a).

Not all of the literature on the K sound system focuses on such nasal patterns. Everett (2008a) presents a locus-equation based analysis of the three voiceless stops in the language and, significantly for our purposes, Everett (2008b) presents an acoustic analysis of the vowels of the language. As noted in that study and in numerous preceding studies beginning with the work of David and Rachel Landin (SIL members who worked on the K language in the 1970's), there are eleven phonemic consonants and five vowel types in the language. Vowel length and nasality are contrastive in the language, however, creating a system of fifteen potential vowels. Our focus here is on short oral vowels. These oral vowels, namely /i/, /e/, /i/, /o/, and /a/, are also the focus of Everett (2008b). In that study the mean normalized vowel spaces for eight adult speakers, four males and four females, are presented. The normalized vowel spaces suggest that the only truly high vowel in the language is /i/. The /i/ vowel is located between /i/ and the /e/ and /o/

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vowels along the F1 (height) dimension. The /a/ vowel is the only low vowel in the language, and is located centrally along the F2 dimension, much like /i/. Among the other findings presented in Everett (2008b) is one that is particularly relevant to the current study. Specifically, in that study it was found that unstressed vowels are characterized by significant phonetic reduction. In general, such vowels tend to occur in a more central location of the F1-F2 plane, nearer to tokens of other vowel types. Vowels in stressed contexts are generally more dispersed within the vowel space and occur in more restricted/specific regions of that space. The patterns of phonetic reduction characterizing unstressed vowels in K are relevant to the results of the current study in straightforward ways discussed briefly in the following section.

2 Methods and participants

The methods employed in this study are generally modeled after those in Clopper and Pierrehumbert (2008). The methods do deviate intentionally in some ways from those in that study, however.

As was noted in the introduction, Clopper and Pierrehumbert (2008) recorded speakers producing clauses such as (1a)–(2b) in which the analyzed vowels occurred in the final monosyllabic word of a given clause. For this study, K speakers were recorded producing clauses in which the word with the analyzed vowel occurred clause-finally or penultimately. While four English monophthongs were examined in Clopper and Pierrehumbert (2008), all five K monophthongs were examined for this study. The ten clauses utilized are listed in (3a)–(7b). The high-lighted vowels in five different words were examined. In half the clauses, the relevant word occurred in a context that was fairly predictable semantically, and in the other half the same word occurred in a context that was less predictable semantically. In (3a)–(7b) the clauses are listed as pairs, with the (a) variants containing the relatively more predictable contexts.

Eight female K speakers were recorded producing three tokens of each of the ten clauses. The order of the recorded clauses was random in each case. Speakers were recorded onto a Mac powerbook at a sampling rate of 44.1 kHz. The duration and formant analyses described below were calculated via wide-band FFT-based spectrograms.

(3a)	i	na-mɨŋgɨdna-t	kind a oti?ap
	3	NSAP ¹ -swallow-NFUT	medicine
	'S/h	e swallowed the medicine.'	

¹ Glosses: NSAP: Verbal prefix used when the absolutive referent is not a speech act participant. CAUS: Causative. NFUT: Nonfuture. FUT: Future. INT: Semantic intransitivity marker. COP: Copula. S: Singular.

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- (3b) i naka-m-?a-t kind**a** oti?ap 3 NSAP-CAUS-make-NFUT medicine 'S/he made the medicine.'
- (4a) taso pikop na-oki-t õmbak**i** man hunter NSAP-kill-NFUT jaguar 'The hunter killed the jaguar.'
- (4b) põnso et na-atik-Ø õmbak**i** woman daughter NSAP-throw-NFUT jaguar 'The woman's daughter threw the jaguar.'
- (5a) põnso o?it na-aka-t i-ambo-t amb**i** ohint woman adolescent NSAP-COP-NFUT INT-climb-NFUT house on/over 'The girl climbed on the house.' (Any built structure.)
- (5b) nõnso o?it naka-i-t kinda o amb**i** ohint woman adolescent NSAP-eat-NFUT thing round house on/over 'The girl ate the fruit on top of the house.' (Any built structure.)
- (6a) in naka-m-?a-t ot?**e**p 1S NSAP-CAUS-be-NFUT bow 'I made the bow.'
- (6b) $\tilde{i}n$ na-okot-Ø ot?ep 1S NSAP-bite-NFUT bow 'I bit the bow.'
- (7a) $\tilde{i}n$ na-oki-j s**o**jja 1S NSAP-kill-FUT wild.pig 'I'll kill the wild pig.'
- (7b) *i*n na-mk*i*wak*i*wa-t s**o**jja 1S NSAP-scrub-NFUT wild.pig 'I scrubbed the wild pig.'

It should be stressed that the vowels examined for this study (highlighted in the examples) were excised from polysyllabic words. Focusing on vowels from polysyllabic words allows us to test for semantically-oriented vowel reduction in a new phonological context, since previous studies have focused on monosyllabic words. This methodological difference may have influenced the results of this study in a specific non-significant manner discussed briefly in section 3.

Another way in which the methods used for this study differ from those in the literature is that the disparity in semantic predictability between the relevant

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words in the (a) and (b) clauses is not as extreme as that evident in stimuli material in previous studies, e.g. (1a)–(2b). The goal here was to test whether semantic predictability affects vowel production even when the relevant vowels are excised from words that do not differ in radical ways according to this variable. Given that semantic predictability is necessarily a scalar variable, it seemed natural to test vowels excised from words that were found in contexts that were characterized as more or less predictable semantically, but were located at non-extreme points on the semantic predictability continuum.

3 Results

The FFT-based wide-band spectrograms for all of the words with the highlighted vowels in (3a)–(7b) were examined, for each of the tokens produced by the eight female adults. Three of these speakers were recorded outdoors, and as the data were being examined it became clear that the recordings for these three speakers would have to be discarded for the purposes of the present study. Unfortunately, the background noise levels were not controlled for properly in the outdoor setting, and it was quickly observed that the formant readings for the recordings in question were not sufficiently reliable to be included in the analysis. Nevertheless, as we will see momentarily, the five higher-quality indoor recording sessions resulted in a robust series of findings. Since each speaker was asked to produce all clauses three times, there were a total of 150 quality tokens on which to base the analysis (5 speakers x 10 clauses x 3 tokens-per-clause).

The focus of the data analysis was on two factors, as in the previous studies on vowel reduction: duration of the tested vowels, and placement in the F1-F2 plane. In the case of vowel position, vowels were tested for F1 and F2 values in Hz. The vowels were not normalized. For a more detailed analysis of normalized vowel spaces in the language, I refer the reader to Everett (2008b). The absence of normalization was not considered problematic in this case since eight females of similar size participated in the study.

Duration values for all of the tokens of the vowels highlighted in (3a)–(7b) were established by visually inspecting the FFT-based spectrograms, while also listening to the audio files on which they were based. The individual token durations gathered via this straightforward procedure were entered into a database and categorized according to three factors: semantic predictability, speaker, and vowel type. Analysis of all the tokens according to the first factor suggested that there was a significant disparity between vowels in semantically predictable contexts and those in less predictable contexts. Consistent with expectations, vowels in higher predictability contexts were shorter (mean duration=112 ms) than in low predictability contexts (127 ms). This disparity is represented graphically in (8). Note that the disparity is significant at the p<0.0001 level, according to a paired two-tailed t-test. The reduced duration of vowels in contexts of higher semantic predictability was observed across all speakers. While there were inter-speaker differences in mean vowel durations, for all speakers vowels in contexts of greater

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predictability were temporally reduced when contrasted to those in less predictable environments. T-tests conducted for each speaker yielded significant or near significant disparities according to this variable in all cases, as we see in (9).



(8) Mean vowel durations according to context.

□ High Predictability ■ Low predictability

(9) Mean vowel durations according to context and speaker.



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(10) Mean vowel durations according to context and vowel type.

Much as we can be confident that the inter-context duration disparities were not due to inter-speaker variation, we can also be confident that they were not conflated by variation across vowel types. In (10) we see that, for each of the five vowel types, vowel tokens in more predictable words tended to be shorter than those in less predictable words. This difference approached significance (at the p<0.05 level) in the case of three vowels.

In general, then, the duration data suggest quite unequivocally that vowels in words that are more predictable semantically tend to be shorter. Interestingly, this difference is not easily perceptible in the audio stream, at least for a non-native speaker such as myself. The mean magnitude of the difference (15 ms) is generally in line with the range of differences evident in Clopper and Pierrehumbert (2008:1684). It should be noted that the vowels analyzed in this study tended to be shorter than the English vowels considered by those authors. This difference is likely the result of methodological factors however, since in the study of English vowels the relevant tokens were extracted from monosyllabic words and were stressed. In this study the vowels were generally unstressed and all occurred in polysyllabic words. The only stressed vowel analyzed here was /e/, which, as can be seen in (10), was longer than the four remaining vowels. This is not surprising given that vowel length is a correlate of word-level stress in K (cf. Everett 2008b).

With respect to vowel formant structure, the prediction made prior to vowel analysis was that vowels in semantically-predictable contexts would be reduced spectrally, i.e. occur in a more centralized portion of the vowel space. Recall that Everett (2008b) demonstrated that unstressed vowels in K are produced in a more centralized portion of the vowel space. More specifically, in that study it was observed that such vowels occur in less precisely-demarcated regions of the vowel space, when contrasted to their stressed counterparts. Based on the more specific findings on phonetic undershoot in that study (which cannot be fully delineated

here for the sake of space), we can make three more fine-grained predictions. Reduced /a/ vowels in that study were found to be higher in the vowel space, i.e. characterized by lower F1 values. We might expect then that /a/ vowels in more predictable words would also be characterized by relatively low F1 values. Reduced /e/ vowels in that study were found to be more retracted in the vowel space, i.e. characterized by lower F2 values. We might also expect then that /e/ vowels in more predictable words would have lower F2 values. Finally, reduced /o/ vowels in Everett (2008b) were found to often occur further forward in the vowel space (likely due to decreased labialization), i.e. characterized by *higher* F2. We might naturally expect that /o/ vowels in more predictable words would have higher F2 values, then. The natural question is whether these three predictions are met by the data collected here. The pattern of reduction for /i/ and /i/ vowels was less obvious in Everett (2008b), and so no clear prediction vis-à-vis the placement of these vowels can be made.

Let us begin by considering the F1 values of all the five vowel types, across both contexts. The relevant data are depicted graphically in (11). As we see in the figure, there is in fact a difference between the mean F1 values of /a/ vowels in the two contexts. While not significant, the difference trends in the predicted direction. In other words, vowels in more predictable contexts tended to have lower F1 values, i.e. were located higher in the vowel space. Interestingly, a similar unpredicted difference surfaced for the /e/ and /o/ vowels, significant in the case of the former vowel. For both vowel types, vowels in more predictable contexts had generally lower F1 values.

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(11) F1 levels according to context and vowel type.

(12) F2 levels according to context and vowel type.



With respect to F2, the two major predictions made for vowels in more predictable contexts were that /e/ vowels would have lower F2 values and /o/ vowels would have higher F2 values in such contexts. As we see in (12), both of these predictions are clearly met by the data. In the case of the /e/ vowel tokens, those in more predictable contexts had significantly reduced F2 values, according to a two-tailed paired t-test. Conversely, in the case of /o/ vowel tokens, those in more predictable contexts had generally *greater* F2 values, though this difference only approached significance.

In general, the /a/, /e/, and /o/ vowels conformed to our expectations. In short, for all three vowels, those tokens in more predictable contexts were typically located in more centralized portions of the vowel space. This is particularly evident in (13), in which the vowels are plotted according to mean F1 and F2 values for

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all five speakers, according to context. Note that the /i/ and /i/ vowels do not exhibit any clear disparities in position across contexts. Significantly, no clear predictions were made regarding the position of these vowels in more predictable contexts. It should be stressed that the data in (11)–(13) do not demonstrate that these two vowel types are not reduced at all in more predictable contexts. They simply suggest that, based on the limited data considered here, there is no clear spectral reduction of these vowels in such contexts. Temporal reduction of these vowels in such contexts was already demonstrated, after all.

(13) Mean vowel locations according to semantic context.



□ Predictable ■ Unpredictable

4. Discussion and conclusion

The results of this study suggest quite strongly that vowels in K are more likely to be reduced when they occur in words that are relatively predictable based on the semantic context established by the clause they occur in. As was noted above, semantic predictability is a scalar variable and the clause pairs utilized in this study could easily have differed more according to this variable. The lack of an enormous disparity in semantic predictability may have influenced the results, that is, the extent of vowel reduction associated with semantic predictability may actually be less for these data than other possible data sets. From one perspective this may be taken as a strength of this study, since it demonstrates the correlation of vowel reduction and semantic predictability even when the degree of semantic predictability in question is relatively modest.

In a similar (somewhat speculative) vein, the results of this study may have been more robust had the vowels analyzed been excised from monosyllabic words and had they been stressed vowels in all cases. Recall from (10) that the only vowel type that was stressed in the clauses produced, /e/, exhibited the greatest

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overall duration and a more readily apparent disparity between mean durations across contexts, when contrasted with the other vowel types.

In sum, the data presented suggest a significant disparity between the mean duration of vowels in less predictable words and more predictable words. For each speaker and for each vowel type, vowels in the latter category of words were typically temporally reduced. With respect to position within the vowel space, vowels in more predictable contexts tended to occur in a slightly more centralized portion of the vowel space. This spectral reduction was minor in most cases, and was restricted to the /e/, /a/, and /o/ vowels. Nevertheless, the vowels in more predictable contexts patterned in accordance with predictions for reduced vowels based on previous findings on vowel reduction in the language.

While I have suggested throughout that the data are consistent with the phenomenon of vowel reduction, it is of course possible to construe them as representing a case of vowel *expansion*. In other words, the data are also consistent with the claim that vowels in K are expanded temporally and spectrally in less predictable contexts. From this perspective, speakers may be more likely to hyperarticulate vowels in semantically unpredictable contexts. Such hyperarticulation would be plausibly motivated by the desire for speakers to heighten intelligibility, as in the case of vowel expansion in less frequent words and words with greater lexical density (Munson and Solomon 2004).

Whatever perspective on the data one takes, what seems clear is that semantic contexts affect vowel production in K. Tangentially, one might note that such semantic effects present difficulties for various phonological models in which phonetic production is seen as modular – influenced primarily by factors such as phonological context but not directly influenced by factors such as semantic context. The phenomenon described here is potentially more amenable to treatment with an exemplar-based approach to phonology (e.g. Bybee 2001), under which phonetic production is affected by a host of context-specific factors.

In conclusion, vowels in K are reduced in words produced in contexts of greater semantic predictability. To my knowledge, this study represents the first case in which the phenomenon in question has been demonstrated for a language besides English. Semantically-oriented vowel reduction is apparently crosslinguistic in nature, surfacing in dialects of English much as it does in the speech of the members of an Amazonian tribe.

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Caleb Everett University of Miami Department of Anthropology PO Box 248106 Coral Gables, Florida 33124-2005

caleb@miami.edu

Universals in the Visual-Kinesthetic Modality: Politeness Marking Features in Japanese Sign Language (JSL)¹

JOHNNY GEORGE The University of Tokyo

Introduction

This work describes results of an experiment that teases out politeness marking features in JSL. The study uncovers a number of prosodic features relevant to marking politeness in JSL, and additionally, demonstrates that non-signers and signers share a visual-kinesthetic medium of communication that enables non-signers to occasionally interpret signs derived from assimilated gestures recognized either culturally in Japan or universally by users of different languages.

The study is based on the Hill et al. (1986) study comparing the use of polite request expressions in American English and Japanese. Consultants watched videos of twenty different expressions in which a native JSL signer makes a request for a pen and then consultants rated the degree of carefulness of each request phrase. The resulting ratings were normalized and averaged to produce a ranking of the expressions by politeness level in order to identify JSL features marking politeness.

The findings show that a number of prosodic features mark politeness in JSL including facial expression, size of signing space, head position and rate of signing. Non-signers shared similar intuitions as signers about the politeness levels of more than half the expressions. The study will refer to a view of encoded visual-kinesthetic tokens from two perspectives, culturally specific and crosslinguistic. The first designates a shared cultural code available to both Deaf and hearing people such as emblems and culturally specific coverbal gesture

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(McNeill 1992). The second refers to crosslinguistically recognizable communication cues such as facial expression (Ohala 1994). Cues related to the shared visual-kinesthetic medium used by Japanese signers and non-signers facilitated the non-signers' ability to rate politeness levels in a way consistent with the intuitions of JSL signers.

This research shows that prosody occupies a key role in marking politeness, and any investigation of politeness is incomplete without a thorough investigation of prosodic as well as lexical features. JSL relies on a number of non-manual signal features, similar to prosodic features in spoken language, to express a broad range of politeness registers. My work also shows that signers and non-signers have closely shared communicative practices evolving from their shared social context. While it has been understood that signers have access to non-signer communicative practice from the oral-aural modality, the examination of nonsigners' ability to access information from the sign modality due to shared visualkinesthetic communicative practice has not received as much consideration.

1 Prosody

In the modalities of sign and speaking prosody refers to a number of suprasegmental features that contribute to the meaning of a given expression. Prosody in speech designates qualities such as loudness, rhythm, speed, voice quality, stress and intonation while sign prosody includes size of signing space, rhythm, speed, holds, tenseness or laxness of movement, and non-manual signals (NMS) such as facial expression and head and mouth movement (Sandler 2006). Prosodic correlates between signing and speaking discussed in the literature include: size of signing space to loudness of the voice (Uyechi 1996, Zimmer 1989), and head movement and facial expression, referred to as "superarticulation," to intonation (Sandler 2006).

While prosodic features such as stress, pitch accent and tone in speech and NMS can create lexical distinctions all of the prosodic features mentioned above have uses that do not involve lexical contrast. The communicative aspect of prosody has relevance to marking register. This paper focuses on prosody defined as the manipulation of the communication signal for communicative purposes rather than marking lexical distinctions.

2 Studies on Sign Language Register and Politeness

A number of studies discuss register variation in sign, especially contrasting the public arena with private contexts. Feature contrasts between formal and informal signing should be reflected in the same way for polite as opposed to less polite signing, since social distance makes up a component of politeness and register. Certain prosodic contrasts in signing speed, articulation, and size of signing space

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potentially represent crosslinguistic contrasts across sign languages.

2.1 Register in Sign Language

Cokely and Baker-Shenk (1980) posits the use of formal signing in public contexts, especially lectures and business environments, while they assume informal signing occurs in contexts where the social distance is small, such as for family members or friends at a party. The changes in signing style they predict relate to the clarity and level of articulation for the signing. Along with Liddell and Johnson (1989[1985]) they note that formal signing is more clearly articulated than informal signing while casual signing involves more deletions of the use of the non-dominant hand. Cokely and Baker-Shenk (1980) and Liddell and Johnson (1989[1985]) both note that in casual signing signs that might normally contact the forehead can contact at the cheek or in neutral space, so the signs become phonetically reduced in informal contexts. Liddell and Johnson (1989[1985]) also note more assimilation, with signs that otherwise have different handshapes becoming similar as the non-dominant hand assimilates to the shape of the dominant hand.

Studies by Zimmer (1989) and Ross and Berkowitz (2008) support the observation that in relatively more formal signing contexts signers more clearly articulate signs while using more assimilation in relatively more informal contexts. Zimmer (1989) compares video from a signer who uses ASL in three contrasting discourse contexts: a formal lecture in an academic setting, a television interview and an informal talk. Ross and Berkowitz (2008) compare videos of signers giving formal academic lectures with videos of signers giving presentations in relatively informal contexts. Both studies observe more technical vocabulary and fingerspelling in formal speech contexts with less use of colloquial vocabulary. The signs are produced more clearly and slowly in the formal contexts than in the informal contexts, supporting the need for less assimilation. They also both find a reduced use of expressive NMS in the formal contexts.

One contrast that Ross and Berkowitz expected to find that they did not in contrast to Zimmer was the use of a larger signing space. Ross and Berkowitz posited that the use of a larger signing space would add to the clarity of a sign, therefore increased signing space size would be one of the qualities of formal sign.

2.2 Facial NMS Politeness Markers in ASL

Hoza (2007) in an extensive study on politeness in ASL challenges the folk notion that ASL signers use more direct language than English speakers by identifying Brown and Levinson (1987) style discourse strategies in requests and refusals in

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ASL via a discourse completion test (DCT). He experimentally finds a number of NMS expressive contrasts used to mark politeness in ASL that originally were described in a study by Roush (2007 [1999]). Roush identifies NMS that mitigate severe threats to face including *polite pucker* and *polite grimace*. Hoza adds two other markers, *tight lips* and *polite grimace frown*, to Roush's inventory. The following expressions mitigate small face threats to a severe face threats: polite pucker/tight lips, polite grimace and polite grimace frown.

The consultants from the JSL pen study utilized polite grimace and polite grimace frown. In the pen study, the degree of grimace impacted consultant ratings in an apparently gradient fashion indicating that such expressions intensify the meaning of a given request.

2.3 Head Position and Movement in JSL

For Japanese Sign Language (JSL) Ichida (2005b) categorizes various types of head movements and positions in JSL, especially in collocations with facial NMS.

2.3.1 Head Position

Ichida (2005a, 2005b) discusses the semantics of head or chin position in JSL. Ichida notes that chin position is instrumental in marking the relative status of the interlocutors. The location of the chin influences the overall head position and signals and important prosodic cue. The chin position labels in the data set description in the feature chart come from Ichida (2005c). The *forward chin* (F) position consists of a lowering and extension of the chin away from the body. Extending the chin to a forward position slightly lowers the head. Ichida labels the forward chin in JSL as marking a closer connection to the interlocutor and associated with propositional content. The *back chin* position is in the opposite direction with the chin being drawn back towards the chest. The back chin can also mark propositional content, but it additionally marks the creation of distance between the signer and interlocutor indicating reserve. Ichida posits that the back chin position would occur in relatively more polite expression contexts. In all cases Ichida refers to the semantics of the positions as general tendencies subject to shift with combination with other NMS and the given language context.

2.3.2 Head Movement in JSL

Ichida (2005b) categorizes various types of head movements in JSL. He focuses on the relation of head movement to semantics, question formation, phrase marking and backchannelling. The two head movements associated with politeness markers from the two studies are the *head nod* and the *head hold*. The head nod tends to indicate assent, agreement or confirmation. In the head hold the head is held in place for a slight duration along with a delay of the release of its

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co-occurring sign. The head hold appears with yes/no questions in JSL and in the studies it frequently appears at the end of a request along with a chin forward position. Ichida posits that the association between head holds and yes/no questions softens a given request signaling to the interlocutor that it may be refused (personal communication). The head hold tends to occur with expressions rated as more polite by pen study consultants.

3 The Pen Request Study

The primary aim of the pen study is to provide a description of features that mark politeness in JSL. The second aim is to consider to what extent signers and nonsigners share the same politeness system. Based on the work from the previously discussed literature on sign language politeness and register marking, the working hypothesis is that JSL relies heavily on prosody for politeness marking. Nonmanual signal (NMS) features such as facial expression, size of signing space, head position and rate of signing will mark politeness register contrasts.

Signers and non-signers share a cultural code in the visual-kinesthetic modality, and sign languages contain signs derived from this shared code; some subset of these signs can maintain enough transparency such that non-signers can intuit their meanings. The signers and non-signers share similar judgments for a number of the pen phrase tokens, so this investigation includes determining what specific features serve as meaningful cues to non-signers and to what extent such cues come from the shared visual-kinesthetic communicative space. In turn, we can have a much clearer understanding of what cues independently belong to the repertoire of sign language users.

3.1 Procedure

The pen study is based on the Hill et al. (1986) study comparing the use of polite request expressions in American English and Japanese. The pen study generates results based on the metrics of social distance and relative power levels of the interlocutors while controlling for the level of imposition. Each consultant watched 20 short videos in which a native signer² makes a request for a pen in various ways. The consultants judged the degree of carefulness of each pen request expression.

I discussed the experiment with a Deaf native signer and gave him a list of the Hill et al Japanese and English pen request expressions and scenarios. The signer referred to the list of scenarios and the various Japanese and English expressions in order to generate different expressions for requesting a pen. The signer did not produce one to one interpretations but referred to the given English and Japanese

²I will use the term "native signer" to refer to signers who began their acquisition of sign language from birth onwards.

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material to get an idea of the range of expressions and possible contexts for creation of the tokens for the study. I then videoed the signer and used the material to create a database driven survey using all 20 tokens produced by the signer³. All phrases produced by the signer were transcribed and annotated in Elan. Consultants watched the pen request clips and could view them as many times as desired. For each request, the consultant would rate the expression from one to five, with a rating of one meaning that the expression could be used when a person is the "least inhibited" in their expression, and the rating of five used when a person is "most careful" in their expression. The consultants could also choose "NA" for expressions that they judged as unusable; expressions assigned "NA" received a rating score of zero. Each set of consultant ratings were converted into z-scores so that the rankings represent the relative weight given to each token by the study consultants; so for instance, if there were an extreme case in which a consultant ranked all expressions five, then all such tokens would receive z-score ratings of zero since impressionistically no expression was more or less different in register than others for that given consultant. The use of z-scores allows for better comparison among all respondents and between signer and non-signer respondents.

3.2 The Subjects

20 JSL signers and 15 non-sign language users completed the survey. All signers identified as Deaf with five of those signers being native signers with Deaf parents. The tables below summarize the consultant profile data.

All Consultants	n	sex age							occupation		
	n	f	m	19	20s	30s	40s	50s	job	student	
Signers (Ro)	20	12	8	0	2	8	8	2	18	2	
Non-signers (Cho)	15	12	3	2	11	2	0	0	0	15	

(1.1) Consultant Profile Summary

(1.2) Deaf Consultant Profile Summa

		sez	X	age				JSL e	JSL acquisition start						
Signers	n	f	m	20s	30s	40s	50s	10+	20+	0	1	5	el	hs	20s
Native	5	3	2	0	2	2	1	5	5	5	-	-	-		-
Fluent	15	9	6	2	6	6	1	15	10	0	2	5	3	4	1

Both signer and non-signer groups represent convenience samples with the

³ The tokens were not randomized. While there was no obvious patterning in the data due to nonrandomization, presentation order is a lurking variable. Phrase references match the presentation order, e.g. "phrase 3" refers to the third token presented.
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signers accessed through acquaintances of the researcher and the non-signers primarily consisting of technical college students. Most of the signers are office workers living in Tokyo in their 30s and 40s, while the non-signers consist primarily of female students in their 20s. As a result of the population bias, age and gender are lurking variables in the data comparison between the signers and non-signers.

The signers have varied JSL acquisition experiences. Most have used JSL as their primary means of communication for over twenty years, and over half of the non-native signers started using JSL by the time they entered elementary school.

3.3 Description of the Consultant Response Data Set

The signing and non-signing consultant groups contrasted in about a third of their pen phrase ratings and rated about half of the pen phrase tokens similarly. The chart (2) below summarizes the standardized rating averages and standard deviations for the phrases for each group.

Ph#	p diff	Non-signer Avg	SD	Avg z	SD	Signer Avg	SD	Avg z	SD
1	.0507	3.00	1.13	0.45	0.88	4.05	0.89	1.01	0.66
2	.2105	1.93	0.80	-0.37	0.63	2.45	0.83	-0.11	0.56
3	.0657	1.07	0.26	-0.97	0.15	1.65	0.88	-0.72	0.55
4	.9727	3.20	0.94	0.61	0.69	3.55	0.76	0.62	0.45
5	.6694	1.20	0.56	-0.84	0.43	1.35	0.75	-0.77	0.62
6	.4479	1.60	0.91	-0.57	0.59	1.50	0.61	-0.71	0.40
7	.0124	3.87	0.99	1.11	0.63	3.30	1.34	0.49	0.75
8	.3140	3.47	0.99	0.80	0.57	3.45	1.23	0.59	0.65
9	.0068	2.87	0.83	0.35	0.48	3.90	0.97	0.85	0.54
10	.5776	1.20	0.68	-0.86	0.43	1.25	0.44	-0.94	0.34
11	.0029	2.40	0.74	0.05	0.48	3.45	1.19	0.66	0.64
12	.1659	3.53	0.99	0.87	0.69	4.35	0.81	1.16	0.46
13	.1179	1.27	0.70	-0.81	0.43	1.10	0.31	-1.01	0.25
14	.6279	1.00	0.00	-1.03	0.19	1.05	0.39	-1.07	0.26
15	.4096	4.40	0.74	1.56	0.56	4.60	0.60	1.42	0.43
16	.0592	3.07	1.03	0.54	0.65	2.90	0.85	0.13	0.59
17	.0382	2.33	0.90	-0.01	0.58	1.90	1.07	-0.46	0.66
18	.1184	3.73	0.70	1.06	0.50	3.85	0.88	0.79	0.49
19	.4808	1.13	0.52	-0.92	0.31	1.30	0.73	-0.83	0.43
20	.4052	1.00	0.00	-1.03	0.19	1.00	0.32	-1.09	0.27

(2) Phrase Ratings Summary

Averages and standard deviations for the raw ratings and standardized ratings

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both appear.⁴ The more a standardized average (Avg Z) is above zero, the more the consultants feel that the given phrase is a "more careful" or polite expression than the average expression. The more a standardized average is below zero, the more consultants feel that the given phrase is "less inhibited" or lower in politeness than the average expression. The "p-diff" column contains two-tailed ttest p-scores that measure the difference between the signer and non-signer standardized rating averages. For example, phrase one has a p-diff of .0507, so the ratings given by the non-signers and the signers represent statistically significantly different sets of responses. Comparing signers and non-signers, seven of the twenty ratings averages have a p<.10 indicating that for about a little over a third of the phrase rating averages the differences between signer and nonsigner responses are significant. Nine of the averages have large p-scores of p>.30, showing great overlap between the response sets of both the signers and non-signers. Phrase rankings indexed with feature descriptions were then arranged by rank from highest to lowest standardized averages for the signer and nonsigner groups to produce the feature chart (3) below.

(3) The Feature Chart

	NON-SIGN ERS										SIG	NERS	5					
E	Κ	0	#N	N#	Т	S	H	Phrase #	Rnk	Phrase #	H	S	Т	N#	#N	0	Κ	E
E		0	#N	N#	55	С	F	15 _{(1.56) 05}	1	15 (1.42) <u>.05</u>	F	С	55	N#	#N	0		Е
	K	0	#N	N#	38	с	F	7 (1.11) <u>.38</u>	2	12 (1.16) 23	F	С	64	N#	#N	0	Κ	
E		0	#N	N#	52	С	F	18 (1.06).25	3	1 (1.01) .24	F	С	63	N#		0	K	Е
	Κ	0	#N	N#	64	С	F	12 (0.87).36	4	9 (0.85) .37	F	С	40	N#		0	Κ	
		0	#N	N#	48	С	F	8 (0.80).21	5	18 (0.79) .19	F	С	52	N#	#N	0		Е
	Κ	0	#N	N#	43	с	F	4 (0.61).41	6	11 (0.66).43	F	с	50	N#			K	
		0	#N	N#	43	С	F	16 (0.54).38	7	4 (0.62) .43	F	с	43	N#	#N	0	К	
E	K	0		N#	63	С	F	1 (0.45) <u>.37</u>	8	8 (0.59) 32	F	С	48	N#	#N	0		
	К	0		N#	40	С	F	9 (0.35) <u>.06</u>	9	7 (0.49) <u>.07</u>	F	с	38	N#	#N	0	К	
	Κ			N#	50	с	F	11 (0.05).37	10	16 (0.13).09	F	С	43	N#	#N	0		
E		0		N#	40	Р	F	17 (-0.01).08	11	2 (-0.11) .04	F	с	30			0	K	Ε
E	К	0		•	30	с	F	2 (-0.37) .21	12	17 (-0.46).09	F	P	40	N#		0		Ε
		0			30	Р		6 (-0.57) <u>.08</u>	13	6 (-0.71) <u>.47</u>	I	Р	30			0		
					38	Р	U	13 (-0.81).39	14	3 (+0.72) .41		Р	23			0		Е
					26	Р		5 (-0.84) .43	15	5 (+0.77) .32		Р	26					
N=	N=head nod (hn)/hold (hh) N#=N co-occurs w/ final sign in utterance #N=N co-occurs w/ 1 st sign																	
0=	oneg	ai O	please	0		K	=kan	naimasen OD	oyou m	indE O		I	E=Fao	cial N	MS			
H=	⊧heaα siσn	i pos snace	: F=c • C=	hin to center	rware red	1 U∺ P=	=chir =neri	ıup =0 nheralT=w	paO+1 ord_rate	in 100ths of	sign		15 (1.5	56) <u>.05</u> =-	Phrase	# (A1	/G) <u>p-s</u>	6000

⁴ The standardized averages (Avg z) are based on z-scores: A consultant z-score=(Individual rating–Avg of consultant ratings)/sd of consultant ratings. The standardized scores tend to lower the sd among consultants' ratings as differences in subjective weights are minimized.

3.4 The Feature Chart

The feature chart (3) lists 15 of the phrases in ranked order indexed with sign features from the Pen Study.⁵ Each row represents a single pen request phrase labeled by features. The features selected were chosen on the basis of relevance to marking politeness as described in the literature. The table shows the features of the phrases ordered by average rankings for the non-signers on the left and the signers on the right. The average standardized rank score appears in parentheses to the right of each phrase number. In underlined subscript label pairs of rankings with p-scores from one-tailed matched pairs t-tests that allow comparison between the differences in averages of consecutive rankings. For example, the non-signers' 11th ranked phrase 17 has a p-score of <u>.08</u>. The p-score indicates that for the t-test with the alternative hypothesis, "the average rank of phrase 17 is greater than the average rank of phrase 2" that p<.10, therefore the difference in averages is statistically significant. Three specific examples follow that explain the chart in more detail.

3.5 Three Pen Request Phrases

The schematization of the politeness features of phrase 12 below represents a pen request that both signers and non-signers ranked high in terms of polite register.



(4) Phrase 12 with features [F C 64 N# #N O K]

The sign for 'please' (O) co-occurs with a head nod (#N), and the phrase final sign 'do you mind' (K) co-occurs with a head hold (N#).⁶ These features appear in four columns representing phrase 12 in the feature chart (3)—the columns (O),

⁵ The top 15 of the 20 phrases are represented since these expressions cover most of the feature contrasts.

 $^{^{6}}$ (N) marks both head nods and head holds as described by Ichida (2005b). The sign "please" (O) typically occurs with a head nod and the sign "do you mind" (K) typically collocates with a head hold. The two types of head movement tend to class together, so to simplify this paper I will not distinguish the two in the final analysis.

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(K), (N#), and (#N). (F) indicates that the signer has his head in a chin forward position (Ichida 2005c), and (C) means that he centers his signing within the boundary formed by his chest rather than pushing signs out to the periphery of the signing space. The number (T=64) represents the signing rate (T) measured as the amount of time to initiate and form a manual sign in hundredths of a second. In this expression, the signer averages about one and a half signs a second, a relatively slow rate.

The second example shows stills from phrase 5, an expression rated low in terms of polite register by both non-signers and signers.



(5) Phrase 5 with features [P 26]

Phrase 5 has far less feature marking than phrase 12 above. The signer maintains a neutral chin position and does not use any lexical polite forms such as 'please' (O) or 'do you mind' (K). The utilized signing space is wider as his arm fully extends into the space in front of him and beyond shoulders' width. He signs about four signs a second (T=26), a much faster rate than in the previous expression. The final sign BORROW gets repeated a number of times.

Phrase 1 receives contrastive rating averages with the signers rating the phrase high and non-signers rating it low.

(6) Phrase 1 with features [F C 63 N# O K E]



Phrase 1 contains many of the same politeness markers as phrase 12. The signer puts his head in a forward position (F) and keeps the signing centralized (C). The rate of signing is the same as in phrase 12 at about one and a half words

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a second (T=63). This phrase includes the lexical signs 'please' (O) and 'do you mind' and both co-occur with a head hold. The final word 'please' (O) involves a lower positioning of the head and occurs with a head hold representing a phrase ending final nod (N#). The signer's face also evidences a polite grimace (E)⁷.

3.6 Observations about the Request Phrase Data

The phrases above show that signers and non-signers rate expressions with particular prosodic characteristics as more polite. Rate of signing, centralization of signs in the signing space, head position and use of the polite lexical items all seem to potentially affect how polite an expression is perceived. In the examples above a number of the features marking politeness seem to conform with observations in the literature while others don't.

3.6.1 Shared Judgments between Signers and Non-Signers

A slower rate of signing that results in less assimilation (Cokely and Baker-Shenk 1980, Liddell and Johnson 1989[1985], Ross and Berkowitz 2008, Zimmer 1989) appears to correlate with a greater degree of polite expression. Phrase 1 appears to contradict this claim for the non-signers but in a linear regression account the rate of signing against average sign ratings shows a statistically significant correlation with faster signed words correlating with lower ratings. Signers had an r^2 of 0.635 (p<.001), and non-signers 0.5557 (p<.001), accounting for about 56~64% of the variance. Since ASL and JSL signers rate faster signs as lower in register, the rate of signing may serve as a register marker salient crosslinguistically. Such a result couples with the fact that non-signers also respond to this same cue and share the same intuitions as signers in this study.

In contrast to the claim of Zimmer (1989) the use of a smaller signing space occurred more commonly in the more highly ranked signs for both signers and non-signers in the study, as can be seen on the feature chart (3). The work of Uyechi (1996) offers some insight to the contradiction of the findings of Zimmer. Uyechi notes that the nature of discourse determines the appropriate signing size space to use, keeping the signs otherwise proportionately the same—in the case of a protest for instance, producing enormous signs visible from the largest distance possible is *apropos*. The size of signing space represents a visibility or "loudness" contrast, so it is likely that in the Zimmer cases, the signer had to present to an audience in a larger presentation space for the formal context, an academic lecture as opposed to the more confined spaces of the less formal contexts, a television set and a small informal talk setting. If we examine signing space size in light of Uyechi's observation, just as one may possibly assume that reducing the voice

⁷ E in the chart represents any marked facial expression, not just the polite grimace. Phrase 15 has a polite grimace frown and phrase 18 has a polite grimace.

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can make speech more polite, utilizing a smaller signing space can create relatively more polite sign. Examples from other languages are needed to see how the use of signing space works crosslinguistically.

Although not discussed in the three example phrases above, the top ranked phrase for both signers and non-signers consisted of the polite grimace frown (Roush 2007[1999], Hoza 2007). The average ranking of the first phrase rated significantly higher than the second ranked phrase for both groups, and the polite grimace frown feature stands out as the contrastive feature relative to other phrases. This feature appears in only one token, so more evidence could lend support to the crosslinguistic salience of the polite grimace frown.

The crosslinguistic salience of particular facial NMS may be attributed to the 'frequency code.' Ohala (1994) uses data from phonetic studies coupled with ethological principles to discuss how a lower fundamental frequency (F_0) or pitch vocalization signals a larger sized body in contrast to a higher F₀ vocalization which indicates a small body. Ohala explains that across species, animals vocalize using a lower F_0 when threatening and use higher F_0 vocalizations when submissive since the use of such vocalizations is grounded in the sound to size association. Ohala dubs the sound to size association the 'frequency code.' Ohala suggests that the 'frequency code' may account for the smile as a non-threatening facial display in contrast to what he calls the "o-face" used with threat signals. The smile has an association with a higher F_0 in contrast to the "o-face" that appears to correlate with a lower F_0 . These traits inherited by humans eventually became ritualized and remain salient communicative markers across languages. As in the relation between pitch or facial expression and body size, some crosslinguistically recognized facial NMS might also derive from the 'frequency code' effect.

The forward head position (F) appears to serve as a politeness marker for both signers and non-signers as phrases with this feature rate at the top of scale of politeness ranking. Ichida (2005c) does not account for this type of politeness marking. Since the head forward position also involves lowering of the head, there may be some association with humility for this position. Further evidence is needed to elucidate the function of this feature.

3.6.2 Judgment Contrasts between Signers and Non-Signers

One way in which the judgments of the signers and non-signers pattern differently is in the response to the appearance of signs accompanied by head nods at the beginnings and ends of phrases. For the non-signers, any phrase beginning with a nod (#N), all paired with the sign for *please* (O), outscore any phrase that does not. The same is not true for signers who appear to consider the content of the entire expression—as seen by the fact that many of the top ranked expressions of the signers do not contain an initial *please* with a nod. Phrase 1 illustrates the

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difference in judgment between signers and non-signers for such a phrase. The two major distinctions between phrase 1 and phrase 12 is the phrase initial (O) with a nod and the polite grimace.

The reason that non-signers find the sign *please* with a nod particularly salient is that these features resemble emblems or conventionalized communicative gestures (McNeill 2005) in Japanese society. The sign for *please* resembles the hand-prow emblem which consists of raising a flat hand at the head level with the fingers pointed up and the plane of the palm perpendicular to the plane of the chest. The person making the emblem moves his or her hand back-and-forth while moving through a crowded space. This gesture signals that the user of the emblem will pass through, and bystanders can then provide more space for the person's passage. Like a language expression, users learn the emblem through normal, everyday life experience. Deaf and hearing people who have sight have equal access to emblematic forms, so both groups have an equally shared cultural communication system vis-à-vis emblems. In addition the nod resembles another Japanese emblem, the bow. Bowing as a greeting represents a well-known emblem in Japan—its use is widespread and completely conventionalized in all regions of Japan.

Non-signers have to pick cues to distinguish between the politeness levels of the expressions, and the culturally shared emblems provide a means for them to make politeness evaluations. The non-signers may be biased in their judgment of signs that resemble cultural emblems.

In contrast, the JSL sign 'do you mind' (K) appears to serve as a more salient marker for politeness for the signers as the phrases with that feature tend to cluster near the top.

4 Conclusion

Consultants identified the phrases consisting of prosodic markers of politeness as relatively more polite and demonstrate that JSL relies heavily on prosody for politeness marking. Non-manual signal (NMS) features such as facial expression, size of signing space, head position and rate of signing signal politeness register contrasts.

Signers and non-signers have closely shared communicative practices evolving from their shared social context. So non-signers' have the capacity to access information from the sign modality due to shared visual-kinesthetic communicative practice. Shared social context means that a relationship exists between the sign language of signers and their contact spoken language(s). It is not a question of whether signers are use spoken language cues, rather, it is a result of languages emerging from the same social spaces.

Non-signers can decode parts of the sign signal sometimes; however, not necessarily with the same understanding as signers. Social communicative

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practice overlaps but takes on different garbs for each group.

There appear to be some cross-sign intelligibility for particular types of prosodic features. The study found that JSL had some similar register marking features as ASL including the polite grimace frown and rate of signing. More comparative work across sign languages will undoubtedly uncover a number of crosslinguistically salient communicative cues.

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Johnny George The University of Tokyo Department of English Language College of Arts and Sciences Komaba 3-8-1, Meguro-ku Tokyo 153-8902

jeg.727@gmail.com

Equative and Predicational Copulas in Thai

NANCY HEDBERG^a, DAVID POTTER^b Simon Fraser University^a; Northwestern University^b

Introduction

In this paper we report on an experimental study of the copula system in Thai. We argue that the Thai copula system is crucial to the debate over whether specificational sentences should be given an inverse predicational analysis or an equative analysis. We conclude that Thai data supports the equative approach. The paper is organized as follows. We first introduce the inverse and equative analyses, and provide a little background on Thai. We then discuss our sentence acceptability task survey, and introduce the idea that the test items in the survey may have been subject to type-shifting. After that, we describe some interviews we did with Thai speakers aimed at fixing the semantic types of the test items. Finally, we discuss the results of the interviews and conclude.

1 The Inverse vs. Equative Controversy

Higgins 1973 presented a classification of copular sentences in English into four types of interpretation, as shown in (1). The examples here are taken from Mikkelsen 2005.

- (1) a. Predicational: *Susan is a doctor*
 - b. Specificational: The winner is Susan
 - c. Identity: She is Susan
 - d. Identificational: That woman is Susan

The controversy has to do with which of Higgins' categories should be grouped together into different senses of the copula. The proper analysis of specificational sentences is at the heart of the controversy.

The Inverse Analysis has a number of recent adherents, including Williams 1983, and Partee 1986 for English, Moro 1997 for Italian, Frank 2002 for English,

Adger and Ramchand 2003 for Scots Gaelic, Mikkelsen 2005 for English and Danish, and den Dikken 2006 for English and Dutch.

This approach takes specificational and predicational sentences to derive from the same base, typically taken to be a small clause. Predicational sentences result from raising the subject of the small clause, an e type argument, to subject position of the sentence, as in (2). In contrast, specificational sentences result from raising the predicate of the small clause, an $\langle e,t \rangle$ type argument, as in (3). In this analysis then, reverse specificational sentences are just predicational sentences with subject focus, as in (4).

- (2) A: What qualities does Susan have?B: Susan is the winner of the student prize.
- (3) A: Who is the winner of the student prize?B: The winner of the student prize is Susan.
- (4) A: Who is the winner of the student prize?B: SUSAN is the winner of the student prize.

The trees in (5) and (6) show a sketch of how this analysis of predicational and inverse sentences works, based on the syntactic analyses of Frank 2002. FP here is a small clause headed by some functional category.

(5) Predicational Tree



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Predicational sentences result from raising the subject of the small clause; and specificational sentences, called 'inverse' sentences, result from raising the predicate of the small clause. Reverse specificational sentences like (4b) are treated as instances of predicational sentences, with a definite DP in predicate position of the small clause where the AP is in (5).

(6) Specificational tree on inverse approach



Thus, on the inverse approach, predicational, specificational and reverse specificational sentences receive identical semantic interpretations, and all result from the same syntactic base containing a vacuous copula that takes a small clause complement. Either the subject or the predicate of the small clause raises to the external subject position (specifier of TP).

A second copular analysis is the equative approach, taken by Zaring 1996 for Welsh, Heycock and Kroch 1999 for English, and Han and Hedberg 2008 for clefts in English. On this approach specificational and predicational sentences are derived from a distinct bases; both specificational and identity sentences are involve an equative copula. Han and Hedberg assume that the descriptive argument in specificational sentences is a generalized quantifier (Barwise and Cooper 1981), i.e. a definite description interpreted quantificationally, and that their semantic interpretation involves the equals sign. These sentences, then, receive the Russellian interpretation shown in (7), where the subject is of type <<e,t>,t> and the complement is an e type argument.

(7) $\exists x [winner(x) \land \forall y [winner(y) \rightarrow y=x] \land x = Susan]$

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A sketch of a syntactic analysis for the specificational sentence on the equative approach, based on Han and Hedberg 2008, is shown in (8).

(8) Specificational tree on equative approach



On the equative approach that we propose, reverse specificational sentences result from the generalized quantifier <<e,t>,t> type argument occupying the complement position while the e type argument occupies the subject position. Thus, specificational sentences are viewed as reversible, like many identity and identificational sentences. Identity sentences like that in (1c) and identificational sentences like that in (1d) make use of the same equative copula as specificational sentences ($\lambda y \lambda x [x=y]$) but both subject and complement are of type e.

Predicational sentences on the equative approach receive the same syntactic analysis as on the inverse approach, as illustrated in (5), and they are interpreted as containing an initial e type (or <<e,t>,t> type) argument and then an <e,t> argument.

Thus, under the equative analysis, predicational, specificational, and reverse specificational sentences involve a small clause, the FP, and, in contrast with the inverse analysis, it is always the subject of the small clause that raises. It is therefore the semantics of these sentences that distinguishes them: specificational semantics result from a non-vacuous, equative copula and a quantificationally-interpreted DP; while predicational semantics follow from a vacuous copula and a predicatively-interpreted AP or DP.

2 Background on Thai

We now provide some background on Thai. Kuno and Wongkhomthong 1981 discuss the interpretation of sentences with two different copulas in Thai, *bpen* and *kheuu*, 'be,' as illustrated in (9). They label sentences containing the copula *kheuu* as 'identificational' sentences.

(9)	a. yîpùn pen	pràthê	è:d	ùdsa:hàkam.		
	Japan is			ry	industry	
	'Japan is a	trial country.'				
	b. khon	thî:	chán	rág	*pen/khi:	cɔ:n
	person	that	Ι	love	is	John
	'The perso	on that I				

About (9b), they say "[9b] is a sentence that identifies the person that the speaker likes best with John. It cannot be interpreted as a sentence that presents as one of the characteristics of the person that the speaker likes best the fact that he is John. Hence, the sentence is exclusively identificational...." *Bpen*, on the other hand appears in 'characterizational' sentences like (9a).

Either copula can appear in (10). They say, "If the speaker's intention is to present one of John's characteristics, *pen* is used. On the other hand, if the speaker's intention is to equate John and the person he (= the speaker) likes best, then *khi*: is used."

(10) cɔ:n **pen/khi:** khon thî: chán rág John is person that I love 'John is the person that I love.'

Kuno and Wongkhomthong explicitly relate *bpen* to Higgins' predicational sentences and *kheuu* to his specificational and identificational sentences. We agree with this analysis, and hypothesize that, consistent with the equative analysis, *bpen* appears in predicational sentences and *kheuu* appears in specificational, identificational and identity sentences. Kuno and Wongkhomthong's discussion is descriptively very rich and convincing. We designed our study to confirm their analysis by presenting relevant data to large groups of participants, to examine some gaps in the data they discussed, and to bring the Thai data to bear more concretely on the current copula sentence controversy.

Specifically, we argue that Thai distinguishes the copula used in predicational and specificational sentences along the lines that the equative analysis predicts (e.g. the distinction between (9a) and (9b)). We also argue that reverse specificational sentences need to be distinguished from predicational sentences, along the lines of the difference between the two copulas exemplified in (10). Crucially,

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kheuu sentences with the two possible word orders receive the same interpretation, while *bpen* sentences with only one word order receive a different interpretation.

3 The Experimental Survey

We now introduce our experimental survey, which utilized a sentence acceptability judgment task. The stimuli presented both copulas, each in one of four sentence contexts, shown in (11). We included a specificational context, an identity context, and two predicational contexts. Thus, there were eight conditions all together.

In order to try to ensure a specificational instead of an identificational interpretation of the sentences, we used a description with no determiner but with a superlative modifier. In this way, we attempted to invoke a quantificational definite description reading associated with uniqueness (type <<e,t>,t>) instead of a demonstrative referential reading associated with familiarity (type e). Our stimuli here consisted of occupational nouns with superlative modifiers. We used adjectival free relatives with a classifier instead of simple adjectives because simple adjectival sentences in Thai don't contain either copula.

(11) a. **Specificational:** Definite Description + *bpen/kheuu* + Proper name

Nak a daaeng	khohn thee	chan	tai ruup	maak thee soot			
Actor	person that	Ι	photograph	superlative			
bpen/kheuu k	khoon	Angela	a				
is p	ooliteness-marker	Angela	a				
'The actor that I photograph most is Angela.'							

b. **Identity:** Pronoun + *bpen/kheuu* + Proper name

Khao	bpen/kheuu	khoon	Angela
He/she	is	politeness-marker	Angela
'She is An	gela.'		

c. **Predicational (1):** Definite Description + *bpen/kheuu* + Adjectival Free Relative

Nak sa daaen	ng	khohn thee	chan	tai ruup	maak thee soot			
Actor		personthat	Ι	photograph	superlative			
bpen/kheuu	khohn	suay						
is	person	pretty						
'The actor that I photograph most is a pretty person.'								

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d. Predicational (2): Pronoun + bpen/kheuu + Adjectival Free Relative
Khao bpen/kheuu khohn suay
He/she is person pretty
'She is a pretty person.'

Out of a total of 120 proper names, 120 descriptions and 120 adjectival modifiers, a pool of 960 stimulus sentences was created, 120 in each of the eight conditions. Eight test versions were created. Each test contained 120 test stimuli. Subject and object tokens were counterbalanced across test versions, and each of the eight conditions were presented 15 times in each test. Each test also contained 120 fillers: 60 grammatical sentences and 60 ungrammatical sentences. Fillers were independently rated grammatical or ungrammatical by three native speakers. Also, while the grammatical sentences were perfectly grammatical, the ungrammatical sentences ranged from 'word soup' to mildly ungrammatical.

The participants were 49 native Thai speakers, who were students recruited from Chukalongkorn and Suan Dusit Universities in Bangkok, Thailand. We report on the results of 40 participants since nine participants were excluded as their mean rating of the ungrammatical sentences was above 4.

The procedure was as follows. The task was a written acceptability judgment task, with acceptability characterized as how 'natural' or 'normal' each sentence sounds to the participant. There was a seven point rating scale, ranging from 1 'completely unacceptable' to 7 'completely acceptable'. Task materials and instructions were given in Thai. Participants were advised to judge based on their first impression and to not second-guess their judgments.

The experimental hypotheses were the following. (1) In specificational contexts, *kheuu* should be more acceptable than *bpen*. (2) In identity contexts, *kheuu* should be more acceptable than *bpen*. (3) In predicational contexts, *bpen* should be more acceptable than *kheuu*.

A summary of the results are presented in (12). For each condition, a one-way analysis of variance (ANOVA) was performed with copula as a repeated measure. In specificational contexts, *kheuu* did turn out more acceptable than *bpen*. This difference appears very close, but was statistically significant (*bpen* (4.40), *kheuu* (4.66), [F(1,39) = 4.565, p < .05]). In identity sentences, *kheuu* was again more acceptable than *bpen* and the difference was statistically significant (*bpen* (4.45), *kheuu* (5.97), [F(1,39) = 45.12, p < .001]). In the predicational (2) context (the one with a pronoun subject), *bpen* was more acceptable than *kheuu* and the difference was statistically significant (*bpen* (5.82), *kheuu* (5.14), [F(1,39) = 26.98, p < .001]). There was no significant difference between the copulas in the predicational (1) context.

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(12) Results of Experimental Survey

While our hypotheses were supported statistically, we were surprised at how close the results were, and we were puzzled at why sentences with the nonpreferred copula were judged acceptable to such a great degree. We have thought about two different types of explanation for the closeness of the results: problems with the acceptability of our particular stimuli, and also the possibility of type shifting in the interpretation of our sentences.

With regard to the first possibility, we note that the specificational and predicational (1) sentences were somewhat awkward in that they convey more than one proposition. We don't know how the participants judged the sentences, and the availability of a simpler and equivalently interpreted alternative discourse sequence may have reduced the rating of the test items. For example for the specificational sentence in (11a) it would be simpler to split the sentence into two: "Angela is an actor. 'I photograph her most". Likewise for the predicational sentence in (11c), it might be easier to understand if the sentence were split into two, i.e. "I photograph one actor most. She is a pretty person".

Note also that these two types of sentence were longer than the identity and predicational (2) sentences. Thus, the absolute ratings of these conditions are not comparable, and the length difference may have obscured the judgments of the participants.

The results may also have been influenced by a number of non-truthconditional factors. For example, more than one participant noted that *kheuu* is strongly preferred in formal writing, and that it signifies a greater confidence in the truth of the statement.

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Importantly however, we also decided that the sentences were possibly susceptible to type shifting of the arguments and that this might have affected the results. The differences were mostly less than 1 point on a 7-point scale. Could participants have been construing the sentences in different ways? After all, copular sentences are well known for supporting different construals, as discussed for example in Higgins 1973.

Perhaps the particular sentence elements can be shifted into different semantic types (Partee 1987). In particular, the adjectival free relatives consist of a classifier and an adjective. We were assuming that they were interpreted as predicates of type $\langle e,t \rangle$ but it is possible that they can be interpreted as referential (type e) or as generalized quantifiers (type $\langle e,t \rangle$,t \rangle)—that is as 'the pretty person'. Also the definite descriptions, which we had assumed were interpreted as referential or as generalized quantifiers could possibly have been interpreted as predicates (type $\langle e,t \rangle$), especially if occurring in complement position.

While an explanation for the closeness of the acceptability judgments in terms of type-shifting is possible for predicational (1) and predicational (2) contexts, we didn't expect it to have an effect on the identity context or the specificational context since in those cases the proper name complement would seem to be an unshiftable argument of type e. In order to test the hypothesis concerning type shifting in the predicational contexts, we conducted some interviews with native speakers. We also wanted to extend the domain of our investigation to include reverse specificational contexts in which definite descriptions occur as copular complements. We discuss these interviews in the next section.

4 The Interviews

Four native Thai speaking professors and one businessman were interviewed in English. The notion of grammaticality was explained, with examples given in Thai. Then the crucial Thai sentence types were presented for grammaticality judgment, first out of context and then in two English contexts each. The contexts were designed to fix the semantic types of the test items.

The first question concerned the Predicational (1) sentence: Actor that I like best kheuu/bpen khohn tall, with contexts shown in (13).

(13) **Context A:** "Suppose that you are describing a number of qualities about your favorite actor. She is sweet, brunette, Canadian and witty. Then you say that the actor you like best is tall."

Context B: "Out of a room full of actors, you are asked to identify the actor that you like the most. You identify the tallest person in the room as your favorite actor."

Out of context, 5/5 participants preferred *bpen*. We felt that Context A supported an e + <e,t> predicational interpretation, and indeed all 5 participants preferred *bpen*. However, in Context B, we felt that type-shifting would apply, turning the response into a generalized quantifier + referential—i.e. specificational sentence: *Actor that I like best is the tall person*, and indeed 5/5 participants preferred *kheuu* here. Thus, type-shifting could explain why there was no significant preference for either copula in this sentence context in the survey.

The second question concerned the Predicational (2) sentence: *He kheuu/bpen khohn tall*, with contexts shown in (14).

(14) **Context A:** "You witness a crime. The police officer asks you to describe the culprit. You list a number of traits, including that he is tall."

Context B: "You witness a crime. Out of a police lineup, you are asked to identify the culprit. You identify the tallest person as him."

Out of context *bpen* was preferred by 5/5 participants. Context A was indeed a predicational context: 5/5 participants preferred *bpen*, and we suggest that this supports an e + <e,t> interpretation of the sentence. However, we suggest that type shifting would occur in Context B, so that the sentence would be interpreted as 'he/it is the tall person'', with an e or <<e,t>,t> type subject and an e-type complement—i.e. an identity sentence. In support of this, note that 5/5 participants preferred *kheuu* here.

The third sentence type included in the interviews had not been included in the survey: a reverse specificational sentence—*Mr Sun kheuu/bpen actor that I like best*, with contexts shown in (15).

(15) Context A: "Suppose that you are talking about the famous actor Mr. Sun. You say that he is short, fat and has a reputation for being short tempered. Nevertheless, you continue your description by saying that Mr. Sun is the actor that you like best."

Context B: "I'm asking about different people in your life. I ask who your mother is and who your best friend is. Then I ask who the actor that you like best is."

Out of context both copulas were accepted, with subjects unable to explain any meaning difference. We hypothesized that Context A would support a predicational interpretation ($e + \langle e, t \rangle$), and indeed, 5/5 participants preferred *bpen* here. However, we hypothesized that Context B would support a reverse specificational interpretation of the sentence and that *kheuu* would be preferred. This would be the assumption of the equative approach, which predicts that specificational

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sentences should be reversible, as well as that there should be at least a semantic difference between reverse specificational and predicational sentences, if not a morphsyntactic difference. Interestingly, it turned out that 4/5 participants did prefer *kheuu* although 1 preferred *bpen*. We conclude that 4/5 of the speakers were interpreting the sentence as $e + \ll e,t >,t >$ rather than $e + \ll e,t >$, thus supporting the need to distinguish between those two interpretations

The fourth, identity sentence type involved the sentence, *He kheuu/bpen Mr. Sun*, with contexts shown in (16).

(16) **Context A:** "You are introducing your friends to a group of people. You say, 'She is Jill. He is John. He is Mr. Sun'."

Context B: "Suppose that you find yourself face to face with King Rama (who can change his shape at will). At first he appears in his true form. Then suddenly, he changes to look like your best friend. Then he changes to look like Mr. Sun."

Out of context, *kheuu* was preferred. We thought Context A supported a referential + referential interpretation, and *kheuu* was preferred by 4 out of 5 participants. The fifth speaker judged both copulas to be ungrammatical. Again we judged Context B to support an e + e interpretation. Three participants preferred *kheuu* here. One participant preferred a 'become' type sentence with *bpen*, and one participant felt that both copulas were ungrammatical.

Finally, the specificational contexts shown in (17) involved the sentence, Actor that I like best kheuu/bpen Mr. Sun.

(17) **Context A**: "Out of a roomful of actors, you are asked to identify the actor that you like the most. You identify Mr. Sun."

Context B: "Suppose that you are huge movie fan. "You have always had a favorite actor, but the identity of your favorite actor changes constantly. Last year, actor that I like best was Mr. Jones. Last month, actor that I like best was Mrs. Kim. Currently actor that I like best is Mr. Sun."

Out of context, *kheuu* was preferred by 5/5 participants. Context A was intended to be a specificational context. *Kheuu* was preferred (5/5). We concluded that this context supported a generalized quantifier + referential interpretation. Context B was a variant of this. Again, *kheuu* was preferred (5/5), but *bpen* was allowed by two participants who said that it was marginal. We thus concluded that even this context supported a specificational interpretation.

However, one participant noted that, in context B, if the temporal modifier 'now' is included, then both copulas can be marginal, but without this modifier,

then it seems to be a statement of fact and *kheuu* is preferred. This seems to indicate that there is something else going on in the choice between *bpen* and *kheuu* besides semantic type, syntactic configuration and truth conditions. We intend to explore this possibility in future work.

To summarize our interpretations of the interviews, we conclude that our "definite descriptions" can be construed in terms of all three semantic types. Our "adjectival free relatives" can be construed as either referential or as predicates. *Bpen* is preferred in e + <e,t> contexts, and *kheuu* is preferred in e + e, <<e,t>,t>+ e and e + <<e,t>,t> contexts.

The fact that *bpen* is preferred in context A and *kheuu* is preferred in Context B of the reverse specificational condition in (15) is strong evidence in favor of the equative analysis for both English and Thai because it is only the equative approach that predicts that reverse specificational sentences should be distinguished from predicational sentences in languages of the world—whether only semantically (as in English) or also morphosyntactically (as in Thai). If we consider the English interpretations of such sentences in relation to their Thai equivalents, they thus seem to be ambiguous in the way that the equative analysis predicts. The inverse analysis treats the English sentences as univocal. That is, it doesn't allow for a reverse specificational interpretation distinct from a predicational interpretational sentence of a small clause with a vacuous copula selecting it. This approach thus cannot explain the difference between the Thai variants.

5 Conclusions

From the experimental survey, we conclude that the results support our experimental hypotheses. From the interviews we conclude that the small differences in the survey data can be explained to be the result of type shifting. Different participants construed the sentences in different ways, consistent with different ways of type shifting the sentence elements. A reverse specificational context was included in the interviews and favored *kheuu*, a finding which supports the equative analysis. Currently we are planning a second round of interviews to more systematically test speakers' judgments in context, and in this round of interviews we will again include a reverse specificational sentence type.

Our theoretical conclusion is that the Thai data support the equative analysis. Two different copulas appear in predicational vs. equative sentence types. *Bpen* is preferred in predicational contexts. *Kheuu* is preferred in identity, specificational and reverse specificational contexts. More generally, we would like to argue that if one language (Thai) lexically and syntactically distinguishes predicational from. equative copular sentences, this lends support to a predicational vs. equative ambiguity analysis of other languages (such as English) which only have one copula.

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Nancy Hedberg Department of Linguistics 8888 University Drive. Simon Fraser University Burnaby, BC V5A 1S6 Canada

hedberg@sfu.ca

David Potter Department of Linguistics Northwestern University 2016 Sheridan Road Evanston, Illinois 60208

dkp1@u.northwestern.edu

On the Reflexive-Antipassive Polysemy: Typological Convergence from Unrelated Languages

KATARZYNA JANIC Université Lumière Lyon 2

1 Introduction

This paper deals with the antipassive construction that has raised considerable interest in the syntactic description of ergative languages over the last few decades (Dixon 1979). Often defined on structural grounds, antipassive is said to be a derived intransitive construction with a two-place predicate, the object argument of which is either suppressed or realized as an oblique (Polinsky 2005). Traditionally, the antipassive is related to the ergative system. Although some authors insist on the link between the antipassive and ergativity (Dixon 1979, Cooreman 1993), certain typologically-oriented publications extend discussions on antipassive phenomena to accusative languages (Heath 1976, Polinsky 2005, Creissels 2006).

To derive the antipassive construction, ergative languages use an antipassive marker that may have a different impact on the clause. It can either affect its syntax, making the transitive clause intransitive, or additionally it can also affect the semantics of the verb. Indeed, the syncretism of antipassive markers with aspect/modality categories is frequently observed across different ergative languages.

Apart from its correspondence to aspect/modality categories, the antipassive marker can also be related to the reflexive/middle function such as in Australian languages. A typological investigation in the development of the reflexive marker shows that the same polysemy also exists in accusative languages, in particular in Slavic (Nedjalkov 2007). In addition to Australian and Slavic languages, Romance, Cariban, Tacanan, Manding, South Caucasian, and Chukotko-Kamchatkan languages can be mentioned among language families in which the reflexive-antipassive polysemy is attested. The fact that the same pattern is observed in genetically unrelated languages provides clear evidence that the morphological coincidence is by no means homophonous in nature.

Up to now, research into reflexive-antipassive polysemy has received relative-

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ly little attention. Apart from a few attempts (Terrill 1997, Polinsky 2005, Nedjalkov 2006, Creissels 2006), the question of the reflexive-antipassive polysemy has not been investigated extensively. This paper extends on the existing work with two objectives. First, it argues in favor of the recognition of antipassives in accusative languages. Second, it aims to show that the shared morphology of reflexives and antipassives is by no means accidental but historically grounded.

To argue for the historical account of the reflexive-to-antipassive extension, I will follow Terrill (cf. 1997 for Australian languages) and I will suggest that antipassives developed from reflexivity through functional extension. Contrary to Terrill (1997), however, I will not restrict my analysis to a single language family. The intention of this paper is to investigate a range of unrelated language families to show that the historical explanation of the shared morphology is legitimate, regardless of the language system. The account of the given polysemous pattern will be based on the functional approach proposed by Givón (2001). Building on his analysis, I will show that contrary to Australian languages in which the reflexive-to-antipassive extension is in its late stage of grammaticalization, in all other languages, the antipassive is still in its early stage of development, characterized by functional ambiguity.

2 **Reflexive-Antipassive Polysemy**

Within the scope of meanings subsumed under the reflexive marker, some of them are directly related to reflexivity, whereas some others have developed from it in an indirect way. Regardless of their direct or non-direct relatedness to the reflexive notion, the fact that the reflexive morpheme developed a number of different meanings ordered on the evolutionary scale remains unquestionable. Consequently, typologically-oriented studies on the polysemy of the reflexive marker tend not only to establish a number of possible meanings the reflexive morpheme can express, but also to define to what extent they are related to each other. This raises a further question of the semantic interrelations between the meanings and their degree of productivity. Indeed, whereas certain meanings are very common and productive, some others remain rare, represented by a limited number of verbs. Still, their existence is significant for the typological study, provided they occur across different languages.

This paper concerns languages with the unproductive type of polysemy, i.e. when the respective marker apart from the reflexive function, expresses also the non-reflexive meaning, i.e. the antipassive one. The following sections investigate in detail a number of languages in which the reflexive-antipassive polysemy is attested. Due to lack of space, I will limit myself to a few language families only.

2.1 Reflexive-Antipassive Polysemy in the Slavic Family

The Slavic languages are well-known for the polysemous property of their reflexive marker. The following two examples illustrate the reflexive and antipassive derivation in Bulgarian respectively:

- (1a) *Toj porjaza průsta* he cut.PST.3SG finger 'He cut his finger.'
- (1b) *Toj se porjaza* he REFL cut.PST.3SG 'He cut himself = his finger.' (Geniušienė 1988:247)
- (2a) *Toj buta vsički* he push.PRS.3SG everybody 'He pushes everybody.'

(2b) Toj se buta he AP push.PRS.3SG 'He pushes [everybody].'
*'He pushes himself.' (Geniušienė 1988:249)

In both examples the presence of the *se* morpheme triggers an obligatory deletion of the object argument. In (1), however, the removed constituent acquires an anaphoric interpretation, whereas in (2), it functions as a non-referring object of the antipassive.

The antipassive meaning of a reflexive marker may also be expressed on the same verbal stem; cf. (3) where the Polish reflexive form *drapie się* has two meanings. In this case we deal with the reflexive-antipassive polysemy of a given derivative.

(3) Proszę pani, a on się drapie
Excuse me Madam but he AP scratch.PRS.3SG
'Excuse me Madam, but he is scratching himself.' (reference to a child sick with smallpox)
'Madam, he is scratching [other children].'

In (3), the semantic overlap between the reflexive and antipassive meaning pertains primarily to the lexical meaning of the base verb. The verb 'scratch' denotes a type of activity the agent of which can equally perform on itself or on some other entity, without being pragmatically odd.

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2.2 Reflexive-Antipassive Polysemy in the Cariban Family

Ye'kwana belongs to the Cariban language family and is spoken in Venezuela and Brazil. Significantly, it has the reflexive suffix $-\ddot{o}t$ which, polysemous in nature, performs a range of different functions. Among the many meanings, the reciprocal, anticausative, autocausative, and antipassive tend to be the most common. Example (4) illustrates the reflexive derivation which, similar to the antipassive one in (5), is derived by means of the $-\ddot{o}t$ marker:

- (4a) *mö'dö* a-ja'se-Ø=je m(i)-ö'tö-aanö tü 2-niece-POSS=ATRB DEM.ANIM INTS 2/3-name-PST.IMPF 'The one that is here, you should call her niece.' (4b) tüwü-:ne kanna kün-öt-ö'tö-aakö 3.SG-INTS probably 3S.PST-REFL-name-PST.IMPF 'It is him who called himself.' (Cáceres 2010) (5a) *a-ja-dü-jüdü* uwö i-ökamma-jötü-jai ma=dü naane DAT 30-tell-ITER-HAB
- 2-grandson-POSS-PST.POSS DAT 30-tell-ITER-HAB
 2.COP=PTC PTC
 'You can tell it to your grandson.'
 (5b) yööje-mma öt-ökamma-jötü-jai-'da ma=dü naane
 thus-only AP-tell-ITER-HAB-NEG 2.COP=PTC PTC

'You cannot tell [it] only like that (without the picture).'

The sentence in (4a) illustrates a transitive use of the verb $-\ddot{o}'t\ddot{o}$ - 'name' that occurs with two core arguments, i.e. the pronominal subject and the object. In (4b), the same verbal form is exemplified in its reflexive use. The presence of the reflexive marker $-\ddot{o}t$ affects the syntax and the semantics of the clause, i.e. the object argument is zero-coded and remains coreferential with its subject. Example (5a), on the other hand, illustrates a transitive use of the verb $-\ddot{o}kamma$ 'tell' from which the antipassive one is derived, ex. (5b). Similar to the reflexive, the presence of the $-\ddot{o}t$ marker obligatorily blocks the overt realization of the object in the syntax. Contrary to the reflexive clause, however, the respective argument is not co-referential with its subject.

2.3 Reflexive-Antipassive Polysemy in the Tacanan Family

The Tacanan family belongs to the Amerindian languages of South America and is spoken in Bolivia. Among the Tacanan languages, the reflexive-antipassive polysemy is documented in Cavineña.

To derive reflexive and reflexive-like constructions, Cavineña uses the circumfix k(a)-...-ti. Similar to Slavic and Cariban languages, the respective

marker presents a number of different functions. Within the scope of meanings, k(a)-...-ti can be used productively to express the reflexive, reciprocal, benefactive, and antipassive meaning (Guillaume 2008). The reflexive and antipassive meanings are exemplified in (6b) and (6c) respectively.

- (6a) Señora=ra peta-wa espejo=eke [chapa ushuri=ke] lady=ERG look.at-PFV mirror=PERL dog skinny=LIG 'The lady looked at the skinny dog in the mirror.'
- (6b) *Señora ka-peta-ti-wa espejo=ju.* lady REFL-look.at-REFL-PFV mirror=LOC 'The lady looked at herself in the mirror.'
- (6c) Ka-peta-ti-ya =mi-ke? AP-look.AP-IMPF =2SG-FM
 'You are watching [a soccer game]?' (context: this was said in a greeting sense, while I was watching a soccer game.) (Guillaume 2008:263)

Example (6a) illustrates a transitive use of the verb *peta* 'look at' from which the reflexive, (6b), and the antipassive, (6c), are derived by means of the circumfix k(a)-...-ti. Due to its presence, the zero-coded object argument is either understood as the anaphoric patient of the active clause, ex. (6b), or as a highly referential patient 'soccer game' of the antipassive.

Similar to Cavineña, Ese Ejja also uses the morphologically complex marker, i.e. *xa*-...-*ki* that along the reflexive and reflexive-like meanings can also have the antipassive interpretation:

- (7a) *Eyaya ekwe bakwa jabe-je.* 1ERG 1GEN child comb-FUT 'I will comb my child.'
- (7b) *Epona xa-jabe-ki-ani*. woman REFL-comb-REFL-PRS 'The woman combs herself.'
- (8a) *Ekwaa motor ishwa-axa-naje* ERG motorboat wait-in.vain-PST 'We waited in vain for the motorboat.'
- (8b) Jamaya esea ani-ani xa-ishwa-ki-ani-ani, so ABS sit -HAB AP-wait-AP-HAB-PRS
 'So we usually sit and wait for [a bus].'
 (Vuillermet 2010)

Example (7b) expresses a reflexive construction traditionally known in the

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literature under the term 'partitive object reflexive' or 'grooming constructions.' In the given clause, the verbal form *jabe* 'comb' is derived from the corresponding transitive clause by means of the circumfix xa-...-ki. The presence of the latter obligatorily blocks the syntactic realization of the patient argument. Example (8), on the other hand, presents the antipassive use of the circumfix xa-...-ki. The sentence (8a) illustrates a transitive use of the verb *ishwa* 'wait for' from which the antipassive, (8b), is derived. Similar to the previous example, the presence of the circumfix xa-...-ki blocks the overt realization of the patient argument. Contrary to the latter, however, the object suppression is subject to different conditions. It is left unrealized on pragmatic grounds. Being semantically implied, the object argument is generic and refers to an unspecified group of vehicles.

2.4 Reflexive-Antipassive Polysemy in the Manding Family

The reflexive-antipassive polysemy is also documented in Bambara, a language spoken in western Africa. Similar to Ese Ejja and other languages, Bambara has a morpheme whose main function boils down to reflexive/middle derivation. In certain instances, however, the latter can also perform the antipassive function. Examples (9) and (10) illustrate reflexive and antipassive derivation in Bambara:

- (9a) *Muso* ye denin ko. woman.DEF PFV.POS girl.DEF wash 'The woman has washed the girl.'
- (9b) *Muso* ye i ko. Woman.DEF ACP.POS REFL wash 'The woman has washed herself.'
- (10a) $C\varepsilon$ ye ji min. man.DEF PFV water.DEF drink 'The man has drunk some water.'
- (10b) Cε ye i min (ji la).
 man.DEF PFV.POS AP drink water.DEF POSTP
 'The man has quenched his thirst.'
 (Creissels 2006:90)

Sentence (9a) exemplifies a transitive use of the verb ko 'wash.' In (9b), the same verbal form is morphologically marked by the *i* morpheme which reduces the valency of the verb. Due to its presence, the object argument is zero-coded and becomes coreferential with the subject argument *muso* 'mother.' In (10), the same morpheme performs the antipassive function. Like in the previous example, the presence of the *i* morpheme affects the syntactic properties of the construction in a way that it becomes syntactically intransitive. Contrary to the previous example,

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however, the object argument is not co-referential with the subject but is demoted to the oblique position. As a result of its syntactic demotion to peripheral status, the object argument loses the properties of a core argument. Significantly, the transitive/antipassive alternation does not affect the semantic roles of the core arguments. Both the subject and object arguments in (10b) assign the same semantic role, i.e. the agent and the patient role as their counterparts in the transitive clause (10a).

2.5 Reflexive-Antipassive Polysemy in the South Caucasian Family

The South Caucasian family is another class of languages in which the reflexiveantipassive polysemy is often encountered. Among languages subsumed under the South Caucasian family, Laz in particular is known for the multifunctional use of its reflexive marker *i*-.

Similar to the previous languages, Laz uses a reflexive marker to express the antipassive meaning. Significantly, the respective morpheme expresses also a number of other meanings which are usually considered to carry the meanings of middle forms. Alongside the reflexive proper and the antipassive, *i*- can be used productively to express the autocausative, auto-benefactive, anticausative, and facultative meaning. Typologically-oriented studies usually refer to this type of marker as a middle marker. Interestingly in Laz, the *i*- suffix can also be used to derive non-middle constructions such as passives and impersonals.

Example (11) illustrates a ditransitive use of the verb *-gur-* 'learn'; from which the reflexive dative, (12), and the antipassive, (13), are derived:

(11)	padisahi-k	jur	ç'ut'al-epe-s	zanaxat	d-o-gur-am-t'u
	sultan-ERG	two	little-PL-DAT	profession	PREV-VAL1-learn-STH-
					IMPF.I3SG
	(~		. .		

'Sultan taught two boys a profession.'

- (12) *bere-k ir sey ko-d-i-gur-u-dort'un* child-ERG every thing PV-PV-REFL-learn-I3SG-PQP 'The young child has learnt everything.'
- (13) hentebe i-gur-am-t'es Amerik'a-s
 DEM2.PL AP-learn-STH-IMPF.I3P America-DAT
 'They studied [Ø] in America.'
 (Lacroix 2009:467)

In (12), the verbal stem *-gur-* is marked by the morpheme i-. Due to its presence, the subject argument *berek* 'child' is co-referential with the dative. The presence of the reflexive marker does not affect the syntactic properties of the subject.

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Similar to the corresponding ditransitive clause, the *berek* argument is still in the ergative case. In (13), the same verbal form *-gur-* is also derived by means of the *i*- morpheme, however, in this example it performs the antipassive function. Due to its presence, the construction in question takes on the formal characteristics of the intransitive clause, i.e. the subject argument that in the ditransitive clause was ergative is now in the absolutive and the object argument that was eliminated from the syntax of the clause is interpreted as the non-referring and non-topical patient meaning 'something.'

2.6 Reflexive-Antipassive Polysemy in the Pama-Nyungan Family

The Australian Pama-Nyungan family is significant for the present discussion in two respects. First, it is not genetically related to the Indo-European languages. Second, apart from regular antipassives, it also developed the so-called structural antipassive (Cooreman 1993). The latter, strongly related to the ergative system, is used to bypass certain syntactic constraints imposed on the subject of transitive constructions.

Although the Pama-Nyungan family is not genetically related to Indo-European languages, like the latter, it exemplifies instances of the reflexiveantipassive polysemy. The following example comes from Warrungu, the Pama-Nyungan family and illustrates the reflexive and antipassive derivation, respectively:

- (14a) *Gaya-nggu bama-Ø giba-n.* father-ERG man-ACC shave-NONFUT 'Father shaved a man.'
- (14b) *Gaya-Ø* giba-gali-Ø. father-NOM shave-REFL-NONFUT 'Father shaved himself.'
- (15) Bama-Ø jurba-nggu bangga-gali-n.
 man-NOM white.ochre-ERG paint-AP-NONFUT
 'The man is painting [someone else] with white ochre.'
 (Tsunoda 2006:305)

In Warrungu, the suffix *-gali* attached to the verbal root is used mainly to express reflexive and reflexive-like actions, (14b). In certain instances, however, it can also perform the antipassive function, (15). Data on Warrungu reveal, however, few instances in which *-gali* expresses the antipassive reading. In most cases, its function boils down to the reflexive derivation. Although the antipassive meaning may seem accidental for the Warrungu reflexive suffix, it is not accidental typologically, as it is concomitant with the reflexive meaning in a wide range of

languages.

Contrary to Warrungu, Yidiny developed two types of antipassive constructions, i.e. the regular one (16), and the one used for syntactic purposes:

(16) *ŋayu bae mbi-:dji-nju*1SG cover-REFL/AP-PST
'I covered myself,' or 'I covered [someone/something].'
(Terrill 1997:83)

Example (16) illustrates the reflexive-antipassive polysemy actualized on the same verbal form *bambi* 'cover.' Consequently, a given derivative is ambiguous, vacillating between two meanings. In such a case, a proper interpretation depends on the relevant pragmatic context. Note that the presence of the *-:dji* suffix triggers the verbal valency. Due to its presence, the object argument is removed from the syntax, though not from the semantics of the clause. Depending on the given context, a zero-coded argument may be either interpreted as the anaphoric patient of the active clause or as a non-referring patient of the antipassive.

In Yidiny, -: *dji* suffix can also be used to derive structural antipassives. In comparison to antipassives used for semantic/pragmatic reasons (16), the latter is used to feed syntactic pivots. It often has various functions and syntactic forms. In Yidiny a structural antipassive, (19), is used to coordinate two clauses:

- (17) *yinjdju:ŋ bama-:l mayi djula:l* these-ERG people-ERG vegetables.ABS dig.up 'These people dug up vegetables.'
- (18) *ŋayu yiŋu bama bandji:li-nju* 1SG.NOM these people.ABS find.PST 'I went and found these people.'
- (19) *ŋayu yiŋu bama bandji:li-nju mayi-: djula-:dji-nju:n* SG.NOM these people.ABS find.PST veg-LOC dig.up-AP-PST 'I went and found these people digging up vegetables.' (Terrill 1997:85)

Examples (17) and (18) illustrate transitive clauses with the common argument 'these people.' To coordinate the respective constructions, referentially identical arguments must be both absolutive across coordinated clause boundaries. When the respective argument is not syntactically absolutive, a special construction, i.e. the structural antipassive, intervenes to bypass this constraint, as in (19). In other words, in (19), the ergative agent of the first clause cannot be deleted under co-referentiality with the absolutive object of the second clause, unless it is syntacti-

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cally absolutive. Thus, in order to delete a respective argument, it must be first marked by the same case as the object argument of the second clause. To achieve this goal, the structural antipassive is used.

2.7 Reflexive-Antipassive Polysemy in the Chukotko-Kamchatkan Family

The Chukotko-Kamchatkan family is another example of languages in which the reflexive-antipassive polysemy is frequently attested. In Chukchi, a language spoken in northeastern Siberia, antipassive constructions are derived by means of the prefix *ena-/ine-* or by the suffix *-tku/-tko*. The latter are of a particular interest here because of their typologically distinctive polyfunctionality.

Apart from the antipassive function, they also allow the reflexive, reciprocal, and the anticausative interpretation. Contrary to the previous languages, however, the primary function of the respective suffixes is not related to reflexivity but to reciprocity, (Nedjalkov 2006). The reciprocal and antipassive derivations are illustrated in (20) and (21) respectively:

- (20) *atri qlawal-mel ukwet-a-tku-y²et*they.ABS man-as kiss-a-RECIP-AOR.3PL
 'They kiss each other as men do.' (situation: 'they kissed once only')
- (21a) $\frac{\partial}{\partial tt} \frac{\partial^2 e}{\partial t}$ *juu-nin* 'The dog bit him.'
- (21b) ²*itt*²*in nə-jyu-tku-qin* 'The dog bites [people].' (Nedjalkov 2006:222)

Interestingly, in terms of referential properties of the patient argument in (21), the antipassive derivation resembles that of Slavic languages illustrated in (2). In both examples, a zero-coded object argument may refer to a definite or unspecified individual or to a loosely specified group of individuals and always displays [+human] properties.

3 Givón's Diachronic Scenario

After having investigated the reflexive-antipassive polysemy in a range of various languages, we can now turn to the chief question of this paper, namely: on what grounds did the antipassive develop from reflexivity? To show that antipassives extended from reflexivity on historical grounds, I will base my arguments on the diachronic properties of the reflexive marker in Indo-European languages.

The historical explanation of the shared morphology will be particularly

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accounted for on the basis of Givón's functional approach (2001:94) in which he claimed that "detransitive constructions, most conspicuously the passive, commonly arise via re-grammaticalization of some functionally related construction" and that "functional extension of syntactic constructions is driven primarily by functional similarity." In other words, I will argue that similar to the passive, the antipassive developed diachronically from the de-transitive, i.e. the reflexive construction through functional extension, and that functional extension was primarily initiated by functional similarity. Thus, if we manage to find functional similarity between the source and the target construction, then it will be legitimate to claim that the antipassive developed from reflexivity through the functional extension, regardless of the language system.

3.1 Functional Properties of Reflexive and Antipassive

The partial functional overlap between reflexives and antipassives pertains mainly to semantic and/or pragmatic dimensions. Both types of construction deviate from their corresponding transitive counterpart on semantic grounds, i.e. they are said to express a semantically less transitive action. Building on the transitivity parameters of Hopper and Thompson (1980), the constructions in question are ranked lower on the semantic transitive scale in three respects.

First, they are characterized by a decreased agentivity of the agent/subject argument. In the reflexive construction the argument in question is less agentive due to the coreference requirement, whereas in the antipassive one a decreased agentivity results from the fact that the agent is often presented not as being voluntarily engaged in a particular type of activity but rather as having a certain predisposition to perform it. This is due to the fact that the antipassive derivation often affects the meaning of the verb that subsequently denotes a habitual action. Consequently, the latter may become a permanent characteristic of the subject.

A lower degree of transitivity of reflexives and antipassives is also visible in terms of a type of activity expressed by the verb. Both constructions express the action that is semantically less transitive. As for reflexives, their events are in general semantically less transitive because of the number of participants involved in the action. A semantic definition of a transitive event requires two highly distinct participants of different semantic properties, whereas in reflexives, due to the coreference condition, only one participant is involved. Antipassives, on the other hand, differ from the corresponding transitive event in that they often denote action that is iterative, habitual, and cognitively non-salient.

Finally, reflexives much like antipassives have a non-distinct object argument whose absence is left unmarked in the syntax of the clause. Consequently, both constructions are structurally identical, i.e. the object argument is removed and a verbal form is marked with the special morphology. As such the respective constructions are syntactically intransitive. The only difference pertains to the

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conditions under which the argument at issue is omitted. In reflexives, the object argument is removed because of the coreference condition, whereas in antipassives because of its irrelevance to the discourse context. As a result, both constructions differ in terms of the interpretation of the zero-out object. Depending on the given example, an object may be considered to be either the anaphoric patient of the active clause or a non-referring, non-topical patient of the antipassive. Thus, for both reflexives and antipassives, there is a functional similarity between the two different uses of the zero argument: "unexpressed information in general is prompted by two major cognitive-functional factors: (a) predictability and (b) irrelevance" (cf. Givón 2007:22 for the passive).

3.2 From Reflexive to Antipassive: a Possible Scenario

Building on the functional similarity between reflexives and antipassives, we can now proceed to a possible diachronic scenario of the given construction.

In the first stage of the development, speakers use the reflexive constructions to code a reflexive event. Consequently, the action denoted by a verb becomes semantically less transitive, the agent less agentive, and the patient, being coreferential with the agent, pragmatically less focused, less salient, and functioning as a non-distinct argument. Such reflexive events are syntactically coded by the zerocoded object and the reflexive marker on the verb.

Now, being confronted with a similar pragmatic situation, but in which the patient was not coreferential with the agent, individual speakers may have extended the use of the old construction to code this new, though very similar, situation. In other words, they used the same syntactic structure in a new discourse context in which the patient was not coreferential with the agent; however, all other functions of the situation remain unchanged. Thus, the same construction whose primary function was restrained to reflexivity started to be used to perform two similar but not identical functions, i.e. the old (reflexive) and the new (antipassive) with the latter viewed as the extension of the former (cf. Terrill 1997 for Australian languages). Consequently, a respective construction was sometimes ambiguous, vacillating between two meanings.

Now, depending on the grammatical system of the given language, either a complete separation of the two functions into different constructions took place (cf. section 2.6 for Australian languages), or the structural adjustment did not occur and a respective construction remained ambiguous, performing two functions (cf. section 2.1 for Slavic languages).

3.3 Antipassive in Early vs. Late Stage of Grammaticalization

Let us now turn to the last issue related to the reflexive-antipassive polysemy, i.e. the degree of grammaticalization of a given construction. Estimating to what

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extent reflexives underwent a grammaticalization process in the respective languages is crucial for the present discussion in two respects. First, it helps us to determine decisive factors that contribute to the grammaticalization process. Second, it shows how far a given construction has progressed along the reflexiveantipassive road. In other words, it allows us to assess whether a respective construction evolved into a canonical type or whether it is still in the evolutionary process characterized by functional ambiguity.

Building on Givón's functional approach, we can presuppose that what gave rise to the functional extension of reflexives is, undoubtedly, the functional similarity between the source and the target construction. Indeed, functional similarity is considered to be one of the defining factors, if not the only one, in the diachronic evolution of the source construction. In addition, it is said that the early stage of development during the grammaticalization process is characterized by functional ambiguity. This is because the same syntactic structure tends to perform two similar, however not identical, functions: the old and the new one. As such, a given construction is ambiguous. This is exactly what is observed for instance in Slavic in (3) or in Pama-Nyungan languages in (16), where the same construction was used to express both reflexive and antipassive functions.

Note that functional ambiguity is a distinguishing feature of early stages of any grammaticalization process. This is because functional re-analysis that usually takes place instantaneously as a spontaneous speech act of individual speakers is considered to be the earliest step in the diachronic extension. Once the use of the source construction in the new pragmatic context becomes a regular speech act, the syntactic re-analysis or adjustment of the given construction eventually takes place. The syntactic re-analysis is expected to occur at a more advanced level of the grammaticalization process and is reflected by the change in the syntactic form of the given construction (Givón 2007). This is what was observed in Yidiny, an Australian Pama-Nyungan language, in (19).

Building on different levels of the grammaticalization process, it is clear now that the reflexive-to-antipassive extension is not at the same stage of development in all given languages. Contrary to Australian languages in which the evolution was a three-step process terminating with syntactic re-analysis of the reflexive construction, a diachronic change of reflexives in the remaining languages was only a two-step process resulting in ambiguous patterns. In this case, depending on the lexical meaning of the verb and/or pragmatic context, either both interpretations were equally acceptable, ex. (3) or ex. (16), or the antipassive reading was more or less strongly preferred, ex. (2). This means that contrary to Australian languages in which the reflexive-to-antipassive extension is in a late stage of development, in the all remaining languages antipassives are still at the beginning of grammaticalization characterized by functional ambiguity.
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4 Concluding Remarks

The aim of this paper was to show that the reflexive-antipassive pattern in respective languages is by no means homophonous in nature but rather it results from the diachronic properties of the reflexive marker. To show that the morphological overlap between reflexives and antipassives is historically grounded, regardless of the language system, I based my arguments on Givón's functional approach which is relevant for the present discussion in two main respects. First, it helps us to determine key factors that contribute to the grammaticalization process of the given construction. Second, it allows us to estimate the degree of grammaticalization.

In relation to this issue, we have seen that only in Australian languages have antipassives completely undergone the grammaticalization process. This means that only for these languages has the reflexive covered the distance from the postulated source construction to what may be interpreted as the target construction. In the other languages examined the antipassive is still in its early stage of development, characterised by functional similarity.

ABS	Absolutive	GEN	Genitive	POS	Positive
ACC	Accusative	HAB	Habitual	POSS	Possessive
ANIM	Animate	IMPF	Imperfective	POSTP	Postposition
AOR	Aorist	INTS	Intensive	PRS	Present
AP	Antipassive	ITER	Iterative	PST	Past
ATRB	Attributive	LIG	Ligature	PTC	Particle
COP	Copula	LOC	Locative	PQP	Pluperfect
DAT	Dative	NEG	Negation	PREV	Preverb
DEF	Definite	NONFUT	Non-future	REFL	Reflexive
DEM	Demonstrative	NOM	Nominative	RECIP	Reciprocal
ERG	Ergative	PFV	Perfective	SG	Singular
FM	Formative	PERL	Perlative	STH	Suffix
FUT	Future	PL	Plural	VAL	Valency

Abbreviations

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Katarzyna Janic Laboratoire Dynamique Du Langage (UMR 5596) Institut des Sciences de l'Homme 14 avenue Berthelot 69 363 Lyon, France

Katarzyna.Janic@univ-lyon2.fr

Position and Height Asymmetries in Hiatus Resolution: A case study of Korean VV sequences

HIJO KANG Stony Brook University

Introduction

Typological patterns in synchronic data, for example, the question of why pattern A is more frequent than B across languages, have been one of the most important issues in linguistics, in particular in phonology. Ohala (1993) seeks the answer in human articulatory and/or auditory mechanisms. If a phonetic 'perturbation' is not corrected properly in perception, a hypo-correction could occur and it could result in a sound change. In this model, typological patterns are assumed to reflect the very variation in ordinary speech. Two crosslinguistic asymmetries in hiatus resolution are the main concerns in this paper. Casali (1996) and Rosenthall (1997) present positional and height asymmetries. They take another approach to the typological patterns in that they suggest universal constraints and rankings to account for the asymmetries in the framework of Optimality Theory (Prince and Smolensky 1993). Crosslinguistically, hiatus resolution such as vowel deletion or gliding is more likely to occur in V_1 and high vowels than in V_2 and non-high vowels. If these patterns result from human articulatory and auditory mechanisms as Ohala (1993) argues, it would be expected that the production of vowel sequences will show a pattern of phonetic variation, which is similar to the phonological processes. As the first step, a set of acoustic data on Korean hiatus is presented in this paper. The results will show that V_1 in hiatus is consistently shorter than V_2 , which corresponds to the positional asymmetry in Casali (1996). As for the height asymmetry, it will be reported that high vowels are more reduced in fast speech, compared to their durations in slow speech. In the next section, after presenting the typological asymmetries, the hypotheses will be presented with previous studies which provided the phonetic basis for the hypotheses. In section 2, the methods and results of a production experiment on Korean hiatus will be presented. Then, in section 3, the results will be discussed, focusing on what should be done in the future.

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1 Previous Research

1.1 Crosslinguistic Findings

Casali (1996, 1997) surveyed 68 Niger-Congo and 19 non-Niger-Congo languages which have vowel elision in at least one context. The survey results in a conclusion that V_1 elision is far more common and productive than V_2 elision in terms of frequency of occurrence (85 vs. 30). Furthermore, V_1 elision implies V_2 elision with only two exceptions. V_2 elision occurs only when it belongs to a function word or a suffix and V_1 belongs to a lexical word or a root. In other words, V_2 elision is morphologically driven. To account for his finding, Casali proposes the universal constraint rankings in (1).

(1) Universal rankings about hiatus resolution (Casali 1996: 31, 137)
a. PARSE(F)-[_W >> PARSE(F) (MAXWI >> MAX in Casali 1997)
b. PARSE(F)-lex >> PARSE(F) (MAXLEX >> MAX in Casali 1997)

The ranking in (1b) accounts for morphologically-determined elision (e.g., V_2 elision) and (1a) for the prevalence of V_1 elision, when hiatus takes place due to combination of morphemes.

Rosenthall (1997) presents additional typological findings on hiatus, which are given in (2). The focus was on the distribution of surface results of underlyingly prevocalic vowels (or V_1 s) such as deletion, glide formation, and epenthesis. (2a) and (2c) imply that if a prevocalic vowel is weakened,¹ high vowels should be the first.

- (2) Generalizations on the relation between distribution and vowel height (Rosenthall 1997: 140)
 - a. If a high vowel has a distribution (other than glide formation), other vowels have the same distribution.
 - b. Languages exhibit at most two outcomes of prevocalic vowels.
 - c. If mid vowels have nonmoraic counterparts, so must high vowels.

The two typological studies above can be generalized as two asymmetries in hiatus resolution, which are presented in (3).

- (3) Two asymmetries in hiatus resolution
 - a. Position asymmetry: If hiatus is resolved by the weakening of one vowel, V_1 is more likely to be weakened than V_2 .
 - b. Height asymmetry: If hiatus is resolved by the weakening of one vowel, high vowels are more likely to be weakened than non-high vowels.

¹ In this paper, 'vowel weakening' is defined as 'losing nucleus status in syllabic structure'.

It is not the case that weakening of high V_1 takes place only next to a morphological boundary. In language change, glide-formation of V_1 is very common even within morphemes, in particular when V_1 is high (Millar 2007: 80). Chitoran and Hualde (2007) found that the diphthongization of *iV* sequences in Romance languages has occurred within morphemes when the language had diphthongs from other sources such as loanwords and/or when the first vowel, *i*, is not lengthened prosodically (e.g., French and Spanish). So historical linguistic data lead us to the question of how we could account for cases where morphology has nothing to do with hiatus resolution, since here V_2 is not an initial segment of any morpheme or word as Casali proposes. Even synchronically, languages have vowel hiatus without morphological conditioning. We will consider a variety of hiatus resolution strategies in Korean in the next section, focusing on 'withinmorpheme' phenomena.

1.2 Hiatus Resolution in Korean

Basically, Korean speakers use different strategies depending on the categories of words. Glide formation, glide insertion, and deletion (in particular, /u/, irrespective of its position) are applied in verbal suffixation and conjugation. In nouns, glide formation (<u>underlined</u>), deletion (**bold**), and coalescence (*italic*) are optionally adopted, as shown in table (4).²

	2							
$V_1 - V_2$	i	ш	u	e	0	Λ	a	
i			iu~ju	ie~je	io~j <u>o</u>	іл~ <u>јл</u>	ia~j <u>a</u>	
ш								
u	ui~ <u>wi</u>			ue~ <u>we</u>		ил~ <u>wл</u>	ua~ <u>wa</u>	
e		euu~e						
0	oi~we	om~0						
Λ	лі~e	∆ <i>W</i> ~ ∆						
a	ai~e	auı∼ a						

(4) The realization of hiatus within nouns in Korean (Kim 2000, Chung 2007)
 * Shaded cells represent 'no change or no hiatus resolution'.

It seems that sonority (high V vs. non-high V), rather than position (V₁ vs. V₂), plays a crucial role in hiatus resolution in Korean. The higher the sonority is, the more likely the vowel is to be retained. For example, /u/ is deleted irrespective of its position in verbal suffixation and conjugation. However, Korean data do show some cases where V₂ looks weaker than V₁. /i+u/ and /e+ Λ / can be realized as [i] and [e] even though V₂ does not have lower sonority than V₁ (e.g.,

² Korean does not have many cases of hiatus in nominal declension because the most frequently used case markers have allomorphs. For example, the nominal case marker is realized as -i after a consonant and as *-ka* after a vowel.

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[tc^hiu]~[tc^hi] 'to put in order' and [peAra]~[pera] 'cut!'). This might be accounted for by the ranking in (1b), PARSE(F)-lex >> PARSE(F) since the first vowels in the examples belong to a root or stem. The Korean patterns have been assumed to be the result of phonological processes, rather than the result of automatic articulatory processes. While Kim (2000) employs different constraint rankings to explain speech rate effects on hiatus resolution, Chung (2007) attempts to explain the variety of hiatus resolution in Korean by adopting rules and repairs. Although Kim (2000) and Chung (2007) are concerned with language-specific data on hiatus resolution, they take the same approach as Casali (1996, 1997) and Rosenthall (1997) in that they view hiatus resolution as involving 'phonological' processes. Whether phonological processes or not, I assume that the aforementioned typological patterns are phonetically grounded, since some hiatus resolutions occur irrespective of morphological environments and they are sensitive to speech rate. Additionally, there is a case where hiatus resolution seems to be not a phonological process but a phonetic process. Van Heuven and Hoos (1991) conducted a production and a perception experiment showing that glides [j] and [w] which surface due to glide insertion in Dutch are different from 'underlying' glides. On the basis of the results, they argue that there is no glide insertion rule in the phonology of Dutch. I speculate that phonetic details of hiatus will provide phonetic clues to the source of the typological patterns because such details should be the starting point of any kind of sound change leading to phonological hiatus resolution (Hyman 1977 and Ohala 1993). Also on the basis of the typological patterns in Casali (1996 and 1997) and Rosenthall (1997), I provide the hypotheses in (5). In this study, speech rate is manipulated as a means of inducing variation which may be related to sound change.

(5) Hypotheses concerning hiatus Hypothesis I : In fast speech, the steady state of V₁ will be reduced more than that of V₂.
Hypothesis II : In fast speech, the steady state of high vowels will be reduced more than that of non-high vowels.

Definitely, the weakening of a vowel in the two asymmetries in (3) involves 'shortening' of its duration (note that gliding occurred in Romance languages when a prevocalic i was not lengthened). So Hypotheses I & II are related directly to the position & height asymmetries in (3). In the next section, we review relevant literature on vowels in sequences as supporting evidence for the hypotheses.

1.3 Phonetic Studies on Vowels

Unfortunately, there are few phonetic studies on hiatus. Whether it is a phonological or a phonetic process, we need to know what is really occurring in the realiza-

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tions of vowel sequences. As Kim (2000) points out, speech rate influences the ways vowel sequences are realized. Gay (1968) investigates how English diphthongs vary according to different speech rates. First, he measured the durations of onset steady state, glide, and offset steady state of /ɔi/, /ai/, /au/, /ei/, and /ou/ in slow, moderate, and fast speech. It was found that in fast speech, onset and/or offset steady states are negligible or absent and that glide durations are longer than both onset and offset regardless of speech rates. Second, the formant properties of diphthongs were also revealed to be influenced by speech rate. In general, the faster the speech, the shorter the distance between onset and offset in the vowel space (for F1 and F2). It was concluded that the two crucial features of diphthongs are onset frequency and second-formant rate of change. With these results and conclusion, Gay (1970) conducted perception experiments where onset/offset formants or durations of English diphthongs were manipulated. The stimuli were perceived as diphthongs even though they did not have any initial or terminal steady states. As for duration, the shifts from monophthongs to diphthongs occurred between 130 and 180ms. The results show that the specific course of the glide, rather than the locations of the targets, serves as the primary distinguishing cue for each diphthong and that transitional duration rather than change in frequency provides the primary cues for separating vowels and diphthongs. In sum, Gay revealed the most crucial part of English diphthongs (i.e., glide or transition) by comparing different speech rates and confirmed it by perception experiments. Though English diphthongs are distinguished from hiatus in that they take only one nucleus position, I expect that an acoustic analysis on hiatus would produce similar results since both vowel sequences and diphthongs involve sequences of vocoids. As the onset and offset steady states are reduced or disappear in fast speech, the steady states of vowels in hiatus are also expected to be reduced. Will the reduction occur in both steady states (i.e., V_1 and V_2) at the same rate? I expect that V1 reduction will be more extensive than V2 reduction, based on the typological tendency described in section 1.1. Also, note that the onset steady states, as well as the offset steady states, were drastically reduced in English diphthongs, though the first vocoid target (e.g., $\frac{1}{2}$ in $\frac{1}{21}$) is considered a nucleus. This implies that the steady states in hiatus could also be reduced or totally lost even though each vowel is parsed under a nucleus.

In sum, acoustic studies of vowels show that the duration of steady states in VV sequences varies drastically depending on speech rate and that diachronically gliding results from 'shortening' of vowels. On the basis of the previous research and the hypotheses in (5), I make specific predictions as follows:

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- (6) Predictions
 - a. SS_1 (the steady state of V_1) will be shorter than SS_2 (the steady state of V_2) in fast speech, but not in slow speech. If SS_1 is shorter than SS_2 in slow speech, the difference between the proportions of SS_1 and SS_2 will be bigger in fast speech. (Statistically, a significant interaction of rate and position)
 - b. SS_1 of a high vowel will be shorter than SS_1 of a non-high vowel and the difference will be greater in fast speech than in slow speech. (Statistically, a significant interaction of rate and height)

To see whether these predictions are correct or not, Korean was selected as test language. As we saw in section 1.2, Korean has many cases where underlying hiatus is realized as VV without hiatus resolution. More importantly, Korean does not have lexical stress, which has a strong effect on vowel length. In the next section, I will describe the experiment in detail.

2 Experiment

2.1 Methods

The materials for acoustic analysis were bisyllabic words containing VV sequences. Out of 7 monophthongs in Modern Korean (/i/, /u/, /u/, /e/, /o/, / Λ /, and /a/), 6 vowels excluding /u/ were adopted for both V₁ and V₂.³ Combined with word-initial /p'/, the vowels produced 30 target nonce words ($p'V_1V_2$, 6 vowels for V₁ × 5 vowels, excluding the same vowel as V₁, for V₂). Nine $p'V_1pV_2$ (/i/, /u/, and /a/ for both V₁ and V₂) nonce words were adopted to compare the durational aspects of vowels in vowel hiatus and CVCV sequences.⁴ To compare VV sequences with and without a glide, Four $p'V_1GV_2$ (glide had the same features as the V₁ except that it is non-syllabic) nonce words were also included. In sum, the stimuli included 30 CV₁V₂ target words plus 9 CVCV and 4 CVGV control words. The total 43 words are listed in the appendix. A randomized list of 54 nonce words (including 11 fillers⁵) was presented in written form, embedded in a sentence con-

³ The high back unrounded vowel /ui/ was excluded because 1) /ui/ is the weakest phonologically and phonetically, which means that it is deleted (Kim 2000) or inserted (Kang 2003) at the phonological level most often in Korean and that it is reduced to [ui] at the phonetic level (Lee 1996), 2) /uii/ is considered as the only diphthong in Korean (Lee 1996) so it could be realized differently from other VV sequences and 3) in a pilot experiment, its reduction made measurements impossible.

⁴ Labial stops were selected for the stimuli following Beddor et al (2002). The initial consonant was tense (p'), which have the shortest VOT period (Lee 1996) and the medial consonant was lax (p) because tense and aspirated consonants shorten the preceding vowel (Choi and Jun 1998).

⁵ The fillers were presented mostly at the first and the last parts of the list since speakers tended to be the slowest at the beginning and the fastest at the end of the list in the pilot experiment.

text, "Mansuka _____-num wekuk Arako malhet'a." ("Mansu said _____ is a foreign word.")

Six native speakers of Korean (three female and three male) were recorded. All were born in Seoul, where standard Korean is spoken, and were Stony Brook University students or their wives at the time of recording. The range of age was 24 to 32 (average was 28) and their length of stay in the US was 6 months to 4 years. Subjects were paid for their participation.

Recording was done in a sound-attenuated room at Stony Brook University. The devices used for the recording were Marantz PMD 660 digital recorder and Shure SM 48 microphone. The utterances were recorded and digitized at a 44.1kHz sampling rate and 16-bit quantization. Speakers were requested to read the written sentences 'slowly and clearly but not syllable-by-syllable' three times and 'as fast as they could without noticeable errors' three times. After the instructions were given, speakers practiced reading sentences at both slow and fast rates. In total, 1,548 tokens (43 tokens \times 2 rates \times 3 repetitions \times 6 speakers) were obtained from the recording.

Analysis was done using Praat (Boersma and Weenink 2005). Segmentation was done by means of visual inspection of waveforms and spectrograms, with the following criteria. Each target word ($p'V_1V_2$) was divided into three parts: SS₁, TP (transitional period), and SS₂. The onset of the V₁V₂ vocalic region (or SS₁) was the first peak of the periodic waveform after a stop burst. The offset of V₁V₂ (or SS₂) was marked at the last vocalic peak of the waveform before the more sinusoidal waveform of the following nasal. Then the onset of TP was marked where the stream of the first and/or second formant changed its direction abruptly. The offset of TP was determined in the same way. These were done on the basis of spectrographic display with an overlay of formant values computed by LPC analysis. ⁶ When there was no abrupt change, the spectrogram was enlarged focusing on F1 or F2 in question. The slope of formant curve (Hz/ms) was calculated and TP was defined where the absolute value of the slope is over 1 Hz/ms for F1 and 4 Hz/ms for F2. An example is given in (7), where the onset and the offset of TP are relatively prominent.

⁶ The LPC analysis was set with 5ms window length, 50dB dynamic range, 100 dB/Hz maximum, 6.0dB/oct. pre-emphasis, and 0 dynamic compression.

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As for CVCV words, the only additional criterion involved the offset of the first vowel. This was taken as the last peak of the periodic waveform before a closure.⁷ As for CVGV words, as Shin (2000) points out, glides did not have any steady states. The onset and the offset of a glide were determined according to the same criteria as TP in V_1V_2 sequences. During the segmentation, 15 tokens⁸ (0.97%) were excluded because their formant structure did not show any observable change and 3 tokens⁹ (0.19%) were discarded because the targeted vowels were not articulated.

After segmentation, the duration of each part (V₁, TP/C/G, and V₂) was computed using a Praat script. The total duration of the three parts will be referred to as 'word duration'.¹⁰ The durational proportions were calculated on the basis of this word duration.

2.2 Results

An ANOVA was carried out on the word duration data. The first test, where speech rate was the only independent factor, confirmed that all the speakers used significantly different speech rates in the fast and slow conditions (F(1,5)=34.07, P<0.003). The ratios (fast to slow) ranged from 0.40 to 0.72 and the average was 0.57.

⁷ Sometimes there was no clear-cut stop closure for the second consonant (lax bilabial stop). Then the offset of the first vowel was marked as the last peak that was higher than the following plateau waveform.

⁸ They include 7 of 'pou', 3 of 'puo', 2 of 'pʌo', 1 of 'poʌ' and 2 of 'pei'.

⁹ They include each of 'pubu', 'poo', and 'pʌʌ'.

 $^{^{10}}$ Word-initial /p'/ was excluded since there was no way to determine the beginning of the closure.

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Having shown a speech rate effect, we now consider whether the effect is stronger for V_1 (Hypothesis I) and whether high vowels are more affected than low vowels (Hypothesis II). The charts in (8) and (9) give segment and word durations in absolute (8) and proportionate (9) units. The data in (8) and (9) include the average durations of CV_1V_2 , CVCV, and CVGV types for each speech rate. The chart in (8) shows that speech rate has an effect on the duration of each part as well as on the duration of the word. The chart in (9) gives an impression that CVCV is fairly well-balanced while CV_1V_2 is slightly inclined to the left.

(8) Duration of V_1 , TP/C/G, and V_2 for three word types at two speech rates



(9) Proportion of V_1 , TP/C/G, and V_2 for three word types at two speech rates



It was hypothesized that SS₁ would be reduced more than SS₂ in fast speech (Hypothesis I). To test this hypothesis, a series of ANOVAs were performed on the durations and the proportions¹¹ with factors such as position and rate, for each word type. Hypothesis I is interpreted as an 'interaction of position and rate' statistically. In CV_1V_2 words, SS₁ was significantly shorter than SS₂ (F(1,5)=12.90,

¹¹ Proportions were included since it has been noted that durational proportion in word is an 'invariant' property of vowel in Japanese and Swedish vowel length contrast, which is little affected by speech rate (Hirata 2004 and Segerup 2000).

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P < 0.02 for durations and F(1,5)=10.70, P < 0.03 for proportions). The steady states of vowels in hiatus were proportionally reduced in fast speech (29.6% (SD=1.86)) \rightarrow 23.5% (5.28) for SS₁ and 34.7% (3.75) \rightarrow 32.1% (2.39) for SS₂). However, there was no interaction between rate and position (F(1,5)=1.52, P=0.27), even though the direction was consistent with Hypothesis I. This means that SS_1 is shorter than SS₂ but it is not reduced in duration significantly more than SS at fast rates. It seems that the duration asymmetry is unique to CV_1V_2 words. In CVCV words, proportions as well as durations were not different depending on the position of the vowel (F(1,5)=0.55, P=0.49 for durations and F(1,5)=0.35, P=0.58 for proportions). Speech rate made a significant difference in proportion (F(1,5)=21.42,P < 0.01). But there was no position asymmetry in CVCV words. The results of CVGV words seem hybrid. Position did not make a significant difference on its own (F(1,5)=1.81, P=0.24 for durations and F(1,5)=0.04, P=0.86 for proportions), but there was a significant interaction between rate and position (F(1,5)=8.04, $P \le 0.04$). V₁ was longer than V₂ in slow speech but shorter in fast speech. In statistics, Hypothesis I was not confirmed. However, it was found that V1 is shorter than V₂, which was not found in other types of words.

noigin				
position	height	Dur. at fast	Dur. at slow	fast/slow ratio
	high	39.7	82.4	0.48
SS_1	mid	46.8	96.1	0.49
	low	49.3	94.5	0.52
	high	49.0	103.3	0.47
SS_2	mid	56.5	112.8	0.50
	low	57.2	101.2	0.56

(10) The durations and the fast/slow ratios of SS_1 and SS_2 for each vowel height

Hypothesis II states that a rate effect will be greater in high vowels than nonhigh vowels. An ANOVA tested the effect of vowel height as well as rate and position on the durations of steady states in CV_1V_2 words. SS_1 was the shortest when V_1 was high and the difference was significant (F(1,5)=19.37, P<0.01). The 'height' effect interacted with rate (F(1,5)=7.16, P<0.05). As predicted by Hypothesis II, steady state was reduced in fast speech more when the vowel was high than when it was not. Also, the interaction of all the three factors was significant (F(1,5)=8.47, P<0.05). The fast-to-slow ratios in (10) make clear the reason for this interaction. The reduction of high vowel duration/proportion is bigger in SS₂ than in SS₁.

3 Discussion and Remaining Issues

This study began from typological asymmetries in both synchronic and diachronic hiatus resolution. The question was why V₁ tends to delete or glide more than V₂, such that, for example, a sequence like /ia/ is much more likely to produce [ja] or [a] than would /ai/. Our acoustic analysis of Korean hiatus suggests some answers. First, the tendency for [i] to glide or to be lost may derive from the fact that the duration of V₁ is consistently shorter than V₂, irrespective of speech rate, and the duration of a high vowel was reduced more than that of a non-high vowel, in fast speech. From the viewpoint of articulation, it seems likely that both effects be due primarily to anticipation. The articulation of V₂ starts before that of V₁ ends and this invasion is prominent when there are no intervening consonants. Consequently the duration of V₁ is short. And the height asymmetry seems, ultimately, due to the intrinsic disparity between high and non-high vowels. However, it remains unanswered why the anticipation effect and the intrinsic disparity have 'synergy' effect in the context of hiatus.

This study raises several interesting questions for future research. Above all, we need to know whether the acoustic patterns reported here are found in other languages. One logical language to conduct followup research on is Japanese, where glide insertion may occur depending on what the VV sequence is and otherwise, VV sequences are realized without hiatus resolution at the surface. Besides determining whether Japanese data will show similar patterns as Korean data, it would be interesting to see whether inserted glides are acoustically different from underlying glides and whether hiatus resolution (via glide insertion) will make a difference in the duration and/or formants of V₁. In other words, will glide insertion protect V₁ from acoustical weakening as in CVGV words in Korean? The second question is whether hiatus in fast speech, which has proportionately short or absolutely no SS₁, will be more prone to misperception than forms with longer SS_1 .¹² It should be found under what acoustic conditions hiatus sequences are misperceived. The presence/absence of 'compensation' would be an additional variable in perception. The third question is whether real words will produce different results. Will the disparities between V_1 and V_2 and between high vowels and non-high vowels be widened? If so, a sound change could be accelerated.

As noted in section 2, hiatus resolution has been regarded as a phonological process in most research. As a result, the two asymmetries in hiatus resolution have been also considered as the results of universal grammar. However, the presence of phonological grammar does not imply the absence of the effects of articulatory/auditory mechanisms at the phonetic level and vice versa. This study

¹² Hyman (1977) notes "In order for a change to catch on (and become a phonological 'rule') it is necessary for it to be perceived and diffused throughout a speech community. In that way phonological change is *perception-oriented*, even though the seeds for a change may be articulatory."

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showed that the acoustic variation reflects the very typological patterns, suggesting that the typological patterns could be the results of phonetic variation.

	CV_1V_2	2	CVCV	CVGV
p'iu	p'ei	р'лі	p'ipi	p'iju
p'ie	p'eu	р'ли	p'ipu	p'ija
p'io	p'eo	р'ле	p'ipa	p'uwi
р'іл	р'ел	р'ло	p'upi	p'uwa
p'ia	p'ea	р'ла	p'upu	
p'ui	p'oi	p'ai	p'upa	
p'ue	p'ou	p'au	p'api	
p'uo	p'oe	p'ae	p'apu	
р'ил	р'ол	p'ao	p'apa	
p'ua	p'oa	р'ал		

Appendix: Stimulus materials – Korean nonce words

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Hijo Kang Department of English Education

Hijo Kang

309 Pilmun-daero, Dong-gu, Gwangju 501-759 Korea

hijo.kang@gmail.com

Negative Concord in Western Armenian

HRAYR KHANJIAN Massachusetts Institute of Technology

Introduction

This paper examines a unique phenomena of negative concord found in Western Armenian (WA). When two negative morphemes appear together in the same clause, there are two possible interpretations that result cross-linguistically. Either each negative morpheme contributes a negation to the semantics, known as *double negation* (DN) or the two morphemes surface as one instance of negation, know as *negative concord* (NC). Standard English and Dutch are examples of languages that exhibit DN, where each instance of a negation adds to the semantics as seen in (1).

(1) John didn't do nothing.
=John did+Neg do +Neg.thing
"John did actually do something."

Greek, Russian and Armenian are examples of NC languages as exemplified by the Greek example in (2), where a negative argument *TIPOTA* and sentential negation *Dhen* together in the same clause result in just one negative meaning.

(2)	Dhen ipa	TIPOTA	
	not said.1sg	g n-thing	
	"I didn't say a	anything."	[Greek] (from Giannakidou, 2000:458)

Western Armenian differs from most other negative concord languages in that the verbal negative marker is completely optional in the presence of any n-word.¹ Secondly, a double negation meaning is possible with two verbal negative markers in the same clause. I propose that negative meaning in WA comes from verbal negation. When verbal negation is absent a covert negative operator gives the negative interpretation following the approach used by Zeijlstra (2004).

The main focus of the data collected is on interpretation. I examined what meaning speakers of WA understand when hearing certain sentences. The main

¹ Terminology after Laka (1990), referring to negative indefinites like English no one, nothing.

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distinction I was examining was whether a sentence had a negative interpretation or a positive one, the latter suggesting that two negative morphemes had canceled each other out giving a double negation reading. Therefore sentences in this paper have not necessarily been extracted from everyday colloquial WA speech. All examples in this paper are given in IPA. All voiceless stops and affricates are aspirated in WA. For convenience I have omitted all aspiration diacritics.

1 Western Armenian Negation

Western Armenian (WA) is one of the major dialects of Armenian, spoken all over the world, mostly in non-post-soviet countries. Armenian is historically an Indo-European language which has been significantly influenced by the presence of the Altaic language Ottoman Turkish for the past millenia. It is a highly agglutinating, predominantly head final, highly scrambling language. The WA sub-dialect that is examined in this paper is that of the Lebanese/Syrian Western Armenian variety spoken in America. Other sub-dialects might have slightly different properties and patterns with respect to negation, which I will not be examining in this paper.

Negation on the verb is marked with the suffix $tf+i/\partial$ depending on the following verb and rate of speech. An example is seen in (3). In slow speech consonant initial verbs take tfi. In quicker speech, the stressless *i* reduces to a ∂ giving the form $tf\partial$. For vowel initial verbs the negative marker is always of the form tf.

(3) Aram-ə dun *tfi*-kənats Aram-DEF home NEG-went.3S "Aram didn't go home"

The WA lexical item corresponding to English "no" is *vot* \int . This free morpheme can be uttered as the answer to a polar question (4).

(4) Aram- ϑ dun k ϑ nats? > vot \int Aram-DEF home went.3S? > no "Did Aram go home?" > "no"

There is no morphosyntactic difference, with respect to case or marking on any arguments or the verb, between a sentence with an n-word and a sentence with an indefinite. This is demonstrated by the following pair where the first, (5) is a positive and the second, (6) contains the corresponding n-word.

(5)	<i>pan</i> -mə	gerav	(6)	<i>vot∫</i> -meg-pan gerav
	thing-INDEF	ate.3S		no-one-thing ate.3S
	"He/She ate	something"		"He/She ate nothing"

Semantically the n-word in (6) seems like a fully negative word such as English *nothing*. However we will see that this is not the case, namely that a covert operator provides the negative meaning. To note, sentential negation is not required in (6).

The n-words in WA are formed with this "no" morpheme as seen from the table below. There are two sets of n-words that are used in Western Armenian. The first set (A) does not contain the morpheme *meg* "one." The second set (B) on the other hand is very parallel to a Turkish agglutinating structure where the "no" morpheme is added to infinitive strings such as the negative word *hitf-bir-fej* "not-one-thing" which is identical to *votf-meg-pan* "no-one-thing".²

(Indefinites)	meg-ә	one-DEF	"someone"
	deв-тә	place-INDEF	"somewhere"
	pan-тә	thing-INDEF	"something"
(Set A n-words)	vot∫-vok	no-individual	"no one"
	vot∫-deʁ	no-place	"nowhere"
	vot∫-int∫	no-what	"nothing"
(Set B n-words)	vot∫-meg-ə	no-one-DEF	"no one"
	vot∫-meg-deʁ	no-one-place	"nowhere"
	vot∫-meg-pan	no-one-thing	"nothing"

The same negative sentence can be obtained with a verbal negative marker, without any n-words. Negation scopes above either subject, (7), or object, (8) and is therefore interpreted over the indefinites.



- (7) $meg \rightarrow \text{Aram-i-n} t \int i \text{-desav}$ one-DEF Aram-DAT-DEF NEG-saw.3S "No one saw Aram" NEG > \exists
- (8) Aram- \neg pan-m \rightarrow tfi-gerav Aram-DEF thing-INDEF NEG-ate.3S "Aram didn't eat anything" NEG > \exists

Lastly, n-words can appear in a number of positions: subjects (9), objects (6) or locatives (10):

(9) votf-meg-ə dun kənats no-one-DEF home went.3S"No one went home"

² There is inter-speaker variation as to which form set (A) or (B) of the n-word is used.

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(10) Aram-ə kirk-ə votf-meg-deb tərav Aram-DEF book-DEF no-one-place put.3S "Aram didn't put the book anywhere"

N-words can be used as fragmentary answers to polar questions. A negative interpretation results as seen in (11). The negative polarity item corresponding to *anyone* cannot occur in this context in WA as opposed to n-words, which is a property seen cross-linguistically (Watanabe 2004).

(11) 30BOV-i-n ov nerga je-r? > votf-meg-ə, *vojeve-meg-ə meeting-DAT-DEF who present is-PAST.3S > no-one-DEF, *any-one-DEF "Who was present at the meeting?" > "No one", *Anyone

To note, in Western Armenian the pre-verbal string usually receives some form of sentential stress. However if the verb is negated the sentential stress shifts to the negative prefix. Also a weaker stress is places on n-words if any are present.³

Besides n-words and verbal negative markers, negation can also be expressed with negative adpositions like *without* (Penka 2007:24). In WA the equivalent lexical item is the negative preposition *arants*, as seen by the example in (12).

(12) [*arants* (pan-mə) ude-l-u] dun katsi [without (thing-INDEF) eat-INF-DAT] home went.1S "I went home, without eating (anything)"

The negative preposition in (12) can be replaced by either the verbal negative marker tf(i)- or an n-word resulting in a similar statement as seen in (13) and (14).⁴

- (13) [(pan-mə) *tf*-ude-l-ov/ *tfi*-ger-adz] dun katsi [(thing-INDEF) NEG-eat-INF-INST/ NEG-eat-PERF] home went.1S "I went home, not eating/having not eaten"
- (14) [*votf-meg-pan* ude-l-ov] dun katsi [no-one-thing eat-INF-INST] home went.1S "I went home, eating nothing"

The three adjunct phrases in the three preceding examples all express one negation. In §1.2 I will show how these phrases give rise to double negation meanings when another negative morpheme is present in the matrix clause.

³ Some speakers might interpret the same string of words differently given different stress patterns.

⁴ There is a semantic temporal difference between the presence of the dative case on the infinitival verb and the instrumental case on the infinitival verb. With the dative, seen with the use of the verbal preposition, the action has been completed when the second verb is in motion. This applies to the perfect in (13) as well. With the instrumental case seen with verbal negation or an n-word, both verbal actions are taking place at the same time. I will not discuss this semantic difference since it is not relevant to this paper. What is relevant is that a negative meaning can be expressed with either a negative preposition, an n-word or a verbal marker in these adjunct clauses.

1.1 Negative Concord in Western Armenian

Negative Concord in Western Armenian is clearly seen when an n-word co-occurs with a sentential negation marker as seen in (15). As stated before sentential negation is optional in WA.⁵ The important fact to note is that when present, sentential negation does not contribute a second negation to the semantics, therefore not resulting in a DN meaning.

(15) votf-int∫ (tfi)-desa no-what (NEG)-see.PAST.1S
"I didn't see anything" (NC)
*"I didn't see nothing" (DN)

Two negative objects as seen in (16) also do not result in a DN interpretation, as they would in English. As seen from (17), three n-words will again yield one negation to the semantics. As before the negative marker on the main verb is optional.

- (16) votf-meg-ə votf-meg-pan (tfi)-gerav no-one-DEF no-one-thing (NEG)-ate.3S
 "No one ate anything" (NC)
 *"No one (did not) eat nothing" (DN)
- (17) votf-meg-ə votf-meg-u-n votf-meg-pan (tfi)-dəvav no-one-DEF no-one-DAT-DEF no-one-thing (NEG)-gave.3S
 "No one gave anything to anyone" (NC)
 *"No one (didn't) give (no)thing to (no) one" (DN)

Finally NC is seen in negative clauses like in "without" clauses where the *without* word and an n-word or verbal negation result in only one negative meaning as seen from the following example. As long as the n-word, verbal negation and/or the negative prepositional complementizer are in the same clause, only one negative meaning arises.

(18) [*arants votf*-meg-pan (*tfi*)-kəne-l-u] dun katsi [without no-one-thing (NEG)-buy-INF-DAT] home went.1S "I went home, without buying anything"

There are two types of NC-phenomena discussed in the literature, *negative doubling* and *negative spread* Watanabe (2004:559-560). Like in Italian and West Flemish, both of these NC types are found in WA. Negative doubling is when the sentential negation marker cooccurs with a NC item as seen in (15). Whereas negative spread involves two or more negative concord items as seen in (16).

⁵ This seems to not be the case for Eastern Armenian.

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1.2 Double Negation in Western Armenian

There are instances of double negation, where two negative morphemes in a sentence each contribute a negation to the semantics. The first case, in which the two negative morphemes are separated by a clause boundary, is seen in almost all negative concord languages (Giannakidou 2000:492). In the following example (19) an n-word is in the matrix clause with a verbal negation in the embedded clause. Since there are two negative morphemes separated by a clause boundary, we get a DN reading.

(19) *votf*-meg-ə gə-gardze [vor Aram-ə dun *tfi*-kənats] no-one-DEF IMPF-think.3S [that Aram-DEF home NEG-went.3S] "No one thinks that Aram didn't go home"

The same is true if we have verbal negation in the matrix clause, and an n-word in the embedded clause as seen in (20). In fact any negation in the matrix with any negation in the embedded CP results in double negation.

(20) Aram-ə *tfi*-gardze-r [vor *votf*-meg-ə dun kənats] Aram-DEF NEG.BE.3S-think-IMPF [that no-one-DEF home went.3S] "Aram doesn't think that no one went home"

Another example of across the clause double negation is with "without" clauses introduced earlier. In (21), we see a "without" clause and a verbal negation on the main matrix verb. The result is a double negation interpretation.⁶

(21) [*arants* kəne-l-u] dun *tfi*-katsi [without buy-INF-DAT] home NEG-went.1S "Without buying [anything] I didn't go home"

There are clauses that are parallel to the "without" clauses as presented before. The following two sentences show that once again with two negative morphemes across such a boundary, we get double negation. In (22) the nominalized verb is carrying the verbal negation morpheme. With the n-word in the matrix clause, this verbal negative marker produces a DN meaning.

(22) [(pan-mə) *tfi*-kəne-l-ov] *votf*-meg-deʁ katsi [(thing-INDEF) NEG-buy-INF-INST] no-one-place went.1S "Without buying anything I went nowhere"

⁶ It must be noted here that some speakers were unable to interpret these sentences. This is not a confound and does not conflict with any of the DN judgments since it shows that there is something more going on than just a NC interpretation.

The indefinite object of the nominalized verb in (22) can be replaced with an n-word giving the same double negation reading with the presence of a matrix negative morpheme as seen in (23).

(23) [votf-meg-pan kəne-l-ov] votf-meg-deʁ katsi
[no-one-thing buy-INF-INST] no-one-place went.1S
"Without buying anything I went nowhere"⁷

The second case of DN arises with multiple verbal negative markers in the same clause. The verbal negative marker can appear on either the finite matrix verb or on a modal like "will" or "must". (24) and (25) show that any two verbal negative markers result in a DN meaning.

- (24) menk heradesil bedk-tfe tfi-tide-nk
 1PL.NOM television must-NEG NEG-watch-1PL
 "We must not not watch TV" = "We must watch TV"
- (25) *tfə*-bidi *tf*-ude-m NEG-will NEG-eat-1S "I will not not eat" = "I will eat"

To summarize, in Western Armenian two n-words or an n-word and verbal negation result in a negative concord reading if in the same clause. However when two verbal negative markers come together a double negation reading arises. Also across clauses we get DN as expected from n-words in NC languages. As a reminder the verbal negative marker is optional with any n-word in WA.

2 Negative Concord Cross-Linguistically

In this section I present how multiple negative morphemes behave in other languages. The three main relevant types of negative morphemes found cross-linguistically are 1) bound verbal negation affixes or clitics like the Turkish *-mA-* and Czech *ne*, 2) free [non-bound] negative adverbs like the West Flemish *nie* and English *not* and 3) n-words, which contain morphological negative strings and can be the arguments of the verb like English *nothing*, *nowhere*, Italian *nessuno* and Czech *nikomu*.

There are two possible interpretations when two negative morphemes appear together in the same clause as introduced above. If each negative morpheme contributes a semantic negation the result is a double negation interpretation exemplified in languages like Standard English, Dutch and German (26).

(26) Dieses Jahr hat *kein* Student *nicht* bestanden.
this year has n-DET student NEG passed.
"This year, no student didn't pass"
="This year, every student passed" [German] (from Penka 2007:19)

 $^{^{7}}$ In this sentence the nominalized verb can also be in the perfect as seen before in (13).

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If the two negative items together contribute just one instance of semantic negation we get a negative concord reading as demonstrated above for WA. Other negative concord languages include Greek, Italian, Portuguese and Russian (27).

(27) *Nichego ne* rabotaet n-thing NEG works "Nothing works"

[Russian] (from Zeijlstra, 2004:3)

Giannakidou (2000, 2002) splits NC languages into strict and non-strict negative concord languages. In strict NC languages, a negative marker is obligatory with both subject and object n-words and DN meanings are not possible, such as in Russian and Greek (28) and (29).

(28)	KANENAS dhen irthe	
	n-body NEG came	
	"Nobody came"	[Greek] (from Zeijlstra, 2004:126)
(29)	Dhen ipa TIPOTA	

(29) *Dhen* ipa *TIPOTA* not said.1sg n-thing "I didn't say anything"

[Greek] (from Giannakidou, 2000:458)

However in non-strict NC languages like Italian and Portuguese, n-words only yield NC interpretations in the object position, where sentential negation is also required (30). Verbal negation is disallowed with the presence of subject n-words (31). In non-strict languages, a possible DN reading arises if the verbal negation marker appears with an emphasized subject n-word (Zeijlstra 2004:129).

(30)	O Rui não viu ningém	
	Rui NEG looked at.n-body	
	"Rui didn't look at anybody"	[Portuguese] (from Zeijlstra, 2004:130)
(31)	Ninguém (*não) veio	
	N-body NEG came	
	"Nobody came"	[Portuguese] (from Zeijlstra, 2004:130)

The difference between strict and non-strict NC languages can be restated as an asymmetry in non-strict NC languages with respect to n-words in subject versus object position, which is not found in strict NC languages where both subject and object n-words are treated the same. Following this generalization, Western Armenian is a strict NC language since subjects (32) and objects (33) are treated the same. The main difference between the strict languages sketched above and WA is that the sentential negation marker is optional in WA.

(32) *votf*-meg-ə dʒaʃ (*tfi*)-gerav no-one-DEF food (NEG)-ate.3S "No one ate food"

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(33) Aram-ə votf-meg-pan (tfi)-desav Aram-DEF no-one-thing (NEG)-saw.3S "Aram saw nothing"

There is a small group of languages like WA where a sentential negative marker is optional with n-words like Bavarian, Quebecois, West Flemish (34) and a variety of Catalan (Haegeman 1995, Zeijlstra 2004, Haegeman and Lohndal 2008). These are strict NC languages (Zeijlstra 2004).

(34) ...da Valère niemand (nie) ken
...that Valère n-body (NEG) knows
"...that Valère doesn't know anybody" [W. Flemish] (From Zeijlstra, 2008:2)

Besides the optionality of the negative marker, in these optional NC languages, DN meanings can arise due to scrambling of a negative adverb. For example, in West Flemish a DN interpretation arises when the negative adverb *nie* "not" precedes the n-word as seen in (35), compared to (34).⁸

(35) ...da Valère *nie niemand* (en)-kent
...that Valère not nobody NEG-know
"...that Valère doesn't know nobody" [W. Flemish] (From H & L, 2008:11)

Western Armenian lacks such a negative free morpheme adverb. Therefore we cannot test if double negation readings arise through scrambling. However DN readings are possible in the same clause in WA with multiple verbal negative markers as discussed in the previous section:

(36) *tfə*-bidi *tf*-ude-m NEG-will NEG-eat-1S "I will not not eat" = "I will eat"

Summarizing the different types of languages presented in this section, negative concord languages are split into strict and non-strict languages. In non-strict languages object n-words require verbal negation marking, where as in strict languages both the object and the subject n-words require a verbal negation marker. Language like West Flemish, Standard Dutch and Western Armenian do not require a sentential negative marker with n-words. In Standard Dutch if a verbal negation appears with an n-word, a double negation reading results, unlike in West Flemish and Western Armenian where a negative concord reading arises. Finally both Standard Dutch and West Flemish have negative adverbs. These adverbs can scramble in West Flemish to get double negation readings. This scrambling is not possible in Western Armenian, but double negation readings arise with two verbal markers.

⁸ For extensive discussion of the minimal pair (34) vs. (35) see Haegeman and Lohndal (2008).

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3 Accounting for Negative Concord

There is a very large pool of literature discussing many languages with n-words, negative concord and at times NPIs. There are a few different approaches as to how to account for the distribution of NC cross-lingusitically. Some of the recent literature that includes discussion and analysis of n-words are: Ladusaw (1992), Giannakidou (2000), Herburger (2001), de Swart and Sag (2002), Watanabe (2004), Zeijlstra (2004, 2008) and Penka (2007) and references within each of them. All of these approaches fail to take into account a certain aspect of the data available in the literature. In this paper I only look at how Zeijlstra's (2004, 2008) analysis would account for the Western Armenian data. His system seems to be able to straightforwardly apply to and account for the greatest diversity of languages.

3.1 Syntactic Agree, Zeijlstra (2004)

Zeijlstra (2004, 2008) proposes a feature checking explanation to account for the different types of negative concord. He extends the syntactic tool of syntactic Agree to negation, as had been done with pro-drop subject/objects and verbal agreement marking (Zeijstra 2008:21). Negative morphemes carry either interpretable [iNEG] or uninterpretable [uNEG] features. All [uNEG] features need to be checked by an [iNEG] feature and deleted before interpretation. Two conditions must hold for this checking to occur. First, the [iNEG] feature must be in a c-commanding relation to the [uNEG] feature. Second, both [iNEG] and [uNEG] need to be in the same domain/phrase. Another assumption about the syntactic theory used is that of multiple Agree where one [iNEG] can multiply Agree with many [uNEG]s.⁹ The clause boundedness of negative concord, which was discussed above, reflects the locality conditions on syntactic agreement.

In negative concord languages all n-words carry [uNEG] features. The difference between strict and non-strict languages is borne out from the feature on verbal negation. In strict NC languages verbal negation carries [uNEG] and in non-strict NC languages the verbal negation marker carries an [iNEG]. Therefore Czech *ne*carries [uNEG], while Italian *non* carries [iNEG]. In double negation languages like Standard English all n-words and negative morphemes carry [iNEG]. Each instance of [iNEG] contributes one negative value to the semantics. All [uNEG] features need to be checked, therefore all n-words in strict NC languages and preverbal nwords in non-strict NC languages will require a licensor that is not found in the covert phonological sentence. In these cases a covert negative operator (Op¬), carrying an [iNEG] feature, is posited in Spec, NegP that contributes the negation. This operator is only inserted as a last resort (Zeijlstra 2004:246). For more details, examples and applications consult Zeijlstra (2004, 2008) and Penka (2007).

⁹ Haegeman & Lohndal (2008) deem multiple Agree unnecessary, claiming simple Agree suffices.

3.2 Agreement Applied to Western Armenian

In this section I show how non-strict negative features, namely [iNEG] features for verbal negation markers, need to be posited for WA which seems to be a more strict-like negative concord language. Western Armenian subject and object n-words are treated the same as mentioned before. Following Zeijlstra (2004), since Western Armenian is considered to be a strict NC language, n-words and verbal negation carry [uNEG] features, like Czech or West Flemish.

However I argue that WA verbal negation carries an [iNEG] feature like nonstrict languages since every instance of a verbal negation, tfi-, contributes a negation to the semantics as is seen by examples like (37).¹⁰

(37) *tfə*-bidi *tf*-ude-m NEG-will NEG-eat-1S "I will not not eat" = "I will eat"

Before demonstrating how the checking works in Western Armenian I will show that the verbal negative marker must carry an [iNEG] feature.

3.2.1 Why [iNEG] for Verbal Negation in Western Armenian?

There are two alternatives to assuming that the verbal negative marker carries an [iNEG] feature, which I will show fail to account for the Western Armenian facts. The first is that the verbal negation carries a [uNEG] feature just like all strict negative concord languages. Coming back to the example seen in (37), this would mean that the two verbal negative markers would each trigger a negative covert operator to be inserted as depicted in (38). This can be done if each negative morpheme is in a different clause, as was seen across CP boundaries.

(38) $[Op \neg_{[iNEG]} t \int \partial_{[uNEG]} bidi] [Op \neg_{[iNEG]} t \int_{[uNEG]} ude-m]$

The issue with this assumption arises when n-words are added to the sentence in (37), as in (39).

(39) votf-meg-pan tfə-bidi tf-ude-m no-one-thing NEG-will NEG-eat-1S
"I will not not eat anything" = "I will eat anything"

Which phrase is this n-word a part of, the phrase that contains "will" or the one containing the finite verb "eat"? With the assumption that there are two phrases, as in (38), the answer to this question is not straightforward.

¹⁰Penka (2007:81 fn 49) points out, three or more NIs do not have more than two negation readings.

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The following examples (40) and (41) both yield negative concord readings with the same resulting meanings.¹¹

- (40) *votf*-meg-pan *tf*ə-bidi ude-m no-one-thing NEG-will eat-1S "I will eat nothing"
- (41) *votf*-meg-pan bidi *tf*-ude-m no-one-thing will NEG-eat-1S "I will eat nothing"

The example in (40) suggests that the n-word and the negative marker on the modal "will" are in the same clause since only one negative reading results. The same is true for (41), where the n-word and the verbal negative marker on the finite verb "eat" must be in the same clause. At this point there are two possible options as to where the n-word is located. The first option is that will and eat are in two different clauses. The n-word in (40) is in the same clause as *will* and the n-word in (41) is in the clause with the *eat*. I disregard this option since it seems arbitrary and convenient for the same n-word to be in two different clauses depending on what other negative items exist or do not exist in the rest of the sentence. The second option is to claim that all three elements, the n-word argument, the verbal negation on the modal "will" and the verbal negation on the finite verb "eat" are in the same clause. However if we conclude that all three of these morphemes are in the same clause, and assume that the verbal negative morphemes carry [uNEG] features, then the only possible reading for (39) is a negative concord reading with one interpretable negation resulting from one c-commanding negative covert operator as shown in (42), which is the incorrect reading. Either way at this juncture it can not be the case that all verbal negative markers carry [uNEG] features.

(42) *[$Op \neg_{[iNEG]} vot f_{[uNEG]}$ -meg-pan $t f_{\partial [uNEG]}$ -bidi $t f_{[uNEG]}$ -ude-m]

Another logical or theoretical possibility to the verbal negative markers carrying [iNEG] features is that some carry [uNEG] features and some carry [iNEG] features. This option has a few downfalls, morphophonological and syntactic. For space limitations I will skip the details of how it fails to capture all the negation facts of WA.

From the arguments given above I conclude that all verbal negative markers, namely all allomorphs of the form tf+i/ ∂ carry [iNEG] features. As with all other negative concord languages the n-words of Western Armenian carry [uNEG] features which need to be checked before interpretation. In the following subsection I will show how the checking of these negative features gives the correct surface interpretations of the Western Armenian data presented above.

¹¹Other NC languages like Russian do get DN readings with two verbal negative markers. However, n-words require a verbal negative marker on the finite verb "will" and cannot appear with just a negative marker on the non-finite verb. This is not the case for WA where both is possible.

3.2.2 Checking Demonstrated in Western Armenian

Now I will go through the different combinations of n-word and verbal negation and show how a syntactic agreement approach accounts for the negative concord facts presented above. I use the simple example sentence in (43) to demonstrate the checking. To reiterate, all *votf* morphemes carry an uninterpretable negative feature, while the verbal negation tfi- morphemes carry interpretable features.

(43) (votf)-meg-ə kirk (tfi)-gartats no-one-DEF book NEG-read.3S "No one read any book"

In the following trees I place the NegP projection in a dominance relation with vP which contains the subject and object arguments as well as the verb being negated. Zeijlstra (2004:165-181) discusses in detail the location of NegP with respect to other phrasal projections, the negative elements that can project NegP and the cross-linguistic availability of NegPs. Another point to make is that in all the trees I assume the subject is inside the vP when checking of the negative features occurs. To account for the linear order of a subject initial sentence, I assume following Zeijlstra (2004) that the subject scrambles out of vP, a property of highly scrambling languages like West Flemish.

When an n-word and verbal negation are present in a sentence the verbal negation's [iNEG] feature checks the n-word's [uNEG] feature as seen in the configuration in (44). Checking can occur since the [iNEG] feature is in a c-command relation with the [uNEG] feature and they are both in the same clause. All the examples discussed here have subject n-words for convenience. The same checking applies to object n-words in WA.



However, as discussed before, in Western Armenian the n-words can occur without the presence of a verbal negative marker. In these cases, like the tree in (45), the [uNEG] feature of the n-word is left unchecked. Therefore a Op¬ is inserted carrying [iNEG], which checks off the n-word's [uNEG]. This covert negative operator is inserted in the same projection as the verbal negative marker, as in (44).





When two negative markers appear in a clause, namely in complex verbal constructions discussed above, a double negation reading arises. An example is repeated in (46). Each verbal negative marker carries an [iNEG] feature as seen in (47). The lower verbal negative marker's [iNEG] will check the [uNEG] feature of the n-word in the subject position.

(46) *votf*-meg-ə kirk *tf*ə-bidi *tfi*-garta no-one-DEF book NEG-will NEG-read.3S "Nobody will not read any book"



The other case of double negation found in the Western Armenian data is acrossclause negation. These are cases where there are two negative elements, either nwords or verbal negation, where each is in separate clauses. This is clearly demonstrated across a CP boundary, as seen by the following example. In (48) there is an n-word in the matrix clause and another in the embedded clause. The nwords' [uNEG] features cannot be checked off by the same [iNEG] feature since the [uNEG] features are not in the same clause. Therefore two covert negative operators are inserted as seen in (49), resulting in double negation.

- (48) *votf*-meg-ə gə-gardze [vor Aram-ə *votf*-meg-pan kənets] no-one-DEF IMPF-think.3S [that Aram-DEF no-one-thing bought.3S] "No one thinks that Aram didn't buy anything"
- (49) $Op \neg_{[iNEG]} vot f_{[uNEG]}$ -meg- \neg ... [vor $Op \neg_{[iNEG]} ... vot f_{[uNEG]}$ -meg-pan ...]

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4 Conclusion

Presenting the interaction of negative elements in WA, I expanded the typology of possible NC languages. I showed how WA NC can be explained using the syntactic agreement approach following Zeijlstra (2004, 2008). However a modification was needed where a strict NC language required non-strict NC negation features.

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Hrayr Khanjian Massachusetts Institute of Technology Department of Linguistics and Philosophy, 32D-808 77 Massachusetts Avenue Cambridge, MA 02139

hkhanjian@gmail.com

Emergent Hidden Grammar: Stochastic Patterning in Korean Accentuation of Novel Words¹

HYUN-JU KIM Stony Brook University (SUNY)

1 Introduction

The lexical accent pattern of a word in North Kyungsang Korean (NKK) is lexically determined, as illustrated in the following minimal triplet: *káci* 'kind,' *kací* 'eggplant,' *káci* 'branch.' Syllable structure does not categorically predict accent placement: for example, a heavy syllable does not necessarily attract accent (e.g. *camcári* 'dragon,' *Árísin* 'older person,' *susukkáŋ* 'kaoliang stalk'). However, it has been claimed that NKK speakers accent loanwords on the basis of syllable structure (Kenstowicz and Sohn 2001). How do NKK speakers decide to accent newly adopted words, which lack accent specification in UR? Do they accent new words randomly or in certain regular patterns? In order to answer these questions, an experimental study was performed using novel words to examine what determines accent placement when no lexical entry is available for accent.

Novel words have been used in many experimental studies recently. There have been at least two different views on how to explain patterns in novel words. One holds that patterns emerging in novel words are influenced by analogy with existing words (e.g. Albright and Hayes 2001; Eddington 2000, 2004; Face 2004). Under the analogy-based account, patterns in novel words follow familiar words which are phonetically similar to the novel words, or which are most frequent in the lexicon. Zuraw (2000) showed that Tagalog native speakers' judgment of nasal substitution in novel words is consistent with the lexical frequency of existing words. Hayes and Londe (2006) also showed that Hungarian vowel harmony patterns in novel words are consistent with lexical frequency. In contrast, the second approach assumes that the phonological grammar contains default rules which are applied when a lexical entry is not available. Crosswhite et al. (2003) showed that

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default stem-final stress is dominant (80%) in Russian stress placement in novel words, even though the occurrence of stem-final stress is much less (30%) in the lexicon.

This study presents empirical evidence that the accent patterns in novel words do not originate from analogy to phonetically similar familiar words. Rather, the accent pattern of novel words reflects statistical patterning in the lexicon. A corpus study showed that lexical distribution of NKK accent patterns is phonologically patterned: penultimate accent is common where all the syllables are light; final accent is more frequent where the final syllable is heavy. Lexical statistics revealed probabilistic structure-sensitive patterning in the lexicon even if exceptions obscure the patterning. This study will show that the accent patterns in novel words actually match this statistical patterning in the lexicon. This indicates that NKK speakers have implicit knowledge of the statistical patterning and apply it to novel words which lack lexical specification.

The rest of the paper is organized as follows: Section 2 presents a corpus study to examine statistical patterning in the lexicon. Section 3 presents experimental studies of NKK accentuation in novel words testing (i) the effect of analogy to phonetically similar words; (ii) stochastic patterning in novel words; and (iii) default accentuation. Section 4 discusses how accent patterns in novel words coincide with lexical statistical patterning. Section 5 is the conclusion.

2 Lexical Statistical Patterning

A corpus study was performed to examine lexical statistics based on a corpus of current Korean word usage (The National Institute of the Korean Language 2003; www.korean.go.kr). If the patterns which emerge in novel words are consistent with statistical patterning in the lexicon, this will support a stochastic grammar based on lexical frequency (Zuraw 2000; Hayes & Londe 2006).

The corpus consists of "pure" native words, excluding Sino-Korean words and loanwords. In order to control morphological effects on accentuation, only "monomorphemic" nouns were selected. Excluding loanwords, Sino-Korean words, derived nouns, and words longer than three syllables yielded 1275 bisyllabic and trisyllabic monomorphemic native Korean nouns out of 39,856 nouns. Of these 1275 words, 865 were bisyllabic and 410 were trisyllabic. Since the corpus does not indicate accent, three native speakers were asked to indicate the accent pattern on the existing words.²

As shown in (1), the bisyllabic words show a relatively balanced accentuation pattern (double 30% vs. penult 40% vs. final 30%).

² Native speakers disagreed on 8% of the words (58 of the 865 bisyllabic words and 45 of the 410 trisyllabic words, e.g. $hwip^h aram \sim hwip^h aram 'whistle'$; tórjánnim $\sim torjánnim 'brother-in-law'$). For these words, the pattern which 2 out of 3 speakers assigned was chosen for the analysis.

(1) Distribution of accent for bisyllabic words according to syllable weight combinations (The number given in parentheses is the percentage of each count)

	Double (%)	Penult (%)	Final (%)	Total
LL	65 (26)	121 (49)	62 (25)	248
HL	86 (42)	83 (40)	38 (18)	207
LH	63 (23)	98 (37)	107 (40)	268
HH	52 (37)	40 (28)	50 (35)	142
Total	266 (30)	342 (40)	257 (30)	865

*H: heavy syllable; L: light syllable

However, accent patterns are not distributed evenly across syllable weight combinations. The distribution shows more frequent penultimate accent in LL (49%), more frequent double accent in HL (42%) compared to 26% in LL and 23% in LH, more frequent final accent in LH (40%) compared to 25% in LL and 18% in HL, and less common penultimate accent in HH (28%) than in other combinations. Statistical analyses using Pearson's chi-square test confirmed that the distribution of accent was significantly different according to syllable weight combinations (LL vs. HL: $\chi^2(2)=12.16$, p=.002; LL vs. LH: $\chi^2(2)=13.67$, p=.001; LL vs. HH: $\chi^2(2)=15.84$, p<.001; HL vs. HH: $\chi^2(2)=13.4$, p=.001). In sum, the accent distribution in bisyllabic words showed a clear tendency toward accented heavy syllables.

Unlike the overall even distribution in bisyllabic words, lexical statistics of trisyllabic words showed uneven accent distribution: 306 out of 411 words (75%) received penultimate accent, 66 words were assigned double accent (16%), 29 words were given final accent (7%), and only 10 words received antepenultimate accent (2%) overall in trisyllabic words as shown in (2).

	Double (%)	Penult (%)	Final (%)	Antepenult (%)	Total
LLL	20 (12)	138 (82)	4 (2)	6 (4)	168
HLL	12 (13)	78 (86)	0	1 (1)	91
LLH	6 (24)	4 (16)	13 (52)	2 (8)	25
HHL	16 (28)	36 (63)	4 (7)	1 (2)	57
LHL	8 (15)	45 (85)	0	0	53
LHH	1 (11)	2 (22)	6 (67)	0	9
HLH	2 (67)	0	1 (33)	0	3
HHH	1 (20)	3 (60)	1 (20)	0	5
Total	66 (16)	306 (75)	29 (7)	10 (2)	411

(2) Distribution of accent for trisyllabic words according to syllable weight combinations

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The results showed that the preference for penultimate accent was overwhelmingly high (75%) in trisyllabic words, while the number of trisyllabic words with other accent patterns was fairly small: double accent 16%; final 7%; antepenultimate 2%. Despite the predominance of penultimate accent, Pearson's chi-square test showed a significant association between accent type and syllable weight combination. Final accent was the most preferred in words ending in a word-final heavy syllable (52% in LLH; 67% in LHH), which was significantly different from LLL combination ($\chi^2(3)=77.16$, p<.001), whereas final accent was one of the least preferred accents in trisyllabic words (7%). This demonstrates that final accent is chosen not accidentally but because accent favors the word-final heavy syllable. In addition, double accent in HHL was significantly more frequent than in LLL ($\chi^2(3)=11.96$, p=.008). However, a word-initial heavy syllable (HLL) itself did not affect accent placement because the pattern of HLL was not significantly different from that of LLL combinations ($\chi^2(3)=3.67$, p=.3). Double accent in HLL (13%:12 out of 91 HLL words) was significantly less frequent than double accented words (28%) in HHL ($\chi^2(3)=12.92$, p=.005).

The following graphs in (3) were based on the raw frequency of the results. The left-hand graph illustrates the occurrence of penultimate accent in LLH, LHH, HLH, and HHH.



(3) Structure-sensitive accent distribution in trisyllabic words

While penultimate accent was prevalent in LLL and HLL words, it was much rarer in words ending in heavy syllables. As illustrated in the right-hand graph in (3), double accent was more frequent in HHL and final accent in LLH and LHH.

To summarize, the lexical statistics showed that penultimate accent is the most frequent in the lexicon. However, the distribution of accent according to syllable weight combination revealed structure-sensitive patterning: there is a strong tendency toward final accent on LH and LLH; a tendency toward double accent on HH and HHL. The next section addresses the question of whether NKK speakers actually internalize the statistical patterning and apply it to novel words.
3 Experiments

An experimental study of NKK accentuation was performed using novel words to examine the factors determining accent placement when no lexical entry is available with an accent specification. Three hypotheses guided this study. (1) The Analogy Hypothesis: accent patterns in novel words will follow the patterns of existing words that are phonetically similar to the novel words. Analogy effects have been found in Spanish stress placement with novel words (Eddington 2000, 2004; Face 2004). Face (2004) especially showed an effect of analogy to phonetically similar words, and effects of lexically subregular patterns and morphological category in nonsense words. Therefore, in the absence of lexical accent specification, it is possible that speakers access neighboring lexical items that are similar to the novel words and follow the patterns of these similar words. (2) The Stochastic Accent Hypothesis: accentuation in novel words will be consistent with statistical patterning in the lexicon. (3) The Default Accent Hypothesis: there is a default accent rule which applies when there is no lexical entry available. Among the previous studies of NKK accent patterns, Kim (1997) actually proposes default penultimate accent for underlyingly accentless words. Kim's hypothesis predicts penultimate accent as default regardless of syllable structure since native accentuation cannot be solely determined by syllable structure.

3.1 Experiment 1: Analogy Test

In this experiment, the Analogy Hypothesis is tested using nonce words similar to existing words. This hypothesis predicts that patterns in nonce words will follow those of words that are phonetically similar to the target word.

3.1.1 Participants

12 subjects, ranging in age from 28 to 55 years (mean 41), participated in this study. Participants were born and grew up in Daegu, a city located in the northern part of Kyungsang province, and most of them still lived in the city at the time of the experiments. Five were male and seven were female. They were paid for their participation, which took less than half an hour.

3.1.2 Materials

The stimulus set consisted of nonce words, 24 bisyllabic and 26 trisyllabic. The nonce words were identical to existing words except for one consonant in the final syllable, of which difference is one place feature from the corresponding consonant in a real word; for example, *toysem, hamjipat* were constructed by changing a place feature of the final consonant of real words, *toyséŋ* 'younger sibling,'

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hamjipák 'wooden bowl.' Forms ending with a vowel were created by changing onset consonants of the final syllable (e.g. *kampa, mujide* from *kamjá* 'potato,' *mújíke* 'rainbow'). Following the finding that the onset of a word activates a set of lexical candidates (Allopenna et al. 1998; Marslen-Wilson 1987), I assumed the nonce stimuli were similar enough to activate neighboring lexical items. An equal number of nonce forms was given for each accent pattern and for each combination of light (open) and heavy (closed) syllables.³

3.1.3 Procedure

Participants were recorded in a quiet room using a cardioid condenser lavalier microphone and a Zoom H4 digital recorder at 44.1 kHz sampling rate. They read a randomized list of words given in a Korean carrier sentence, for example "*atiri* <u>to satalla k^hatara</u>" (My son asked me to buy <u>too</u>) with 2 repetitions. The second readings were analyzed. Nonce words were presented with pictures of unfamiliar cartoon characters as in (4) and introduced as the names of new cartoon characters which had recently become popular among children.

(4) Example sentence

atiri **kampa** to satalla k^hatʌra 'My son asked me to buy **kampa** too'

Participants were asked to read the sentences as natural conversational speech. Each speaker looked through the word list in order to familiarize himself/herself with all the words before recording. Speakers were asked to read in their own dialectal accent.

Accent patterns in target words were judged by two native NKK speakers (the author and an undergraduate linguistics student at Stony Brook University). If disagreement occurred between the two judgments, accent decision was made based on the pitch contour generated using Praat.

3.1.4 Results

A total of 599 tokens (50 items x 12 subjects, excluding one token with production error) were collected for the analogy test. The distribution of actual accent patterns was compared to that of analogy accent patterns using a loglinear analysis. The independent variables were syllable weight combination, e.g. LL, HL, LH, HH (H:heavy; L:light), accent type (double; penultimate; final)⁴, and accent

³ The list of all test words used in the study appears in the Appendix.

⁴ Initial accent was rarely produced in novel words. Only two tokens were produced in initial accent (one in analogy set and the other in non-analogy set). Therefore, it was omitted in statistical

word group (actual vs. analogy). The dependent variable was the count of tokens for each variable.

The results showed that only 41% of responses (246 out of 598 tokens) showed analogy patterns, while 59% showed no effect of analogy. As shown in (5), penultimate accent was the most frequent overall (51.2%; 306 out of 598 tokens). Penultimate accent was dominant in words with only light syllables (76.2%) and in forms with an initial heavy syllable (64.3%). The predominance of penultimate accent did not comply with the result predicted by the Analogy Hypothesis, which predicted that only 33% of these forms should have penultimate accent. The distribution of final accent was also different from that predicted by analogy: 86 out of 144 tokens (59.7%) were final accented, as opposed to 33% predicted by analogy. For the words with two initial closed syllables (HH/HHL), double accent was more common than in words with other syllable weight combinations.

	Double (%)	Penult (%)	Final (%)	Total (%)
LL/LLL	16 (9.5)	128 (76.2)	24 (14.3)	168 (100)
HL/HLL	42 (29.4)	92 (64.3)	9 (6.3)	143 (100)
LH/LLH	31 (21.5)	27 (18.8)	86 (59.7)	144 (100)
HH/HHL	63 (44.1)	59 (41.3)	21 (14.7)	143 (100)
Total	152 (25.4)	306 (51.2)	140 (23.4)	598 (100)

(5) Overall results of actual accent patterns

The distribution of actual accent patterns compared to that of analogy patterns is illustrated in the following figures.

(6) Comparison of actual patterns and analogy patterns



If analogy influences accent patterns in nonce words, actual patterns with double, penult, and final accent are expected to be evenly distributed in each syllable

analyses.

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weight combination, as in the analogous real words. However, the results showed that actual patterns did not follow analogy patterns. For instance, more final accent in LH and more double accent in HH were found in actual patterns than in analogy patterns. A loglinear analysis confirmed that the distribution of actual patterns was significantly different from that of analogy patterns (χ^2 (3)=84.28, p<.001). It also showed that interaction between syllable weight combination and accent type was significant (χ^2 (9)=427.72, p<.001).

To summarize, the analogy test showed that the actual patterns were significantly different from analogy patterns to similar words. This result suggests that analogy to phonetically similar words is irrelevant to NKK accentuation of novel words.

3.2 Experiment 2: Stochastic Accent and Default Accent Test

Experiment 2 was designed to test whether the accent patterns of novel words reflect the statistical patterning in the lexicon (Stochastic Accent Hypothesis) or default penultimate accentuation (Default Accent Hypothesis). The Stochastic Accent Hypothesis predicts that heavy syllables will tend to attract accent in novel words, in accordance with the statistical association between accent and syllable weight in the lexicon. On the other hand, the Default Accent Hypothesis predicts that penultimate accent will be the most common regardless of syllable structure.

3.2.1. Participants and Procedure

The participants were the same as those in Experiment 1 (12 NKK speakers, ranging in age from 28 to 55 years (mean 41), five male and seven female). Experiment 2 was run following the same procedure as in Experiment 1.

3.2.2 Materials

The test word set consisted of four possible combinations of syllables for bisyllabic words and for trisyllabic words: LL, HL, LH, HH, LLL, HLL, HHL, LLH (H:heavy; L:light) (e.g. mana, maŋna, manaŋ, maŋnaŋ, takapa, tapkapa, tapkanpa, takapak). Heavy syllables used in the experiment were closed with one of the following coda consonants: k, p, m, n, g. Light syllables were open. A single vowel, either a or i, was used within a word; for example, only the vowel a was used as in a word takapa or the vowel i was used as in a word citiki. Phonetic quality of onset consonants was also controlled: each word contained only obstruent onsets such as p, t, k (e.g. kapa) or only sonorant onsets such as m and n (e.g. mana). For trisyllabic words, only obstruent consonants were used for onsets (e.g. pakapa, citiki), because sonorant onsets such as l, m, n trigger nasalization of obstruent coda consonants in the preceding syllable (e.g. tapnaka \rightarrow tamnaka). Four or five items were included for each syllable weight combination. In total, 36 words were created: 20 bisyllabic words and 16 trisyllabic words.⁵

3.2.3 Results

A total of 427 tokens were collected from 36 test words with 12 subjects excluding 5 tokens with production errors⁶. 237 tokens were bisyllabic and 190 tokens were trisyllabic. The Default Accent Hypothesis predicts that penultimate accent would be the most frequent regardless of syllable structure. As shown in (7), overall results showed that penultimate accent was the most frequent in bisyllabic and trisyllabic words: 45% in bisyllabic words; 56% in trisyllabic words. However, double accent was assigned frequently in bisyllabic words (37%) although it was not as common as penultimate accent. Final accent was least favored (less than 20%) in both groups (18% in bisyllabic words; 16% in trisyllabic).



Table (8) presents counts of each accent according to syllable weight combinations in bisyllabic words.

(8)	Distribution	of	accent	for	bisyllabic	words	according	to	syllable	weight
cor	nbinations									

	Double (%)	Penult (%)	Final (%)	Total
LL	10 (16.7)	49 (81.7)	1 (1.7)	60
HL	15 (25.4)	42 (71.2)	2 (3.4)	59
LH	17 (28.8)	11 (18.6)	31 (52.5)	59
HH	45 (76.3)	6 (10.2)	8 (13.6)	59
Total	87 (36.7)	108 (45.6)	42 (17.7)	237

⁵ The list of all test words used in the study appears in the Appendix.

⁶ The tokens excluded due to production errors were as follows: *kakpap* produced for the target word *kakpa* (S2); *manaŋ* for *maŋnaŋ* (S2); *tampa* for *tapam* (S7); *kintinci* for *kikdinci* (S7); *taŋkanpa* for *tapkapa* (S11).

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Penultimate accent was chosen more than 80% of the time in words with all light syllables (LL). When the initial syllable was heavy (HL), accent placement was similar to that of words with all light syllables (LL): penultimate accent for HL was still as high as 71%. However, the weight of the final syllable was crucial in inducing non-penultimate accent. The final syllable was accented in 53% of the words with a final heavy syllable, which was significantly different from patterns of the other combinations: final accent was produced in fewer than 5% of LL and HL combinations $(p < .001)^7$. Double accent assignment increased to 76% in words beginning with heavy syllables when the final syllable was heavy. This result contrasted with the low assignment of double accent in HL combination (25%). Therefore, the final heavy syllable was a trigger for non-penultimate accent placement.

Figure (9) presents more clearly the distribution of double accent and final accent according to syllable weight combinations, which demonstrates structuresensitive accentuation.



(9) Structure-sensitive accentuation in bisyllabic words

Among the words with double accent, the HH combination was the most favored and the percentage (52%) was significantly higher than that of other combinations (LL, HL, LH; p<.05). In addition, most of the final accented words were LH. The probability of final accent in LH (74%) was significantly higher than in LL (2%) (p<.001). Even though final accent was not favored, final accent was chosen when the word-final syllable was heavy.

As for trisyllabic words, the results were similar to those of bisyllabic words: penultimate accent was most frequent, double accent less, and final accent was least favored. Double accent was also not preferred in most combinations except in words where the initial two syllables were heavy (HHL). The results are shown in (10).

⁷ The results were compared using a repeated measures analysis of variance (ANOVA). The independent variables used were syllable weight combination and accent position. The dependent variable was the number of tokens.

	Double (%)	Penult (%)	Final (%)	Total
LLL	4 (8.3)	39 (81.3)	5 (10.4)	48
HLL	16 (34)	28 (59.6)	3 (6.4)	47
LLH	4 (8.3)	22 (45.8)	21 (43.8)	48
HHL	28 (59.6)	17 (36.2)	2 (4.3)	47
Total	52 (27.4)	106 (55.8)	31 (16.3)	190

(10) Distribution of accent for trisyllabic words according to syllable weight combinations

Penultimate accent was dominant in the combinations LLL (81%) and HLL (60%). However, penultimate accent was less frequent in the combinations LLH and HHL: 46% and 36% respectively. Instead, final accent became more common in LLH (44%) and double accent in HHL (60%) compared to LLL and HLL combinations. The tendency toward final accent for LLH (44%) was significantly stronger than the tendency toward final accent in other combinations (10% in LLL (p=.019); 6% in HLL (p=.02); 4% in HHL (p=.002)). Even though double accent was more common in HLL (34%) than in LLL (8%), the difference did not reach statistical significance. However, double accent increased to 60% in HHL, which was significantly higher than the number of double accented words in all the other combinations (p<.05).

The structure-sensitive accentuation was revealed more clearly in the distribution of each accent according to syllable weight combinations as illustrated in (11).



(11) Structure-sensitive accentuation in trisyllabic words

Words with double accent were significantly more common in HHL than in other combinations (p<.05). Also, 68% of the words with final accent were LLH combinations, which was significantly higher than those in other combinations (p<.05).

To summarize, penultimate accent was the most frequent in nonce forms. However, accentuation in nonce forms was also syllable structure-sensitive, contrary to the prediction of the Default Accent Hypothesis. The structure-sensitive

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patterns manifested in nonce words actually complied with statistical patterning in the lexicon, which will be discussed in the following section.

4 Discussion

The results showed that analogy was not a factor in accentuation of nonce words. The accent regularity expressed in nonce words suggests that phonologicallygrounded sources, not random choices, determine the patterns: both penultimate accent and structure-sensitive accent patterns. Penultimate accent was the most frequent; however, default accentuation was not sufficient to account for nonce word accentuation because it failed to predict structure-sensitive accent in nonce words. The source of the structure-sensitive patterns can be ascribed to statistical patterning in the lexicon. As Figure (12) shows, the accent patterns in the corpus and in nonce words match fairly well.





Final accent was quite rare in LLL, HLL, and HHL but common in LLH, both in nonce words and in the corpus, as shown in the left-hand graph. The strong tendency toward accented word-final heavy syllable in nonce words accords with lexical frequency. The right-hand graph illustrates that double accent was preferred in HHL both in nonce words and in the corpus. The preference for double accent for HHL was even stronger in nonce words. On the other hand, double accent in HLL was not as common as in HHL in the corpus whereas double accent emerged rather strongly in HLL nonce words.

The structure-sensitive accentuation in nonce words is consistent with the statistical patterns in the lexicon. Furthermore, the structure-sensitive patterning appeared even more strongly in nonce words. This suggests that NKK speakers have implicit knowledge of the structure-sensitive patterning, even though it is obscured by exceptions. Weight-sensitive patterns of loanwords also provide another source of evidence that NKK speakers apply the knowledge of structure-sensitive patterning to newly adopted words: penultimate accent is generally assigned in words without heavy syllables (e.g. *jik*^háko 'Chicago'), final accent in words end-

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ing in a heavy syllable (e.g. sit^hak^híŋ 'stocking'), and double accent is preferred in words beginning with heavy syllables (e.g. símp^hóni 'symphony'). It has generally been assumed that the structure-sensitive patterns of loanwords cannot be attributed either to native phonology or to the influence of the source language.⁸ However, these results suggest that the accent patterns in loanwords are in accordance with the native language association between syllable weight and accent.

5 Conclusion

An experimental study using novel words revealed a strong tendency toward accented heavy syllables as well as a preference for penultimate accent. A corpus study showed that these patterns are present in statistical patterning in the lexicon. This suggests that the syllable structure sensitivity and the predominant penultimate accentuation emerging in novel words are actually the reflection of statistical patterning in the lexicon. Furthermore, the results of an analogy test showed that analogy is not a factor in accentuation of novel words. I conclude that NKK speakers internalize lexical statistical patterning and that a stochastic grammar based on lexical frequency guides the accentuation of newly adopted words in NKK (Zuraw 2000; Hayes & Londe 2006).

Appendix

Experiment 1

CV.CV	CVC.C	CV	CV.CVC	CVC.CVC
suga	n i kbe		gas i ŋ	лkc ^h лр
cagu	damge		badap	bлрsлt
cop ^h a	cipde		giriŋ	hлtgaŋ
gubu	gukda		hobat	лlgun
geni	nemgi		g i nim	dangoŋ
nadi	gamba		gusʌt	bancup
CV.CV.CV acire, gamari sat ^h umi, mucio mudAbi sadami doragi nAs i me	le	CVC.CV.CV nalc ^h isi simmami doŋc ^h iri dalgugi danmugi conami	CV.CV.CVC jAdinim Arisiŋ arimaŋ susuttaŋ gAdiriŋ ttigegil	CVC.CVC.CV baŋraŋi gombaŋge caŋttaŋgi inc∧lri cindamme mindinne
		•••••••		

⁸ Accent placement in loanwords is not necessarily consistent with stress placement in the source language (e.g. $sit^{h}ak^{h}i\eta$ vs. stócking).

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Experiment 2

s.CV

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Hyun-ju Kim Stony Brook University (SUNY) Department of Linguistics S205 Social and Behavioral Sciences Stony Brook, NY 11794-4376

hjkim@sunykorea.ac.kr

Evidentiality in Korean Conditional Constructions

IKSOO KWON University of California, Berkeley

Introduction

This paper explores a seemingly non-canonical phenomenon where Korean firsthand evidential marker *-te* is employed in counterfactual conditionals (CC, henceforth). The phenomenon is of special interest, since it has been claimed that evidentials are not used in irrealis clauses (Anderson 1986: 274-275). Nevertheless, this paper shows that the firsthand evidential marker does appear in Korean CCs and further, argues that to employ the firsthand envidential marker is a conceptually optimal tactic for the speaker to have cognitive distance towards the focal event in CCs. The main claim is as follows: The marker's extended function - its function of distancing and of accommodating presupposed information, not its firsthand evidential marking function, licenses the marker to be utilized in such a way.

The organization of this paper is as follows: In Section 1, background of Korean conditional constructions and that of the firsthand evidential marker's general properties are provided. In addition, the seemingly potential conceptual incompatibility between conditionals and evidentials is discussed in the section. Based on the background knowledge, this paper explores how the marker's usage conceptually fits the conditional constructions in Section 2. In Section 3, this paper models how the constructions containing the evidential marker are licensed within the Mental Spaces Framework (Fauconnier 1997, Dancygier and Sweetser 2005, Kwon 2009) to better grasp the conceptual structure of the constructions.

1 Background

1.1 Korean Conditional Constructions

Korean has agglutinative morphological system. As shown in (1), if conditional marker *-myen* is attached either directly to a verb stem or to declarative ending marker *-ta*, then, it forms a protasis of conditional construction (protasis in brackets []):

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(1) [ney-ka o-myen/o-n-ta-myen] (ku-ka) kippe-ha-l-theyntey you-Nom come-if/come-Imperf-Decl-if he-Nom be.happy-do-Fut-end Lit. If you come, he will be happy. [Neutral]
"If you come, he will be happy."

Example (1) is a predictive conditional construction. Tense morphology involved here is similar to the one in English. As present tense can represent future tense in protasis of predictive conditionals in English, Korean can either utilize a null morpheme, which indicates present tense as default or a tense morpheme complex which consists of imperfective marker -n + declarative marker -ta. It is noted that they are ambiguous between simple predictive conditional (e.g. if you come, ...) and quotative (e.g. if it is said that you come, ...) conditional.¹ In either case, the speaker's epistemic stance toward the focal event (of the addressee's coming in (1), for instance) is neutral: The speaker does not have any kind of belief on whether the addressee is coming or not, but she naively imagines or refers to the situation where the addressee comes. In this vein, this sentence conveys the speaker's neutral epistemic stance so that it could also mean 'when you come, he'll be happy.'

Now, let us take a look at CCs where the speaker's negative epistemic stance is encoded. As in English, Korean also employs a past tense morpheme in the protasis of CCs, which can be shown as follows:

(2) [*ecey ney-ka o-ass-ta-myen*] yesterday you-Nom come-Ant²-Decl-**if** (*ku-ka*) *kippe-ha-ess-l-theyntey*

(1`) [*ney-ka o-n-ta-myen*] *ku-ka kippe-ha-l-teyntey* you-Nom come-Imperf-Decl-if he-Nom be.happy-do-Fut-end "If <u>it is said that</u> you are coming, he will be happy."

However, it is also true that this construction can be interchangeably used as a predictive conditional construction with the one without -ta in the protasis. This paper will not discuss the ambiguity issue any further here, but the metarepresentational function of marker -ta calls for further research within the Mental Spaces Theory framework. For further discussion on which kind of epistemic stance can be conveyed, see J.-W. Park (2006).

² Following H.-S. Lee (1991), it is assumed that the marker *-ess/-ass* is an **anterior** marker, because it functions either as a past tense marker or as a perfective aspect marker depending on context. The concept of ANTERIOR can be briefly shown as follows:

¹ It is possible that the latter construction (*-ntamyen*) reads as a quotative reading and thus, it might be able to mark the speaker's distance toward the event more or less (metacomment; metarepresentation; Noh 2007), which can be shown as follows (The ambiguity can also be found when *-ass-ta-myen* [Ant-Decl-if] is used in the protasis):

^{...} The suffix $-\delta ss$ - gives a past tense meaning when in a given discourse context the speaker is concerned with the location of a given situation with respect to a reference point, as the suffix indicates that the situation takes place prior to the reference point. The suffix $-\delta ss$ - expresses a "completed" sense of perfective aspect when the speaker is concerned with whether the situation described has reached its end point, that is, the reference point is located either at or after the terminal juncture of a situation described (H.-S. Lee 1991: 176-177).

he-Nom be.happy-do-Ant-Fut-end Lit. If you came yesterday, he would be happy. "If you had came yesterday, he would have been happy."

Example (2) can be licensed when the speaker knows that the addressee did not come yesterday. In other words, the speaker conjectures an alternative world that is opposed to what really occurred in the real world, when she talks about the protasis of the examples. It is noted that the protasis used in (2) is also ambiguous in some cases in that they can be interpreted to be quotative conditionals such as *If it is said that you came, he will be happy*. In this respect, we can see that the fact that a protasis contains an anterior morpheme *-ess* does not guarantee that the utterance will be absolutely interpreted as a counterfactual reading.

In contrast, when pluperfect tense is used in the protasis of conditionals, the utterance will absolutely encode counterfactuality. This construction is equivalent to a distanced counterfactual conditional sentence in English, e.g., *if he had come, she would have been happy*. Likewise, in Korean, when a protasis of conditional constructions contains pluperfect tense marker *-esste*-, the utterance will always convey negative epistemic stance (J.-W. Park 2006: 125-126), which can be shown as follows:

- (3)a. [*ney-ka o-ass-te-la-myen*] (*ku-ka*) *kippe-ha-ess-(u)l-theyntey* you-Nom come-Ant-Evid-End-if he-Nom be.happy-do-Ant-Fut-end Lit. If you had come, he would be happy. "If you had come, he would have been happy."
 - b. [*ney-ka o-ass-te-la-myen*] (*ku-ka*) **kippe-ha-l-theyntey* you-Nom come-Ant-Evid-End-**if** he-Nom be.happy-do-Fut-end Lit. If you had come, he will be happy.

(3a) is licensed only as a counterfactual conditional sentence: The speaker should believe that the addressee did not come. Notice that the apodosis should contain anterior morpheme and future morpheme complex. (3b) sounds ungrammatical, since the protasis frames the past event whereas the apodosis speaks of the future prediction.

Furthermore, the pluperfect tense marker seems to yield a constructionspecific meaning: Only with a protasis clause that contains the pluperfect tense complex, the speaker's regret toward the past event encoded in the protasis can be expressed. The reading conveyed by this particular construction is equivalent to *I wish* or *If only* conditional constructions in English:

(4) [*ku-ka o-ass-te-la-myen* ...] he-Nom come-Ant-Evid-Decl-if Lit. If only he had come...
"If only he had come... (it would have been great)"

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In sum, we can learn that if a protasis contains the pluperfect tense marker, the construction will encode the speaker's negative epistemic stance and furthermore, it can encode the speaker's emotional state, i.e. regret, toward the past event as well as the speaker's negative epistemic stance.

1.2 The Firsthand Evidential Marker in CCs

The pluperfect tense marker, *-esste-*, embraces the firsthand evidential marker *-te*. To better grasp functions of the marker *-te*, basic properties of the firsthand evidential marker are explored following Kwon (2009), K.-S. Chung (2006, 2007), Mary Kim (2005), J.-M. Song (1998, 2002), J.-S. Suh (1994), and I.-S. Yang (1972) among others.

The evidential marker *-te* encodes the speaker's acquisition of information in the past, first of all. Thus, the retrospective firsthand evidential marker *-te* presupposes that the focal event took place in the past and the speaker witnessed it as shown in (5):

(5)	a. <i>chelswu-ka</i>	kong-ul	cha-ess-ta
	Chelswu-Nom	ball-Acc	kick-Ant-Decl.ending
	"Chelswu kicke	d a ball."	C C
	b. <i>chelswu-ka</i>	kong-ul	cha- te -la
	Chelswu-Nom	ball-Acc	kick- te -ending
	"(I saw that) Ch	elswu kicked	a ball."

By replacing the anterior morpheme with the evidential marker, the meaning of the sentence changed: In order for (5b) to be licensed, the speaker should have seen the scene where Chelswu kicked a ball in the past. The evidential marker has multiple functions, as Floyd (1999) mentioned, such as encoding firsthand evidential function, epistemic modality, irresponsibility, and emotionally indifferent state of mind (K.-S. Chung (2006, 2007), J.-S. Seo (1993)). Particularly, the semantic properties of the morpheme's encoding firsthand evidential and epistemic modality are indefeasible. The indefeasible properties can be tested as follows:

(6)	*chelswu-ka	kong-ul	cha -te- la,	kulentey	chelswu-lul
	Chelswu-Nom	ball-Acc	kick-te-endi	ng but	Chelswu-Acc
	po-ci-mos-ha-es.	s-ta			
see-Conn-Neg-do-Ant-Decl.ending					
	*"(I saw that) Cl	helswu kicke	ed the ball, but	I didn't se	e him."

The second clause contradicts the first clause. Hence, we can see that the marker definitely encodes that the speaker must have observed the event that is talked about.

Regarding the epistemic modality encoded by the marker, we can see that it is also inherent, since the marker is conceptually incompatible with a weak epistemic adverbial probably:

(7) **amato chelswu-ka kong-ul cha-te-la* Probably Chelswu-Nom ball-Acc kick-te-ending "*(I saw that) Probably, Chelswu kicked a ball."

Since linguistic element *amato* 'probably' encodes that the speaker does not fully vouch validity of the information that is talked about, if (7) is not acceptable, then the evidential marker should entail that the speaker vouches validity of the focal event based on his/her firsthand information source. In this vein, we can see that the marker inherently functions as an epistemic modal marker as well as a firsthand evidential marker.

1.3 Problem Raised

If the evidential marker presupposes witnessed factivity via its inherent firsthand evidential and strong epistemic modal characteristics as shown above, it would be natural for the evidential marker not to be used in CCs that will unavoidably make use of an irrealis event. For instance, no evidential marker in Tariana can appear in conditional constructions (Aikhenvald 2006:259).

The phenomenon is of special interest, considering that it has been claimed that "[e]videntials are normally used in assertions (realis clauses), not in irrealis clauses, nor in presuppositions..." (Anderson 1986: 274-275). Nevertheless, the seemingly incompatible combination does occur in some other languages such as Western Apache (Anderson 1986), Tucano (Aikhenvald 2002), and Mangarayi (Merlan 1981: 182). According to Anderson (1986: 277-278), the claim that evidentials are not used in irrealis clauses holds up, except for *lek'eh*, which is quite common in the protasis of a conditional sentence in Western Apache, which is both irrealis as well as subordinate. An example can be excepted from de Reuse's (2003: 90) work:

(8) <u>Dáhayú nt'é ánailijhi gozāā lékehyúgohí</u> tsist'ū ik'án ła' nasil<u>n</u>ii doleeł ni' nláh, tsístū hidāāhí bigha itsi'bil, doleeł ni'.
<u>'If there were a place that had a kitchen</u>, I would have bought some tortilla flour, because we would have eaten tortillas, with meat.'

In (8), a quotative particle *lékeh* is used at the end of the protasis (underlined part) and it seems that the quotative function is not in focus. Regarding this particle, Uplegger (1945: 13) described it as follows: 'as it is to be seen in mind though belonging to the past or to circumstances not actually present.' Notice that in its translation, past tense is used in the protasis: the marker's retrospective character and/or the marker's distancing function, rather than its quotative function, seems to be in focus. It might be relevant to note that as Dahl pointed out (1997: 97), there is a relationship between past tense and counterfactuality cross-linguistically. If Dahl's point is taken, it would not be implausible to say that if an evidential marker encodes retrospective aspect of

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an event, it will be licensed in CCs. Considering that the Korean evidential marker *-te* also encodes an event in past, it might not be surprising that the marker can be used in CCs. The question is how the element, which conveys both of the firsthand evidential nature and the retrospective characteristics, fits the irrealis semantics of CCs.

Based on a number of reasons, this paper argues in the following section that the use of a retrospective firsthand evidential marker in the protasis is, in fact, an optimal distancing strategy that conceptually licenses CCs in Korean (contra Anderson (1986)).

2 Evidentials in CC as a Conceptually Optimal Tactic

This paper hypothesizes that the marker's distancing function is inherited from its function of encoding a retrospective event and that it makes a conceptually optimal tactic to yield more distanced counterfactuality. To support the claim, this section discusses two major issues: First, the firsthand evidential function of the marker does not work in CCs. It appears that one of the marker's complex semantic primes - its retrospective marking - licenses the CCs conceptually. It is also shown that in fact, it is an anterior marker -ess, not the evidential marker *-te*, that encodes the perfectivity of the described event in the constructions, which eventually licenses the firsthand evidential marker in the construction. Second, the evidential marker's accommodating presuppositional space and distancing functions (Kwon 2009) will enable the constructions to convey more distanced counterfactuality than those without the marker, even implicating the speaker's regret.

2.1 Retrospectivity of -Te

Since the evidential marker encodes the speaker's firsthand source of evidence and has its strong epistemic modal properties, it would be conceptually marked, if it appears in CCs: its realis-related properties of the marker are to conceptually clash with CCs, which conjectures irrealis events. Regarding the conceptual mismatch, one significant point that native speakers of Korean made is that, intuitively, the evidential marker does not fulfill its firsthand evidential function, which can be shown in (9):

(9)	a. ecey ku-ka	kunye-lul	chac-ass-te-la
	yesterday he-Nom	he-Acc	look.for-Ant-te-Decl
	'(I saw that) He foun	d her yesterday	-
	b. [<i>ecey ku-ka</i>	kunye-lul	chac-ass-te-la- myen]
	yesterday he-Nom	she-Acc	look.for-Ant-te-Decl-if
	motunkes-i	cal-toy-ess	s-ul-thentey
	everything-Nom	well-get-Ant-	Fut-ending
	'If he had found her	yesterday, every	thing would have been fine.

In (9a), the evidential marker encodes the speaker's firsthand source of evidence, since the utterance can only be licensed when the speaker directly experienced the focal event. However, if they are embedded in the protasis of CC as shown in (9b), the function does not seem to be at work: Notice that the translation is not 'If I saw that he had found her yesterday, ...,' but simply 'If he had found her yesterday,,' In other words, source of evidence, the speaker's direct experience is already accommodated via presuppositions in the utterance. This suggests that the firsthand source marking property of the marker is not functioning or not in focus in CCs, which might enable the non-canonical construction to obviate the semantic realis-irrealis mismatch. Rather, they function as a marker presupposing occurrence of the focal event that the speaker directly experienced. In brief, its extended function is in focus - its function of accommodating presuppositional space (Kwon 2009).

Furthermore, the evidential marker cannot be licensed without anterior marker *-ess/-ass* in the protasis of CCs, as shown in (10):

(10) a. <i>ecey</i>	ku-ka	kunye-lul	chac-te-la
yesterday	he-Nom	she-Acc	look.for-te-Decl
'(I saw th	at) He was lo	oking for her yes	terday.'

b.*[<i>ecey ku-ka</i>	kunye-lul	chac-te-la- myen]
yesterday he-Nom	she-Acc	look.for-te-Decl-if
motunkes-i	cal-toy-ess-ul-thentey	
everything-Nom	well-get-Ant-Fut-ending	5
'If he looked for h	er yesterday, everything	would have been fine.'

In (10a), only with the evidential marker, it can be encoded that the speaker obtained the information in question from his/her firsthand evidence, whereas sentences (10b), where only the evidential marker is used in the protasis, are not even licensed at all. In other words, it is an anterior marker *-ess*, not an evidential marker *-te* that determines perfectivity of the described event and thus, that licenses CCs.

Counterfactual conjecturing is possible only when it is based on the speaker's assessment of perfectivity of an event. Conceptually, a cognizer will not able to conjecture the opposite situation of an event, unless he/she has assessed that the focal event is terminated. This is the reason why CC only with *-te* is not licensed. The evidential marker does not encode the perfectivity of the event that the speaker perceived, but the anterior marker *-ess*, which seems equivalent to a perfective aspect marker here, encodes it. Notice that only when the perfectivity of the event is determined and assessed by the speaker, the speaker can conjecture the counterfactuality adding the distancing morpheme *-te*.⁴ In order for the evidential marker to be licensed in CCs, the

⁴ In a sense, it can be argued that the firsthand evidential function is still in effect, because the speaker should have completed assessment of the focal event based on the direct experience at the utterance time. However, the event within the scope of the evidentiality construction is the

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perfectivity should be presupposed with an anterior marker and thus, we can understand *-te* alone is not licensed with the counterfactual conditional.

2.2 The Function of Accommodating Presupposition

The second reason why the evidential marker's employment in CCs is optimal is that the marker accommodates what is presupposed by the speaker, that is, the fact that the speaker has directly observed a focal event. For instance, if someone says (11), it entails that the focal event occurred, as far as the speaker's memory is correct, and the speaker's assertion based on the entailment is in focus. In contrast, the fact that the speaker has directly observed the event of his having meal is presupposed:

(11) <i>ku-ka</i>	pap-ul	mek -te- la
he-Nom	rice-Acc	eat-te-Decl
(I saw that)	he ate rice.'	

The presupposed event (the speaker's direct event perception) obtains different cognitive status from the focal event observed in the past does in that they involve spatiotemporally different indexical or deictic properties. As a result, the cognitive discontinuity between the events yields an interesting asymmetry on subject usages. That is, if a first person subject is used with the marker, then the utterance will not be natural in a normal circumstance. Since the involved events – a presupposed one and a focal one - should be discontinuous, the participants of the events should not be identical. Putting differently, it would be contradictory if the speaker objectively describes what she did in a normal context, which can be shown in (12):

(12)? nay-ka	pap-ul	mek -te- la		
I-Nom	rice-Acc	eat-te-Decl.		
'(I saw that) I ate rice.'			

Nevertheless, Kwon (2009) shows that utterances such as (12) are licensed, when the subject participating the event of eating rice was a non-volitional self of the speaker. For instance, if the speaker suffers from amnesia and cannot remember what she did (e.g., ate rice), but she is observing a video that was taken of her. So to speak, in order to license the utterance, the speaker is capable of creating distance between the cognizer and the observed subject, i.e. conceptual discontinuity between the speaker and the observed subject in the event (in this case, the speaker's self) in the given context. If she is successful

one that actually did not occur. In other words, the event that the speaker directly experienced, for instance in (10b), is that *he did not look for her yesterday*, but not that *he looked for her yesterday*. If someone wishes to claim that the firsthand function is in effect, the event embedded by the protasis should be what the speaker actually experienced, not what the speaker conjectures based on what really occurred. In this respect, its firsthand evidential function is not at work, this paper claims.

in creating the conceptual discontinuity with rich implicatures exploitable in the given context, utterances like (12) can be licensed. The conceptual distance imposed by the evidential marker is the distance between the described event and the recounting event. The marker's distancing function is conceptually salient enough to override the syntactic constraint on the subject usage that otherwise would not have licensed the utterance.

Whenever *-te* is used in the sentence, it is presupposed that the speaker witnessed the focal event in the past. An attested example that shows its presuppositional characteristics clearly is shown below:

(13) aykwukca yiswunsin-un nolyang aph pata-lul palapo-te-la patriot Admiral.Lee-Nom Noryang front sea-Acc stare-te-ending "The Patriot, Adimiral Lee, Sunshin stared at the sea near Noryang."
 (Y.-K. Ko 2007: 203-204)

Strictly observing truth-conditional logics, no one who lives now can utter (13): in principle, since the encyclopedic knowledge that the historical figure does not exist any more in the present world and our common sense tell us that the author of the novel cannot have seen him in the past, no one should be able to make that utterance. However, it is not unnatural to use the utterance, if the author wants to describe an event in her imaginary world for the sake of vividness. What we can see here is that the marker's accommodatational character enables the author to describe an imagined event as if she had physically observed the focal event objectively in the past. Putting it differently, if someone uttered (13), we would automatically presuppose that the speaker witnessed the focal event and soon find it false. This conforms to what Lambrecht has pointed out (1996:78): what the interlocutors have in common is not a presupposition of existence of the historical figure, but the mental representation of the figure in the presupposed mental space. As with other presuppositions (e.g. the existence of the King of France in *The King of* France is bald), the question of whether the speaker observed the figure or not is infelicitous to talk about, since it is already presupposed by the speaker.⁵

In sum, this section has shown that in fact, there are more than a few cases where the marker's distancing function based on its function of accommodating presupposed information is more salient over the other functions, and where the marker's firsthand source encoding function might not be in focus. If the marker's primary function, its firsthand source encoding function, is not in effect for whichever reason and thus, only its distancing function remains to function, it will be definitely an optimal lexical item for CCs: Its retrospective marking and distancing functions conspire to encode

⁵ The cognitive motivation of the phenomenon is, however, never clear. There are two possibilities: First, the firsthand marker's primary function encoding the firsthand source is simply bleached out as a result of its undergoing grammaticalization process. Second, the primary function of the marker is suppressed by the irrealis characteristic of the CCs. The thing is that, only with the fact that *-te* alone cannot be licensed in CCs, it might not be clear to decide which scenario is the motivation, which calls further research.

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more distanced counterfactuality in the constructions.

3 Mental Spaces in Evidentiality of CCs

Within the Mental Spaces Theory framework (Fauconnier 1997; Dancygier and Sweetser 2005), this section argues that these seemingly non-canonical phenomena can be accounted for in an elegant and consistent fashion. Particularly, this section argues that in addition to Dancygier and Sweetser's way of representing CCs in terms of darkening blocks in Mental Spaces diagrams, the distancing strategy in the CCs should be represented by layering blocks.

3.1 Mental Spaces in Korean Conditional Constructions

Following the Mental Spaces models demonstrated by Dancygier and Sweetser (2005), we can account for Korean conditional constructions in terms of the models, which can be shown in (14).



(14) is an example of conditional constructions where the speaker poses a neutral epistemic stance toward the event. That is, in order to utter (14), the speaker does not have to presume either that the addressee will not come or that the addressee will come. Since the speaker's epistemic stance is neutral, there is no imminent occurrence of the focal event of the addressee's coming presupposed in the base space. In IF/FUTURE space, the event in the protasis is a sufficient condition for the event in the apodosis, on the one hand. On the other hand, in ALTERNATE/FUTURE space, the event of the addressee's not coming is in the protasis and the event of the opposite result is in the apodosis, which form a complete sentence where the former is also a sufficient condition for the latter.

Now, let us take a look at an utterance where anterior marker *-ess/-ass* is used. As mentioned in the previous section, since an anterior morpheme affects the temporal domain of the protasis so that the protasis conjectures a mental space where what really happened in the real world did not happen, the utterance will convey counterfactual reading. This explains why perfectivity goes well with counterfactual reading: Based on the speaker's knowledge on what happened in the past in the real world, its alternative space can be conjectured. Let us take a look at (15).



Following Dancygier and Sweetser's (2005) way to represent the counterfactuality, we can darken the blocks involved in IF/PAST space as shown in (15), indicating that the contents represented by the darkened blocks result from the speaker's conjecturing the opposite to what really happened.

3.2 *-Te* in CCs

Based on the background discussions on Korean conditional constructions, now we can elaborate our model for the firsthand evidential marker *-te* in CCs. It has been shown in the previous section that the marker's firsthand evidential marking function is not in focus in CCs, but rather, its distancing function is taken advantage of in the constructions. Due to the marker's functions of distancing and accommodating presuppositional space, the marker's appearance in the protasis can also be represented by creating a layer in the diagram. Let us look into an example, which can be shown in (16).

In the protasis of (16), the focal event block is distanced by creating a layer of firsthand evidential space. Moreover, both the firsthand evidential

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space block and the focal event block are darkened. Comparing it to (15), we can learn that (16) can convey more distanced counterfactuality, since the speaker's negative epistemic stance toward the focal event is encoded by the anterior marker and at the same time, the negative space is further distanced by the firsthand evidential marker's function of accommodating presuppositional space. Notice that in ALTERNATE/PAST space, the event of the addressee's not coming, not the event of the speaker's not witnessing the focal event, is conjectured. The fact that the focal event space, not the firsthand evidential space, is negated in the ALTERNATE space supports the claim that the firsthand evidential marker functions only as a distancing item to accommodate presupposition.





In sum, CCs where the firsthand evidential marker appears yield more distanced counterfactual reading than CCs where it does not, because the marker will create conceptual distance between the speaker and the focal event by accommodating presuppositional space and thus, the focal event whose counterfactuality has already been marked by the anterior morpheme *-ess-* is even to be further distanced by the firsthand evidential marker's distancing characteristics. The doubly distanced focal event naturally and compositionally yields more distanced counterfactuality.

It seems that the CCs can be configured with two major parameters. The first parameter is that the target event is conceptually the one that has been completed so that its counterfactuality can be conjectured. The second one is that the target event is conceptually distant from the speaker. In this respect, the phenomenon that the retrospective firsthand evidential marker -te- is employed in CCs might not be unintuitive and unnatural, but rather optimal,

since the evidential marker originally has its retrospective marking function and its accommodational character. Although we cannot be sure whether the marker's firsthand source marking function is bleached or suppressed, but it is sure, at least, that the marker's primary function is not in focus when it is used in the protasis of CC.

More intriguingly, the morpheme complex *-asste-* can encode farther distanced counterfactuality so that it oftentimes depicts the case where the speaker was regretful toward an event in the past where she should have done something, but she couldn't, only with the protasis. This can be paraphrased to be *if only* constructions in English, which can be exemplified in (17).

(17) *ney-ka* o-ass-te-la-myen ... you-Nom come-Ant-te-Decl-if





Since the utterance consists of the protasis only, which has an anterior marker and the evidential marker, we only need one meta-mental space to represent the protasis. In the similar mechanism shown in (17), the evidential marker creates conceptual distance between the speaker and the conjectured focal event of the addressee's coming. Then, implied extension of the protasis which is potentially given in the context can be linked afterwards and finally, the utterance will encode the speaker's regret.

4 Concluding Remarks

This paper showed that a Korean firsthand evidential marker *-te* is employed in counterfactual conditional constructions, which is conceptually unexpected, since it has been claimed that evidentials are normally used in realis clauses, not in irrealis clauses, nor in presuppositions. Nevertheless, this paper showed that the firsthand evidential marker does appear in Korean CCs and actually,

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argued that employing the firsthand envidential marker in CCs is a conceptually optimal tactic for the speaker to distance the focal event.

In the last section, the paper modeled Korean conditional constructions in general and Korean CCs that contain the evidential marker within Mental Spaces Theory (Fauconnier 1997, Dancygier and Sweetser 2005, Kwon 2009). Particularly, this paper proposed that representing layers created by tense complex (anterior marker *-ess/-ass* and firsthand evidentiality marker *-te*) will be of great help in grasping elaborately varying degrees of counterfactuality.

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Iksoo Kwon University of California, Berkeley Department of Linguistics 1203 Dwinelle Hall Berkeley, CA 94720-2650

kwoniks@hufs.ac.kr

The Source-Goal Asymmetry in SLA

WOJCIECH LEWANDOWSKI University of Copenhagen

Introduction

It has been shown in the literature on motion events that there is a strong tendency for speakers of different languages to express goals in preference to sources (e.g. Regier 1997, Ihara & Fujita 2000) and that this linguistic asymmetry could have its origins in non-linguistic event representations (cf. Lakusta & Landau 2005, Lakusta et al. 2007).

In this paper, it will be shown that the goal bias in language and cognition has important implications for SLA. In particular, the acquisition of the verbs *come* and *go* (henceforth, C&G) by Polish speakers of Spanish L2 will be addressed.

As first shown by Fillmore (1971), C is a goal-oriented, while G is a sourceoriented verb, i.e., in a sentence like (1), the expression at 5 refers to the arrival time; in contrast in (2) it specifies the departure time.

(1) a. John came home at 5.b. John went home at 5.

On the other hand, it has been argued that C&G display a universal deictic contrast defined as motion toward the speaker vs. motion away from the speaker (cf. Talmy 2000). However, Lewandowski (2014) shows, against this hypothesis, that whereas such an analysis appropriately characterizes the lexical semantics of C&G in Spanish, in Polish the use of C&G relies on non-deictic factors: overall, C is preferred when the speaker adopts an arrival-oriented perspective, and G if the motion event is conceptualized from a source-oriented perspective, regardless of whether the goal of movement is constituted by the speaker or any other entity involved in the communication act. As a consequence, the author concludes that Polish speakers can choose to think about the same motion event from two different perspectives (that of arrival or that of departure), while no such possibility is available in Spanish, where motion toward the speaker needs to be described as goal-oriented and motion toward any other goal as source-oriented. A special case

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of use of C&G are the comitative contexts, i.e. situations in which the speaker asks the addressee to accompany him/her to a place: in Spanish such situations are conceptualized as motion toward the speaker and, consistently, the use of C is obligatory; in contrast, in Polish the source-oriented perspective is adopted and the use of G is required (cf. Lewandowski 2010).

(2)	a. ¿Te vienes	conmigo	al	cine?		(Spanish)
	you come	with me	to the	cinema		
	'Would you	like to com	e to the	e cinema w	vith me?'	
	b. Pójdziesz z	e mną do	kina?			(Polish)
	you go w	rith me to	cinema	a		
	'Would you	like to com	e to the	e cinema w	vith me?'	

As noted by Lewandowski (2014), these linguistic facts reflect Slobin's (1996) "thinking for speaking" hypothesis, according to which different language patterns yield different patterns of thought in the process of producing and interpreting verbal expressions. As for C&G in Polish and Spanish, the following conditions of use involving different "thinking for speaking" patterns can be distinguished: (i) motion toward the speaker in a source-oriented context (Polish = G, Spanish = C), (ii) motion toward any other goal in a goal-oriented context (Polish = C, Spanish = G) and (iii) comitative contexts (Polish = G, Spanish = C). The acquisition of C&G by Polish learners of Spanish thus implies restructuring these particular conditions of use.

The main hypothesis is that, if Lakusta & Landau (2005) and Lakusta et al. (2007) are on the right track, then this process is constrained by the Goal-bias in spatial cognition, i.e. the shift from a source-oriented perspective to a goal-oriented perspective should be easier than the other way around. In order to test it, an acceptability judgment task with 30 Polish learners of Spanish L2 of three different proficiency levels (low intermediate, high intermediate and advanced) and a control group of 10 Spanish native speakers was performed. It consisted of 6 grammatical sentences, 6 ungrammatical ones, representing the three conditions of use listed above, and 12 distractors. The task consisted in judging the acceptability of each sentence according to a Likert scale containing the values from -2 to +2. The repeated measures ANOVA confirmed our hypothesis: no matter how advanced the level of Spanish L2 speakers was, they tended to judge incorrectly the sentences corresponding to the second condition; in contrast, the correct responses concerning the first and the third conditions increased significantly with the proficiency level.

This article is organized as follows. Section 1 gives an overview of the theoretical background of our study. In Section 2 we present the empirical base of our research, i.e., the behavior of C&G in Polish and Spanish, and we formulate the hypothesis for our experiment, which is described in Section 3. Conclusions are drawn in Section 4.

1 Theoretical Background

The main argument that we would like to put forward in this paper relies on two hypotheses which were independently developed in psycholinguistic research on motion events, namely the non-linguistic goal path bias hypothesis and Slobin's (1996) "Thinking for speaking" hypothesis.

1.1 Non-Linguistic Goal Path Bias

Experimental data by Lakusta & Landau's (2005) provide evidence that—in language—there is an asymmetric relationship between sources and goals in motion events. In particular, when children and adults describe motion events, they tend to encode goal paths (i.e., *into X*) in preference to source paths (i.e., *from X*). For example, manner of motion verbs appear more often with goal PPs than with source PPs, although both types of PP are optional.

This pattern holds not only for motion events, but also for change of possession events, change of state events and attachment and detachment events (in the sense of Levin 1993). For example, change of possession events are much more frequently described from a goal-perspective (e.g. *buy*) than from a sourceperspective (e.g. *sell*).

Additional evidence for this source-goal asymmetry comes from studies of brain-damaged children and adults. For example, Ihara & Fujita (2000) reported that Japanese agrammatical speakers tend to drop source but not goal case markers, sometimes substituting the latter for the former. The bias to omit sources also extends to children with Williams syndrome (Landau & Zukowski 2003) and children who are congenitally deaf and have received no exposure to a conventional language model (Zheng & Goldin-Meadow 2002).

Finally, there are also cases where this bias influences grammar. For example, the semantics of a change of state verb specifies both source and goal, but the syntax "tends to render the source path optional" (Lakusta & Landau 2005:28), while the omission of the goal leads to ungrammaticality (cf. also Nam 2004).

- (3) a. The frog turned from green to blue.
 - b. The frog turned to blue.
 - c. *The frog turned from green.

Lakusta & Landau (2005) conclude that the robustness of a goal bias in language raises the possibility that it might be an innate characteristic of our cognitive system. Indeed, Lakusta et al. (2007) found that 12-month-old children preferentially

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attended to the goals rather than to the sources, when watching motion events (they looked longer at motion scenes involving a change in the goal object), thus suggesting that the preference for goals rather than sources exists prelinguistically, i.e., before infants produce full linguistic structures for expressing motion events.

We suggest that, if the claim that goals are higher ranked than sources in human cognition is correct, then this asymmetry should have important implications for SLA. In particular, path-oriented linguistic structures should be acquired easier than source-oriented linguistic structures. Before going to the details of the present study, however, another piece of its theoretical background – Slobin's (1996) "Thinking for speaking" hypothesis – needs to be introduced.

1.2 The "Thinking for Speaking" Hypothesis

For the last decades research on first language acquisition has shown that children learning typologically different languages provide different amounts and different kinds of information when describing motion events. For instance, Slobin (1996) reported that English-speaking children use twice as many manner verbs as Spanish-speaking children, when talking about motion. This has been attributed to the fact that speakers of satellite-framed languages (such as English) pay more attention to the conflation of Motion and Manner than speakers of verb-framed languages (such as Spanish), in which Motion is usually conflated with the Path component in the verb root (cf. Talmy 1975, 1985, 2000).

(4)	a. The bottle floated into the cave.	(English)
	b. La botella entró en la cueva flotando.	(Spanish)
	the bottle entered in the cave floating	

In order to account for this finding, Slobin (1996) has coined the term "thinking for speaking", which is defined as «a special form of thought that is mobilized for communication» (Slobin 1996:76) and, thus, refers to the role of the language in the process of expressing and interpreting verbal expressions. As rightly observed by Stam (1998), if it is true that linguistic categories play an important role in the shaping of concepts children are going to use in speaking, this would mean that learning a typologically different L2 involves learning another pattern of "thinking for speaking".

Providing evidence from the acquisition of C&G we will show that one important factor constraining the restructuration of the L1 thinking for speaking patterns is the non-linguistic goal path bias. A description of the empirical basis of our study follows in the next section.

2 COME and GO in Polish and Spanish

It has been widely assumed that all languages have a class of motion verbs corresponding to English *come* and *go* and that these verbs lexicalize a universal deictic contrast (cf. Miller & Johnson-Laird 1976, Talmy 2000, among many others).

For instance, in Talmy's (2000) framework C&G are analyzed as a special type of Path-conflating verbs, in which the Path consists of the speaker as a Ground and a deictic vector. As Talmy (2000:56) claims, the deictic vector "typically has only the two member notions, 'toward the speaker' and 'in a direction other than toward the speaker'". Hence C is assumed to denote inherently 'MO-TION TOWARD THE SPEAKER' and G 'MOTION AWAY FROM THE SPEAKER'. These definitions imply, on the other hand, that both verbs are in complementary distribution.

However, as it has been argued by Lewandowski (2010), Talmy's claim is too simplifying, since there is cross-linguistic variation concerning the type of Ground encoded in C&G: whereas in some languages it is constituted crucially by the speaker, in others the Ground may extend to other goals of movement. As a general rule, if such an extension of the deictic centre takes place, C&G tend to alternate. Moreover, the author observes that Polish and Spanish are situated at two extremes of this "deicticity and complementarity scale" (cf. also Ricca 1993): whereas in the latter these verbs express the deictic opposition "motion towards the speaker" vs. "motion away from the speaker", in the former the use of one or the other verb relies on pragmatic factors related to a particular kind of conceptualization of the motion event. In particular, it has been shown by Lewandowski (2014) that the use of C is preferred when the speaker wishes to adopt the perspective of arrival, while G is used when the event is conceptualized from the perspective of departure, which is due to the different temporal orientation of C&G (cf. (1)).

2.1 C&G in Spanish

The Spanish coming verb *venir* typically describes motion toward the speaker's location, whereas the going verb *ir* is used in contexts of movement toward any other goal (cf. (5)).

(5) a. Ven/ *ve aquí a las cuatro. come.IMP go.IMP here at four 'Come/*go here at four.'

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- b. Quién vendrá a vernos a ese lugar tan lejano? who will come to see us to that place so far-off 'Who will visit us in that far-off place?'
- c. Ella fue /*vino a verlos a aquel lugar. she went came to see them to that place 'She visited them in that place.'

The spatial adverb aqui ('here') in (5a) indicates that the speaker is located at the goal of movement at the time when the sentence is uttered ("coding time" in Fillmore's 1997 terms). However, as shown in (5b), *venir* can describe not only motion toward the speaker's location at the coding time, but also toward the speaker's location at the displacement ("reference time" in Fillmore's 1997 terms), that is, toward a place where the speaker will be situated when the displacement takes place. As may be deduced from (5a) and (5c), the Spanish going verb *ir* is in complementary distribution with the verb *venir*: it refers only to motion toward a goal distinct from the speaker.²

Finally, a special case of motion towards the speaker are the so-called comitative contexts, i.e., situations in which the speaker asks the addressee to accompany him/her to a place. In Spanish the use of C is obligatory in such speech acts (cf. (2a)), since they involve, first of all, the addressee's displacement toward the speaker, while the displacement of both the event participants to another goal of movement may be regarded as a less salient property of their illocutionary force (the term is used in the sense of Austin 1975 and Holdcroft 1978).

To sum up, it should be stressed that Talmy's prediction about the lexical semantics of C&G is fully borne out by the Spanish data, since in this language the verb *venir* describes uniquely motion toward the speaker as the Ground (at either the coding or the reference time), whereas *ir* refers to motion in a direction different from the speaker.

2.2 C&G in Polish

As may be appreciated in (6), in Polish both types of verbs can be used in contexts of motion towards *any* Ground, i.e., the speaker (6a, 6b), the addressee (6c, 6d) or a goal beyond the speech act participants (6e).

(6) a. Jan przyszedł wczoraj do mnie. John came yesterday to me 'John came to my place yesterday.'

² Lewandowski (2010: 79-80) shows that the alternation between C and G is apparently allowed when movement toward the speaker's location at the reference time is described, as in (5b). However, he argues that G typically involves the speaker's absence at the goal of movement, whereas C is clearly preferred when the speaker's presence at the goal of movement is implied.

b. Powiedzia	ł jej,	że by	/łem	chory i		żeby	do	mnie	poszła.
he told	her	that I	was	ill	and	that	to	me	went
'He told h	er tha	t I was	ill ar	nd aske	d hei	to co	me	to my	place.'

c. Mówiłeś, że jak ktoś do ciebie przychodzi, you said that when somebody to you comes robisz się nerwowy.
you get nervous
'You said that every time somebody goes to your place, you get

nervous'

d. Najpierw poszli do biura i stamtąd poszli first they went to office and from there they went do ciebie.

to you

First they went to the office and from there they went to your place'

e. Jak tam impreza u Jana? Przyszło dużo ludzi? what about party at John's place came many people 'What about the party at John's place? Did many people go?'

As mentioned, C is preferred when the speaker strongly identifies with the goal of movement and G – when the speaker focuses on the departure point.

In (6a) we can observe that when motion towards the speaker in a neutral context is referred to, C is usually used: since the speaker constitutes the goal of motion, it is natural for him/her to adopt his/her own – arrival-oriented – perspective. However, the use of G is also possible, e.g., when the speaker wishes to convey that he or she identifies with the source-oriented perspective of the person whose words he/she reports, as in (6b). In (6c) and (6d) the Ground is constituted by the addressee. In (6c) the arrival-perspective is taken due to the fact that the speaker relates the event, as in (6b), from the viewpoint of the person whose message is reported. On the other hand, in (6d) the departure perspective is taken because the source-path expression "from there", introduced previously in the discourse, determines the spatial orientation of the utterance. Similarly, although in (6e) the speaker is talking about a party in a place he did not go to, he uses C, because the goal of movement has previously been introduced in the discourse and so it serves as a focal Ground of the narration in the mind of the speaker.

Finally, let us recall that in contrast to Spanish, comitative contexts in Polish require the adoption of a departure perspective, since, as illustrated in (2b), in such speech acts the use of G is obligatory.

In sum, in Polish it is possible to adopt two different perspectives (or construals, in Langacker's 1987 terms) when referring to the same objective spatial situation: the perspective of departure or the perspective of arrival. No such possibility is available in the case of the Spanish C&G, where motion towards the speaker can be depicted uniquely from the perspective of the arrival point (C is obligatory), whereas motion towards any other goal must be described from the perspective of the departure point (G is required).

This cross-linguistic difference involves 5 different conditions of use of C&G: 2 in which the same verbs are used in both languages (Condition 1 and 4 in (7)) and 3 in which the use of a different verb is required (Conditions 2, 3 and 5).

Goal of motion	Polish	Spanish
1. Speaker, neutral context	С	С
2. Speaker, departure perspective	G	С
3. Speaker, comitative context	G	С
4. Non speaker, departure perspective	G	G
5. Non speaker, arrival perspective	С	G

(7) Conditions of use of C&G in Polish and Spanish

As argued by Lewandowski (2014), this phenomenon clearly reflects Slobin's (1996) idea that the resources of a given language determine (to a certain extent) the way the speaker can choose to think about a particular event when speaking about it.

3 The Present Study

As follows, a more detailed description of the present study is provided.

3.1 Hypothesis

Taking into account that there is possibly a pre-linguistic goal path bias in human cognition, as Lakusta & Landau (2005) and Lakusta et al. (2007) suggest, we hypothesized that it would be easier for Polish learners of Spanish L2 to acquire those patterns of use of C&G which involve the shift from a source-oriented perspective to the goal-oriented one (cf. Conditions 2 and 3 in (7)) than the other way around (Condition 5).

3.2 Participants

The experimental group consisted of 30 learners of Spanish at different Polish universities, both male and female. For a participant's data to be included in the analysis all of the following criteria had to be fulfilled: (a) their level of Spanish was not lower than "low intermediate" in order to ensure that they could under-

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stand the experimental items, (b) Polish was the participant's reported native language and (c) the participant had not stayed in a bilingual Spanish autonomous region for more than ten days. The last criterion was thought to prevent the possible inferences with other peninsular languages, such as e.g. Catalan, where C&G behave differently than in Spanish (cf. Lewandowski 2010). 10 native speakers of Spanish acted as a control group. Only Spanish was their reported native language and they had never lived in a bilingual Spanish autonomous region.

3.3 Testing Instruments

We verified our hypothesis using a packet that consisted of (i) a language experience questionnaire, (ii) a cloze test and (iii) an acceptability judgment task designed to test the hypothesis formulated in 3.1. The objective of the language questionnaire was to exclude from the experiment those participants which did not meet the criteria described in 3.2. On the other hand, the cloze test was used in order to measure the participants' proficiency level in Spanish. And finally, the main hypothesis was tested by means of an acceptability judgment task, consisting of 6 sentences and the same number of distractors. The experimental items clearly reflected Conditions 2, 3 and 5 (cf. (7)). Two items per Condition, one grammatical and one ungrammatical, were included (cf. (8)).

(8) a. En la universidad. Carmen está hablando con Juani. At the university. Carmen is talking to Juani. Hola, Juani. ¿Cómo estás? ¿Qué tal la fiesta en casa hello Juani how you are how the party at home de Juan? ¿Fue mucha gente? Yo al final tuve que went many people I in the end had to John's quedarme en casa. stav at home 'Hi, Juani! How are you? What about the party in John's place? Did many people go? In the end I had to stay home. (Condition 5, grammatical sentence) b. Carmen y Juani hablan por teléfono. Carmen está en la universidad y Juani en casa. Carmen and Juani are speaking on the phone. Carmen is at the university and Juani is at home. Juani: Oye, Carmen, esta noche hago una fiesta en mi casa. Juani hear Carmen this night I do a party in my home ¿Te quieres pasar? you want come 'Juani: Listen, Carmen. I am organizing a party this night in my place. Would you like to come?'

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Carmen: Claro que sí, pero vendré sobre las once. Carmen clear that yes but I will come about eleven 'Carmen: Sure, but I will come about eleven.' (Condition 5, ungrammatical sentence)

The order of the experimental items was counterbalanced across different participants. Below each sentence there was a Likert scale with values from -2 to +2 in order to judge a given item as "sounds awkward" for "-2", "sounds bad" for "-1", "I don't know" for "0", "sounds okay" for "+1" and "sounds perfect" for "+2".

3.4 Procedure

The data were collected between August and October 2009 via an on-line video conference. First, all the participants answered a language experience questionnaire and after that they took the cloze test. Next, they were presented with the acceptability judgment task and asked to judge the sentences on a Likert scale from -2 for completely unacceptable to +2 for perfectly acceptable, according to their first impression. Precise instructions with examples not related to the sentences at issue were provided in order to explain the reasons why a sentence should be considered acceptable or unacceptable. The participants took ca. 15 minutes to complete the acceptability judgment task and they were not allowed to go back and modify the responses.

3.5 Results and Discussion

The results of the experiment are graphically represented in (9). The vertical axis represents the percentage of errors, the horizontal axis the three conditions of use of C&G taken into account in the experiment (cf. (7)), whereas the columns on the graph depict the proficiency levels: G1 stands for "low intermediate", G2 for "high intermediate", G3 for "advanced" and G4 for the control group.



(9) Results of the acceptability judgment task.
First of all, the Test of Between-Subject Effects reveals that there are significant differences between Conditions, Groups and there is also a significant interaction between Groups and Conditions (p<0.05 for all these cases), but no significant interaction between subjects within a given group was found (p=0.86).

As far as the interaction between Conditions and Groups is concerned (cf. (9)), it can be observed that Polish speakers of Spanish clearly follow the Polish patterns of use of C&G when motion toward a non-speaker from a goal-oriented viewpoint is described (Condition 5), independently of the level of proficiency. Polish requires the use of C under this condition, whereas in Spanish G is obligatory. The results show that it is practically impossible for Polish native speakers to learn this condition of use, since even the advanced learners group make almost the same amount of errors as the low intermediate group (95% vs. 79% of incorrect responses). The repeated measures ANOVA indicates that the difference between all the Polish learners groups and the Spanish control group is statistically significant (p=0.000 for all the proficiency levels).

The situation is quite different in the case of Condition 2. Although none of the proficiency groups acquired a native speaker-like command of this condition of use and there is a significant difference between the answers of the control group and all the proficiency levels (p=0.000 for all cases), a slight progression is observed, since the percentage of error decreases from about 84% to 50 %. Quite interestingly, also the Spanish control group gave incorrect responses in the 15% of cases.

Analogously, a clear progression in the acquisition of Condition 3 is observed, since the percentage of errors decreases from 77% to 23%. From the statistical viewpoint, there is a significant difference between the answers of the control group and the low intermediate and high intermediate proficiency levels (p=0.000), but there is no significant difference between the answers of the control group and those of the advanced learners of Spanish (p=0.07).

Thus our hypothesis is borne out. Undoubtedly, there is L1 thinking for speaking influence in the acquisition of all the conditions of use of C&G by Polish speakers of Spanish L2 even at advanced stages. However, as expected, the L1 thinking for speaking patterns involving the shift from G to C (Conditions 2 and 3) are easier to be restructured than the thinking for speaking patterns involving the shift from C to G (Condition 5). In our view, this is due to the goal-bias in human cognition, since the use of C instead of G implies adopting a new thinking for speaking pattern focusing on the final point of movement, whereas the use of G instead of C involves adopting a new source- or departure-oriented perspective.

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4 Concluding remarks

In this paper we reported on the results of an experimental study dealing with the acquisition of C&G by Polish speakers of Spanish as L2. We conducted an acceptability judgment task involving three conditions of use of these verbs (Conditions 2, 3 and 5, summarized in (7)) in order to verify the hypothesis of whether a source-goal asymmetry in human cognition is involved in SLA. The results of our experiment clearly support this hypothesis, since we observed a certain progression in the acquisition of the conditions entailing the shift from a source-oriented perspective (G) to the goal-oriented perspective (C) as language proficiency increases (Condition 2 and Condition 3). In contrast, no progression in the acquisition of the shift from the goal-oriented perspective to the source-oriented one (Condition 5) was found.

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University of Copenhagen Department of English, Germanic and Romance Studies Njalsgade 128 2300 Copenhagen S Denmark

woj.lewandowski@gmail.com

Subject Relatives and Expletives in Early New High German

CAITLIN LIGHT University of Pennsylvania

Introduction

The status of the subject position in German has been the source of some debate.¹ For example, some studies (Biberauer 2004; Richards and Biberauer 2005) have argued that German does not have an EPP requirement in the traditional sense. The absence of an expletive that occurs specifically in the subject position (as opposed to the topic position in Spec,CP) seems to support the argument that Spec,TP has no special status in German.

This paper will argue against such analyses, and show that in historical stages of German, we see evidence of a subject expletive licensed specifically to fill Spec,TP. This expletive, *da* in Early New High German (ENHG), is merged specifically when the logical subject does not move to Spec,TP, leaving the position empty. This supports a traditional analysis of the EPP in German. Furthermore, I will show that the existence of expletive *da* lends support to the argument that two (non-topic) subject positions are available in the German clause structure (cf. Haeberli 1999, 2000, 2005), which I take to be Spec,TP and Spec,vP (the base position of the subject).

This study is based on data from a parsed corpus of Martin Luther's *Septembertestament*, a translation of the New Testament published in 1522. Luther intended for his Bible translation to be accessible to a wide audience, and hence the text represents a more colloquial sample of ENHG. The *Septembertestament* corpus, at the time of this study, consisted of approximately 40,000 words that have been fully POS-tagged and parsed. This provides a sample of 1,716 subordinate and 2,996 main clauses.

The paper will proceed in the following way. In Section 1, I will outline the behavior of *da* in ENHG. Section 2 will introduce some related constructions else-

¹ I would like to thank Anthony Kroch, Julie Legate, Dave Embick, and Joel Wallenberg for their assistance in this work. I am also deeply grateful to Beatrice Santorini and Florian Schwarz, who provided the Modern German judgments used in this paper. Of course, any errors are my own.

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where in the Germanic family. I will review previous analyses of the behavior of *da* in contemporary German in Section 3. A discussion of the element's historical origins will be presented in Section 4. I will give my own analysis of *da* in Section 5. Finally, in Section 6, I conclude.

1 The behavior of *da* in Early New High German

The pronominal adverb *da* is generally locative, although it can also have a temporal interpretation, dependent on context. In both ENHG and contemporary German, *da* is also available as a complementizer. The following examples show ENHG *da* behaving as a locative (1) and temporal (2) adverb, and a complementizer (3).

- (1) Vnd es waren da viel weyber ... and it was DA many women ... 'And there were many women there.' (Septembertestament, Matthes 27:55)
- (2) Da berieff Herodes die weysen heymlich ...
 DA appointed Herod the wise secretly 'Then Herod secretly appointed the wise men.' (Septembertestament, Matthes 2:7)
- (3) vnd da sie yhn sahen, fielen sie fur yhn nyder...
 and DA they him saw fell they before him down
 'And when they saw him, they fell down before him.'
 (Septembertestament, Matthes 28:17)

Note that, like other demonstratives (such as the personal demonstrative pronouns *der*, *die*, and *das*), locative *da* may also be used as a relative pronoun in ENHG, alternating with the *wh*-word *wo* 'where.' I do not count this as a separate property of *da* because it behaves like other demonstratives in this sense.

All of these facts are essentially unchanged between ENHG and contemporary German. However, the ENHG element *da* differs in one significant respect: in subordinate clauses, it shows a high correlation with the position of extracted subjects, particularly in relative clauses and free relatives.

- (4) Simon, der do heyst Petrus Simon who DA is-called Peter
 'Simon, who is called Peter'
 (Septembertestament, Matthes 4:18)
- (5) Selig sind, die da geystlich arm sind blessed are who DA spiritual poor are 'Blessed are those who are spiritually poor.' (*Septembertestament*, Matthes 5:3)

Subject Relatives and Expletives in ENHG

The use of *da* in these examples sounds archaic, and in fact distinctly biblical, to native German speakers. They are not acceptable as contemporary German utterances, even if they are adjusted to exclude DP extraposition and other constructions which are no longer grammatical in German. The behavior of *da* has clearly undergone some change since the ENHG period.

In subordinate clauses, *da* is almost entirely restricted to clauses with gaps. Even more significantly, only subject gap clauses show this effect. Out of the 79 subordinate clauses where *da* occurs, only three appear in clauses without a subject gap.

	da	No da	Total
Clauses with gaps	77	422	499
All other subordinate	2	1146	1148
Total	79	1568	1647

Figure 1: Appearance of da in different types of subordinate clauses

Figure 2:	Appearance	of da	in clauses	with gaps
0	F F C C C C C C C			0.0

	da	No da	Total
Subject gap	76	326	402
Non-subject gap	1	96	97
Total	77	421	499

In the subject gap examples where *da* appears, it is uniformly clause-initial. In contrast, the single example of *da* in a clause with a non-subject gap is *not* clause-initial, shown in (6). This example is a fairly unremarkable example of *da* as a locative adverb. The behavior of *da* in subject gap clauses seems to suggest an entirely different phenomenon.

(6) vnd wie viel korbe hubt yhr da auff? and how many baskets lifted you DA up 'And how many baskets did you collect there?' (Septembertestament, Matthes 16:9, 16:10)

Although *da* is available both as a complementizer and a relative pronoun in ENHG, as I discussed above, I will argue that the *da* correlated with subject gaps is neither. This *da* almost always occurs below an overt relative pronoun, making it clear that it cannot itself be a relative pronoun. In addition, when it is used as a

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relative pronoun (as discussed briefly above), *da* has a locative interpretation, and corresponds to the extraction of a locative adjunct, not a subject.

Further evidence demonstrates that this *da* is not a complementizer. The corpus provides two examples of "subject gap" *da* occurring below an overt complementizer, as shown below.

- (7) a. vnd wirtt eyn bawm das da komen die vogel vnder dem hymel and becomes a tree that DA come the birds under the heaven 'And (it) becomes a tree, so that the birds of the heavens come.'
 (Septembertestament, Matthes 13:32)
 - b. Wer sagen die leutt, das da sey des menschen son?
 who say the people that DA is of-the man son
 'Who do the people say is the son of man?''
 (Septembertestament, Matthes 16:13)

In (7a), an adverbial clause headed by the complementizer das (Modern German $da\beta$) has clause-initial da in the subject gap created by extraposition of the subject (evident because the subject DP occurs after the finite verb). In (7b), the subject of a complement clause is extracted, and do (an alternate spelling of da) appears in the clause of its origin, again below the complementizer das. Based on these two examples, we can safely exclude the possibility that the da correlated with subject gaps is a complementizer. The evidence calls for an alternative analysis.

2 Subject gaps in Germanic

This phenomenon is not wholly unique cross-linguistically. Several languages in the Germanic family have constructions in which subject gaps left by extracted subjects are filled by expletive elements. In order to provide a context for the puzzle at hand, I will review two such cases. A better understanding of the mechanisms underlying these phenomena may help explain the behavior of *da* in ENHG.

2.1 Danish der

In Danish, the element *der* appears clause-initially in relative clauses and indirect questions with a subject gap (cf. Jacobsen and Jensen 1982; Erteschik-Shir 1984; Vikner 1991; Mikkelsen 2002). The following examples demonstrate that *der* is grammatical in an indirect question where the subject has been extracted, but not permitted in a similar example if the object has been extracted instead.

(8) Jeg ved ikke hvem der kan li' ham.I know not who DER likes him'I don't know who likes him.'

(9) * Jeg ved ikke hvem der han kan li'.
I know not who DER he likes
'I don't know who he likes.'
(Erteschik-Shir 1984)

The literature is divided on whether this element is the subject expletive *der* 'there' occupying the gap (Erteschik-Shir 1984; Mikkelsen 2002), or a homophonous element in C (Jacobsen and Jensen 1982; Vikner 1991). There are two obvious reasons to position *der* in the subject gap (Spec,TP). The first is that *der* does not appear in clauses with a non-subject gap. The second is that *der* is independently attested as a subject expletive in Danish, so it is clearly available to occupy Spec,TP.

Mikkelsen (2002) shows that the distribution of *der* supports this analysis. It is marked, but acceptable, for *der* to occur with the complementizer *at* and the element *som*, which Mikkelsen analyzes as an invariant operator (like OP) in Spec,CP. Whenever any of these elements co-occur, they *must* be in the order *som at der*, requiring *der* to appear below the complementizer. The analysis of *der* as a C-element requires CP-recursion to account for this structure, while idiosyncratic properties of each head must explain the ordering restriction. However, the assumption that *der* is in Spec,TP predicts exactly this distribution.

Vikner (1991) suggests some problems with the expletive analysis which must be addressed. There is generally a transitivity restriction on the appearance of the expletive, as well as a restriction on the definiteness of the logical subject. When *der* appears in the subject gap position, it defies both of these restrictions.

(10) a. vi kender de lingvister der vil læse denne bog we know the linguists DER will read this book 'We know the linguists who will read this book.'
(Vikner 1991)

Because German (unlike Danish) does have transitive expletive constructions, the first issue is unique to the Danish case, and a discussion of it is beyond the scope of this paper. I will focus instead on the definiteness problem. In response to Vikner's point, Mikkelsen proposes that the gap in relative clauses behaves like an indefinite, even when its antecedent is not. This has been previously argued, particularly for English (cf. Browning 1987; Bianchi 1999), based on examples like the following:

- (11) a. * There were the men in the garden
 - b. The men that there were in the garden were all diplomats (Browning 1987)

I find the judgment in (11b) tricky, but agree that it is certainly more acceptable than (11a). Furthermore, in isolation, the phrase *the men that there were* seems

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relatively natural. Mikkelsen (2002) proceeds by relating this to the argument made in Reinhart (1987), that relative *wh*-words in English are inherently indefinite. Mikkelsen suggests that the evidence provided by *der* motivates us to extend this analysis to Danish, to explain why the relative pronouns seem to be patterning as indefinites.

2.2 Yiddish subject gaps

Yiddish is a symmetric V2 language: verb-second orders are required both in matrix and subordinate clauses. If the subject is not raised to the topic position, the expletive element *es* may appear instead. However, if another constituent is topicalized, *es* is not licensed. More importantly for our purposes, the expletive also appears in subject gap position, when the subject is extracted from a free relative or indirect question (cf. Diesing 1990, 1997; Prince 1993, 1989). This does not take place in 'ordinary' relative clauses.

- (12) a. Ikh veys nit ver es iz gekumen I know not who ES is come'I don't know who came.'
 - b. * Ikh veys nit ver iz gekumen
 - c. Ikh veys nit vos Max hot gegesn
 I know not what Max has eaten
 'I don't know what Max ate.'
 - d. * Ikh veys nit vos Max hot **es** gegesn (Diesing 1990)
- (13) a. Der melamed vos iz besser far ir iz beser far mir.the teacher that is better for her is better for me'The teacher that is better for her, is better for me.'
 - b. * Der melamed vos **es** iz beser far ir iz beser far mir. (Prince 1989)

Free relatives and indirect questions clearly have a special status here. Prince (1989) argues that the relevant characteristic of these clause types is that the extracted element represents brand-new information in the discourse, unlike relative clauses, which have a clear referent. This allows us to relate the expletive in subject extraction contexts to the expletive in the Yiddish 'subject postposition' construction. As in the subject gap examples, subject postposition triggers *es* insertion in the case that no other element is topicalized.

(14) a. **a yid** geyt farbay oyf-n gas. a guy goes by on-the street 'A guy passes by on the street.' b. es geyt farbay oyf-n gas a yid. ES goes by on-the street a guy (Prince 1989)

Using a small corpus of narrative Yiddish, Prince (1989) demonstrates that subject postposition in Yiddish is more frequent with brand-new subjects. Prince argues that in indirect questions and free relatives, the extracted element is pragmatically treated as brand-new, because it is not related to any elements already present in the discourse. As a result, they are extracted from the postposed position. The insertion of the expletive *es* in these cases is required because there is no subject trace in the topic position, and the expletive is licensed to fill the gap.

This analysis cannot be directly applied to the ENHG data under consideration. Unlike *es* in Yiddish, ENHG *da* is attested in ordinary relative clauses. In addition, because Yiddish is a symmetric V2 language, we know that there is a requirement to fill the topic position in subordinate clauses. In German, subordinate clauses have no topic position. Expletive *es* is frequently ungrammatical in embedded contexts, where it would be required in a matrix clause, because it is generally licensed to fill the topic position in Spec,CP. This raises the question of whether the subject position must be filled in German subordinate clauses. The present study will, in fact, prove relevant to this issue.

3 Previous analyses of *da*

The previous section has shown several Germanic languages which require an expletive to fill a gap left by a subject. This seems to fit with the facts we have seen for ENHG. However, as I will demonstrate, *da* is clearly not an expletive in German as it is spoken today.

In normal usage, *da* may carry either a locative or temporal interpretation according to context, much like *there* in English (cf. Bayer and Suchsland 1997; Koeneman and Neeleman 2001; Kratzer 2004; Richards and Biberauer 2005). This ambiguity of interpretation often makes it difficult to identify whether *da* may be semantically null in a clause. Despite this, I will provide evidence that *da* cannot be analyzed as an expletive in Modern German.

Bayer and Suchsland (1997); Richards and Biberauer (2005) have proposed that *da* may in fact be used as a subject expletive in Spec,TP, which may be merged into the subject position when the logical subject remains low.

- (15) a. daß (da) gestern ein Schiff versunken ist that (DA) yesterday a ship sunk is
 ... that a ship sunk yesterday.'
 - b. * daß **da** ein Schiff gestern versunken ist
 - c. daß ein Schiff gestern versunken ist (Richards and Biberauer 2005)

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In (15a), we see that the proposed expletive *da* may appear if an adverb (*gestern*) intervenes between it and the logical subject, which must therefore (presumably) be low. If the logical subject appears to the left of the adverb, as in (15b), the sentence becomes ungrammatical, while (15c) shows that it is perfectly acceptable when *da* is omitted. Richards and Biberauer (2005) argue that this is evidence that *da* is an expletive that may fill a high subject position. They argue that because the EPP in German does not behave as it does in languages like English, filling this position is optional; but if the subject raises from its base position, the expletive element should be disallowed.

This is an attractive analysis for da. However, it must ultimately be rejected, for contemporary German at least. With further exploration, it becomes evident that native German speakers easily accept the sentence in (15b), contrary to the judgments in Richards and Biberauer (2005). Furthermore, sentences such as these are not possible without a locative (or temporal) interpretation for da, which cannot be semantically null. When paired with another locative, the sentence generally gains a redundant or contradictory reading.

- (16) a. ? Ich glaube, daß da auf der Party getanzt wurde.
 I believe that DA at the party danced became
 'I believe that there was dancing there, at the party.'
 - b. ?? Ich glaube, daß auf der Party da getanzt wurde.

(17) Ich glaube, daß da in China angerufen wurde.
I believe that DA in China up-called became.
'I believe that someone in China was called (from there).'

Although the examples in (16) are not ungrammatical, the presence of da is considered redundant, pointing to the same location as the adjunct *auf der Party*. In contrast, (17) is interpreted such that da and *in China* are actually indicating *different* locations; while China is identified as the place where the call was received, da is consistently interpreted as referring to the place where the call was *made* – that is, the location of the agent. These examples provide evidence that da cannot have the semantic properties of an expletive in contemporary German.

Furthermore, the structural position of *da* does not fit this analysis. In German, weak pronouns are necessarily high in the structure. If an object pronoun is also included in the sentence, it must occur to the left of *da*.

- (18) a. * Ich glaube, daß da er ihn gegessen hat.I believe that DA he it eaten has 'I believe that he ate it there.'
 - b. * Ich glaube, daß er **da** ihn gegessen hat.
 - c. Ich glaube, daß er ihn **da** gegessen hat.

The position of *da* thus does not match with the claim that it occupies Spec,TP. What we see instead is that in Standard German, *da* is weak, and behaves much like weak pronouns in German. As a result, it prefers a position at the left periphery of the clause, often string-adjacent to the material in C. However, it must appear after a pronominal object. Weak elements in German follow an ordering hierarchy: weak adverbs like *da*, for example, must be lower than a weak object pronoun (cf. Lenerz 1977). The fact that *da* tends to appear at the left periphery is completely expected, simply because it is weak.

An alternative analysis of *da* has been proposed by Kratzer in the literature on situational semantics, which captures the ambiguous interpretations associated with the element. She suggests that *da* may be considered a *situation pronoun*, an adverbial pro-form which may be used to refer to any salient information in the context situation.

- (19) Was riecht denn da so komisch?what smells PART DA so funny'What's the strange smell here?'
- (20) Da brandelt was.
 DA burns something 'Something is burning.'
 (Kratzer 2004)

As I have noted before, non-subject gap *da* in ENHG has the same general properties as *da* in Modern German, including an ambiguous and context-dependent interpretation. I will therefore assume that the general usage of *da*, both in ENHG and in Modern German, falls under Kratzer's analysis (excluding, of course, its use as a complementizer or relative pronoun). However, as it stands, this analysis offers no further insight into the particular correlation between *da* and subject gaps. Instead, in the next section, I will show that the necessary evidence can be found farther in the past.

4 The historical origins of expletive *da*

Regular sound change led to the collapse of two OHG adverbs, $th\bar{o}$ 'then,' and $th\bar{a}r$ 'there,' into a single adverb da. This led to the element's ambiguous interpretation (cf. Axel 2007), allowing it to develop into a situation pronoun by the modern period. However, only the behavior of OHG $th\bar{a}r$ offers insight into the curious behavior of subject gap da in ENHG. In fact, $th\bar{a}r$ shows a correlation with subject gaps, just as we have found for da in ENHG.

It is simpler to diagnose $th\bar{a}r$ as an expletive than da, because it does not have the semantic ambiguity we have seen in ENHG (having not yet merged with the temporal adverb $th\bar{o}$). Instead, if $th\bar{a}r$ does not have a possible locative interpretation in a given clause, it can be assumed to be semantically null. In order to explore

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the behavior of *thār* in these cases, I considered a small sample from the OHG *Tatian* text. This sample included 56 relative clauses, 41 of which had a subject gap. As predicted, many of the subject gap examples included an instance of *thār*, with no possible locative interpretation.

- (21) bithiu uuanta mir teta mihhilu thie thār mahtīg ist because since to-me does much that THAR mighty is 'Because the Mighty One did great things for me' (Lucas 1:49)
- (22) Thie thār habē orun thie hore.
 that THAR have ears that hear
 'He that has ears to hear, let him hear.'
 (Matthes 13:43)

As in ENHG, *thār* occurs almost exclusively in the position of an extracted subject. Although the sample size is too small to say with complete confidence, this data allows a tentative estimate that *thār* occurred in subject gaps about 50% of the time in OHG.

	thār	No thār	Total
Subject gap	21	20	41
Non-subject gap	1	14	15
Total	22	34	56

Figure 3: OHG thar in clauses with a gap

I also compared the subject relatives in this sample to 35 parallel clauses from the *Septembertestament* which were also translated as a subject relative. The frequency of $da/th\bar{a}r$ has significantly decreased between the two time periods (chisquare = 5.29, p = 0.021). This suggests that the use of the subject expletive has already begun to decline by the ENHG period.

Figure 4: The subject expletive in OHG and ENHG

	da/thār	No da/thār	Total
OHG	21	20	41
ENHG	8	27	35
Total	29	47	76

According to this preliminary study of OHG, we can establish the following stages: in OHG, *thār* was available as an expletive, to optionally fill Spec,TP when

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the subject is extracted. In ENHG, *da* shows the same property, although its status as an expletive is obscured by the semantic underspecification of the situation pronoun *da*. In Standard German, *da* is no longer available as an expletive in any environment. In the next section, I will propose an analysis for the historically attested occurrence of *da* in subject gap position, and show how it offers new insight into the status of the subject in the Germanic languages.

5 Analyzing *da* in Early New High German

From OHG until the present day, da patterns as a weak adverb, preferring a position in the left periphery of the verbal domain. In addition, while da is never used as a subject expletive in Standard German today, its OHG cognate $th\bar{a}r$ 'there' did have this function. I have shown that ENHG can be taken as the middle stage in between these two systems: ENHG shows frequent use of the situation pronoun da, but also some evidence of a subject expletive da inherited from OHG.

Because of the ambiguous interpretation of the situation pronoun, I have shown that it is often difficult to distinguish semantically null cases of *da* from cases that are behaving as referential pro-forms for a less obvious situational context. However, the examples of *da* in subject gap position may occur in non-narrative and even 'timeless' contexts, in which there is literally no salient situation for it to refer to. When supported by the OHG evidence, this becomes clear evidence that subject gap *da* has the properties of a true expletive.

- (23) Jhesu Christi, der do ist ein son Dauids des sons Abraham.
 Jesus Christ who DA is a son of-David the son of-Abraham
 'Jesus Christ, who is a son of David, Abraham's son.'
 (Septembertestament, Matthes 1:1)
- (24) Selig sind, die da geystlich arm sind.
 blessed are who DA spiritual poor are
 'Blessed are those who are spiritually poor.'
 (Septembertestament, Matthes 5:3)

As Prince (1989) argued for Yiddish, I will propose that *da* occurs in Spec,TP when the subject is extracted from a position lower in the clause. However, unlike Yiddish, the appearance of *da* in subject gaps is optional (the evidence from OHG, in which the expletive occurs in roughly 50% of the subject gap clauses, supports such an assumption). My analysis of the ENHG expletive must hinge on a mechanism which allows subjects to optionally remain low.

Haeberli (1999, 2000, 2005) discusses two subject positions in the Germanic language family. Weak subject pronouns are restricted to the high position, as we have discussed above; full DP subjects, meanwhile, may optionally remain low. I follow Wallenberg (2009) in assuming these positions to be Spec,TP and the base

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position of the subject in Spec, *v*P. Wallenberg also notes that the low subject position in German is related to the 'definiteness effect' discussed by Diesing (1992). Definite DPs, Diesing observes, prefer a high position; only indefinite subjects may (optionally) remain low.

I argue that in historical Germanic, expletive da is licensed when the subject is extracted from its base position in Spec, vP without first raising through Spec, TP. As Mikkelsen (2002) claims for der in Danish (Section 2.1), there is reason to believe that the gaps in subject relatives are inherently indefinite, regardless of the characteristics of their antecedents. Therefore, I argue that the subject of a relative clause behaves like an indefinite DP in German as well, and may optionally remain low (before extraction). In these cases, da is inserted to fill the empty position in Spec, TP.

This argument has the following consequences. First, the expletive *da* provides evidence that there is an EPP feature on T in German. When the extracted subject does not leave a trace in Spec,TP, the expletive is licensed to satisfy the EPP in its place. The evidence indicates that this feature changed at some point between OHG and contemporary German. This suggests that a null expletive became available to fill Spec,TP, and eventually replaced *da* in this function. As a result, *da* lost its expletive function, and behaves only as a situation pronoun in the modern language.

Second, the presence of *da* becomes support for the claim that there are two subject positions in German: the expletive may only occupy Spec,TP if the extracted subject can be licensed in a low position. Otherwise, we expect the subject trace to fill Spec,TP. We cannot easily motivate an analysis in which *da* is a pronounced version of the subject trace, because subject gap *da* is optional. By relating expletive *da* to the low subject position in German, we account for its optionality: indefinite subjects may be extracted without passing through Spec,TP. In this case, an expletive is licensed to fill the empty position. The subject may also move to Spec,TP, making the insertion of *da* unnecessary and impossible.

6 Conclusion

Understanding the behavior of *da* in ENHG has required not only that we compare the facts in contemporary German, but also that we look deeper into the past. By considering *da* in all attested stages of the language, we find that it has remained quite stable in some respects, but changed in others.

The exploration of this phenomenon has led to a deeper understanding of the subject position in German. The proposal of two subject positions in Germanic is supported by the behavior of *da*, which may only be licensed if the subject is extracted from its base position, and does not move through Spec,TP. In addition, we have seen evidence that the EPP in German behaves much as it does in languages like English.

This study relied on evidence drawn from the Septembertestament corpus of

Early New High German, as well as some pilot research using a small corpus of Old High German texts. This shows the importance of parsed corpora to empirical syntactic research. By using tools such as these, we come to understand synchronic facts of a language in ways that are not evident when viewed in isolation.

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Caitlin Light University of Pennsylvania Department of Linguistics 619 Williams Hall Philadelphia, PA 19104

clight@babel.ling.upenn.edu

An Embodied Account of Argument Structure Development

Josita Maouene¹, Nitya Sethuraman², Mounir Maouene³ and Linda B. Smith⁴

Grand Valley State University¹, MI; University of Michigan Dearborn²; Universite El Assaadi, Tangier, Morrocco³, Indiana University, Bloomington⁴.

Introduction

Theorists of verb learning concentrate on the abstract structure of the knowledge to be acquired and the contexts that support learning. This emphasis on the abstract has led to insights about universal principles (e.g., Lidz, Gleitman, & Gleitman, 2003), the role of parental input (e.g., Tomasello, 2003), shared knowledge and other factors of discourse-pragmatics (Clancy, 2004; DuBois, 1987), gaze and joint attention (Allen, 2007; Skarabela & Allen, 2002; Skarabela, 2007), and information from language itself in verb learning and syntactic development (e.g., Naigles, Gleitman, & Gleitman, 1993; Goldberg, Casenhiser, & Sethuraman, 2004). Researchers have rarely considered the physical properties of the bodies of the learners.

However, all information enters the cognitive system through the body. Thus, it is possible that the body—and its morphology—may also play a role in structuring knowledge and acquisition. This idea is particularly cogent in the case of verbs, since early learned verbs are about bodily actions and since recent advances in cognitive neuroscience (Pulvermueller, 2005; James and Maouene, 2009) indicate that the neural processing of common verbs activates the brain regions responsible for the specific body parts that perform those actions. Here we provide initial evidence these body-part verb relations may also be related to the argument structures associated with specific verbs. We will conclude that in the same way that verb meaning and argument structure develop out of correlations in *linguistic experiences*, they may also develop out of correlations in *body experiences*.

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1 Rationale

Study 1 examines the body parts most commonly associated with early-learned verbs by adults and children (36-60 months). This study shows consistent and coherent structure in the association of body-parts and common verbs.

Study 2 examines associations of objects with these verbs. Adults were asked to associate the 101 verbs from the MCDI with one specific object. These analyses provide the basis for a subject (rather than linguist)-based categorization of the verbs as (primarily) Transitive, Instrumental, Subject, Locative, or Other. Using the evidence from Study 1, we then show that these classifications are tightly tied to the body part that performs the action labeled by the verb.

Study 3 examines children's speech (CHILDES) to determine whether these verb-object correlations exist in their speech using the same categorization scheme as in Study 2. Again, there is a strong correlation between body part and syntactic frames.

Study 4 provides a direct test by presenting adults and children with novel verbs in different frames and examining the body parts used to act out the verb.

2 Connecting verbs to body parts

It seems obvious that at least some concrete verbs are about actions done by specific body parts: we *kiss* with our *lips*, we *run* with our *legs*, we *give* and *get* with our *hands*. To examine systematic correlations between body parts and earlylearned verbs, Maouene, Hidaka & Smith (2008) asked 50 adults to name the main body part suggested by each of 101 early-learned verbs from the MacArthur Communicative Development Inventory (MCDI: Fenson, Dale, Reznick & Bates, 1994). This inventory includes the verbs that are normatively in the productive vocabulary of at least 50% of children learning American English by 30 months of age. (Two verbs on the MCDI, *stay* and *tear* were omitted by experimental error).

Results: Sixty-one uniquely different body-part words were offered by the participants. However, just 15 unique body-part terms accounted for over 84% of the associations. A correspondence analysis (dimension reduction technique) of the 61 body parts by 101 verbs matrix indicated that the 4 first dimensions accounted for 34.7% of the variance among the judgments and revealed 5 main body part regions: EYE, MOUTH, LEG, HAND, EAR as shown in Figure 1. For the purpose of the present article we collapse EYE, MOUTH, EAR verbs into HEAD related verbs. Of the 101 examined verbs, by this measure, 54 were hand verbs, 13 were leg verbs, and 19 were head verbs. 15 other verbs were related to multiple body regions.



Figure 1. Similarity structure of body part associations in adult judgments. Each verb is a dot. Close verbs have similar body part associations (from Maouene, Hidaka & Smith, 2008).

2.1 Children's Associations of Verbs and Body Parts

Next, we asked 60 children, ranging from 36-60 months of age, to make a comparable judgment on the same 101 verbs by answering the question *What part of your body do you use to*____? Each child saw a subset of 20 verbs, so 10 children total saw the same 20 verbs (some verbs appeared twice for consistency control).

Results: 48 unique body parts were offered by the children. Applying the same dimension reduction technique to the 48 by 101 matrix, we found as seen in Fig. 3, that children form patterns of associations similar to those formed by adults, in that five major regions of the body organize verbs: EYES, EAR, MOUTH, HANDS, LEGS. The correlation between children and adult judgments is strong, r=0.85, p<.001. Children and adults have the same ideas about how common verbs connect to body parts.



Figure 3. Similarity structure of body part associations in child judgments. Each verb is a dot. Close verbs have similar body part associations.

3 Connecting Verbs, Objects, Transitivity and Intransitivity and Body Parts

As a first step, we examined the *first* dictionary entry of the 101 MCDI verbs as indicating whether that verb was transitive or intransitive. For 74% of the HAND verbs, the verb was transitive by this criterion; 88% of the first dictionary entries for HEAD verbs were transitive; but 88% of the first dictionary entries for LEG verbs were intransitive. This is a first indication of a link between the relational meaning of a verb and the body part that performs the action.

3.1 Adult's Object Associations

A perhaps more direct way to look at transitivity is to ask speakers of the language what kinds of objects "go with" these verbs.

Participants: The participants were 286 college undergraduates, whose native language is American English.

Stimuli: The verbs were 101 transitive verbs from the Bates-MacArthur Communicative Developmental Inventory for American English (MCDI, Fenson, Dale, Reznick & Bates, 1993).

Procedure: Participants were tested individually. Each was given a randomly ordered list of verbs on a computer screen, one verb at a time, and asked to supply (by typing the word on the keyboard) the *one object* that first came to mind given the verb. There were no constraints and no definition of what was meant by "object;" in this way, these are free associations and measure the strength of the connection in semantic memory between the verbs and the produced associate. We chose this metric based on past evidence that adult word associations directly reflect the contiguity, semantic, and frequency properties of words in the language (Deese, 1965). Co-occurrence in particular seems to be a primary factor (Lund,

Burgess, & Audet, 1996; Spence & Owens, 1990), with words that appear together in language more frequently also having a higher likelihood of appearing in associative pairs.

Analyses: For the following analyses we only considered the most frequently named noun for each verb. Then three independent coders sorted the relationship between each verb and its most frequently named object into one of five basic relations: Transitive – Subject – Instrumental – Locative – Other. Finally we considered the preferred body part associations of each of those 101 verbs (from study 1) and the mean percentage of each body region for each relation was computed.

Results: 80 verbs out of 101 were attributed to one of the five categories of interest (Transitive, Instrumental, Locative, Subject, Other) with 100% agreement among the coders after error corrections. The following results consider these 80 verbs. The objects that were coded as standing in a transitive relation with the verbs are Hand verbs (76%). The objects that were coded as standing in an instrumental and transitive relation are Head verbs (respectively 33% and 43% of the sample). The objects that were coded as standing in a locative relation with verbs are mostly Leg verbs (46% of the sample).



Figure 4: Proportion of main body part associate (from Maouene et al., 2008) per each type of relational structure.

These results, along with the dictionary definitions again suggest a relation between the relational meanings of verbs and the body parts that do the action.

3.2 Co-occurrences Verbs-1stNouns in CHILDES

Here we seek converging evidence for a relation between the relational meaning of verbs and body parts by examining co-occurrences of verbs and objects in the

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CHILDES database (McWhinney, 2000). We chose to examine co-occurrence on three grounds. First, comparisons of adult judgments and co-occurrence patterns in child corpus analyses yield correlated patterns (Kidd & Bavin, 2007). Second, co-occurrence patterns have been shown to be highly reliable indicators of syntactic categories but are, in and of themselves, objective and not dependent on a priori commitments about the properties of the words (Lund & Burgess, 1996). Third, the co-occurrence patterns in the input themselves are part of the data from which children learn verbs and syntactic relations.

All of the corpora, a total of 36, in the American English portion of the database were used. In all, there were 2,163 transcripts comprising 1,481,858 transcribed utterances. Speech by 899 children were analyzed; the children in these conversations ranged in age from 6 months through 10 years, although the majority of children were between 1 to 5 years. The co-occurrence counting procedures used a computer program written in Python using the SciPy libraries (Jones, Oliphant, & Peterson, 2001). The program examined the morphosyntactic coding to identify nouns (pronouns were excluded) and the 101 verbs from Study 1. All forms of a verb (*splash, splashed, splashing*) were considered to be the same verb. For each verb, the program extracted the first noun after the verb. Then three independent coders sorted the relationship between each verb and its most frequently named object into one of five basic relations from the adult associations study: Transitive — Instrumental – Locative – Subject – Other. Finally we considered the preferred body part associations of each of those 101 verbs (from study 1) and the mean percentage of each body region for each relation was computed.

Results: 64 verbs out of 101 were attributed to one of the five categories of interest (Transitive, Instrumental, Locative, Subject, Other) with 100% of agreement among the coders after grammatical error corrections. The following results consider these 64 verbs. The objects that were coded as standing in a transitive relation with the verbs were Hand verbs in 64% of the sample of hand verbs. The objects that were coded as standing in transitive relation were Head verbs in respectively 64% of the sample of head verbs. The objects that were coded as standing in a locative relation with verbs were again mostly Leg verbs in 48% of the sample of leg verbs.



Figure 5: Proportion of the main body part associate (from Maouene et al., 2008) per each relational structure type.

This corpus analysis in conjunction with the adult object associations and the dictionary definitions support the idea that there are systematic associations between the relational meanings of verbs and the body-parts that do the actions. None of the three analyses –dictionary definition, adult associations, CHILDES analysis –are perfect. Yet they all agree. There is structure in the language with respect to a verb's relational meaning and body parts.

4 Connecting body parts to made-up sentences: Body parts to syntactic frames experiment

Do children and adults know and use this structure? To address this question, we gave participants sentences with structured frames and novel verbs and asked them to guess whether the action was performed by hand, head or leg.

The participants were 12 adults, 12 four- to five-year-olds, and 12 five-to sixyear-olds, mean age of respectively 57 months and 76 months, who heard eight made-up sentences with different sentential structures, corresponding to [NP V], [NP V NP], [NP V with NP], [NP V to NP], [NP V on NP], [NP V at NP], [NP V NP to NP], and [NP V-S], for a complete list, see Appendix III. We grouped [NP V to NP], [NP V on NP], [NP V at NP] under [NP V loc].

We used pseudo words, each appeared in as a noun or a verb in the experiment. The carrier sentences maintained English determiner and prepositional structures. Participants were given the following instructions: Let's play a guessing game. You are in a pretend world where people speak a language that is half English and half something else. Let's imagine I can speak this language and I am telling you what you are going to do next. Can you guess if the action will be

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done by the head, the hands or the feet?" To help you out, first I will give you two sentences that in English, all right? Let's start this game! You will now eat in the kitchen! Head Hand or leg? You will know get off the bus! Head Hand or leg?

The results are shown in Figures 6-11. They suggest that adults associate frames with body parts and this is so for 4 out of 6 common syntactic frames studied. Overall, the patterns observed in Study 2 are supported in the adult results for [NP V]—HEAD, [NP V loc]—LEG, and [NP V-S]—HEAD AND [NP V INST] HEAD.



Figure 6. Proportion of choices of head, hand, and leg as associated by 4-yearolds, 5-year-olds, and adults with the frame [NP V]. Example use of frame: "*You will now gorp*."



Fig. 7. Proportion of choices of HAND, HEAD, and LEG as associated by 4-yearolds, 5-year-olds, and adults with the frame [NP V-S]. Example use of frame: *"You will now gorp that the dax is bivish."*



Figure 8. Proportion of choices of HEAD, HAND and LEG as associated by 4-yearolds, 5-year-olds, and adults with the frame [NP V-S]. Example use of frame: *"You will now gorp with the modi"*.



Figure 9. Proportion of choices of, HEAD, HAND and LEG as associated by 4-yearolds, 5-year-olds, and adults with the frame [NP V loc]. Example use of frame: *"You will now gorp on the modi, You will now gorp to the modi."*

The correlative patterns in Study 2 are not supported in the adult results for V NPloc and V NP, see below.

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Figure 10. Proportion of choices of HEAD, HAND, and LEGS as associated by 4-year-olds, 5-year-olds, and adults with the frame [NP V NPloc]. Example use of frame: "You will now gorp the modi to the dax."



Figure 11. Proportion of choices of HEAD, HAND, and LEGS as associated by 4-year-olds, 5-year-olds, and adults with the frame [NP V NP]. Example use of frame: "You will now gorp the modi".

In fact, the V loc is highly ambiguous in terms of body parts, it could be either transitive (hand) or intransitive (leg) if the participants only considered the "loca-tive" part of the frame. Similarly, the V NP could be either transitive (head and hand) or locative (leg).

Older children and younger make a significant association with the most common body part that does the action for 2 out of 6 common syntactic frames. But they differ on which associations they make. Older children were able to infer HEAD for the frame [NP V] and [NP V inst]. There is some suggestion that this is knowledge that develops with age in that younger children show no clear linkage of HEAD with the frame [NP V]. Younger children did show an association of HAND with the frame [NP V NP loc] and [NP V inst]. As shown in Study 1,

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HAND verbs are predominant among the early-learned verbs in children, and it may be that younger children rely upon HAND more than other body parts because it is probabilistically more frequent. However, this is an issue that requires further study.

In this study, syntactic frames containing nonce verbs were presented, and the children had difficulty associating particular body parts with particular frames. Adults were able to do the task for four out of six frames. These results suggest that if the verb meaning is absent, children cannot disambiguate between sentential structure well and need additional context, particularly the verb. We infer this from the fact that in the two warming up sentences, all children (younger and older) were at ceiling. Data from studies in different cognitive domains suggest that young children need more information than adults in solving the same problem (Gibson, Michelle Leichtmana, Kunga and Simpson, 2007).

5 Conclusion

Traditional views of cognition, and a fortiori language, separate cognition from emotion, perception and action. However, a number of lines of research—in cognitive neuroscience (Dourish, 2001), in behavioral studies of adult cognition (Barsalou, 2003; Wilson, 2002), in philosophy and linguistics (Lakoff & Johnson, 1999), and in robotics (Anderson, 2003)—suggest that language and cognition are embedded in and not entirely distinct from the processes of feeling, perceiving and acting. This hypothesis, generally referred to as Embodied Cognition, is the idea that cognition is embodied, meaning that cognition, including language, derives from the experiences in the real world that come from the body's interaction with the environment through the perceptual and motor modalities

There are many different positions on what embodiment is, with respect to meaning and representation (Anderson, 2003; Wilson, 2002; Ziemke, 2001) including the view that even abstract concepts are influenced by perception-action in a dynamic world (e.g., Landy & Goldstone, 2007), perhaps via metaphors related to more concrete meanings (e.g., Matlock, 2004). Indeed, body parts have been found to often be used for this type of "grounding", that is, as a metaphor framing many abstract semantic domains, such as number, space, and emotion, in terms of body parts and physical world experience (de Leon, 1994; Saxe, 1981; Yu, 2004). There are some suggestive ideas that have been put forth that body parts may also play such a metaphoric role in our understanding of verb meaning (e.g., see hints in Richardson, Spivey, Barsalou, & MacRae, 2003), which we would not be surprised if explored and supported by future work.

There may be deep relations waiting to be discovered between the possible actions-perceptions experienced by different body parts and more abstract, relational aspects of verb meanings (see Kemmerer, 2006), as suggested by the results presented here. The present results suggest that links from word to body part may be

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pervasive and systematic for the common verbs that children learn early. Further, they suggest that links to the body may be important both for verbs that are unambiguously about actions done by specific body parts (e.g., kick) as well for verbs that at first seem to be about relations not so tightly tied to a specific bodily action (e.g., get, go, put). The present results also tell us that mature speakers of English have considerable shared knowledge about verbs and body parts and that this knowledge is used in the comprehension of verbs and syntactic frames; the results further suggest that this knowledge is developing in 4- to 6-year-olds. Granted, we present here a correlational study and further work need to address these ideas further, but many results from different researchers using different methods, both in adults and in children, suggest that the idea of an embodied path to early language learning should be examined thoroughly.

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Josita Maouene Grand Valley State University Psychology Department AuSable Hall Allendale, MI, 49401

maouenej@gvsu.edu

Nitya Sethuraman Department of Behavioral Sciences 4012 CASL Building University of Michigan-Dearborn Dearborn, MI 48128

nitya@umich.edu

A Gujarati Origin for Scripts of Sumatra, Sulawesi and the Philippines

CHRISTOPHER MILLER Independent Scholar

Introduction

Indigenous scripts of Sumatra, Sulawesi, and the Philippines (SSP) have proved difficult to trace to a specific origin. The first serious investigations begin with Holle (1882), whose detailed alphabet charts clearly established all the indigenous scripts of the archipelago as members of the Indic family, and Kern (1882) who, while noting numerous individual points of similarity with old Javanese Kawi or north Indian Nagari scripts, concluded that all Indic scripts of the archipelago descended from Kawi. Diringer (1948) concurred on a Kawi source for Sumatran scripts, but placed the source of the Sulawesi and Philippine scripts in northeast India on the basis of partial affinities with early Nagari script from Assam. Based on letter shapes or evidence from its spelling system, the origin of Philippine scripts has been placed in northeast India (Gardner 1943), south Sumatra (Francisco 1975), Cham script (Wade 1993), or south Sulawesi (Scott 1984).

While each proposal has brought forth new partial correspondences, none has provided a cogent case for the putative origins. Current specialist consensus is that absent further discoveries, the similarities between the modern scripts and putative relatives are still too unclear for any convincing demonstration of their origins (de Casparis 1975, Noorduyn 1993, Cummings 2002, Kozok 1996).

This paper presents evidence for a new theory that SSP scripts are descendants of an early variety of Gujarati script introduced into the archipelago, thus placing them in the Nagari group. This at first seems implausible, but the historical record attests to the major role of Gujaratis in the archipelago. Tomé Pires (Cortesão 1944) reports a thousand Gujaratis in Malacca prior to 1512, Barnes (2004) shows that Gujaratis sold printed cloths manufactured to the tastes of customers in Sulawesi and the Moluccas around this time, and Gujaratis are known to have played a major role in introducing Islam to the archipelago. Though no records of Gujarati script are known in the region from that era, it would not be surprising if

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similarities to Nagari scripts could be explained as developments from a locally adopted variety of Gujarati script.

1 Theoretical and Methodological Considerations

This paper compares features of the internal structure of letters rather than only individual letters as is typically the case. Correspondences between structural features provide regular and systematic evidence for intra- and inter-script relationships. Seemingly irregular changes in form often appear, serving to maintain contrast between similar letters. Scripts may also develop characteristic stroke types and sequences leading to reanalysis of earlier stroke sequences. Both factors can obscure otherwise regular relationships and must be taken into account in evaluating correspondences.

The core of the arguments presented here is a hypothetical proto-script (henceforth PS) reconstructed initially to illustrate regular changes between old Gujarati and early Philippine letter forms. Augmented with a restricted range of attested variants, it provides the basis for an empirical demonstration of the common origin of the SSP scripts. Letters and other graphic elements whose form cannot be explained on the basis of a given script's internal evolution are attributed to contact with other scripts, and borrowing itself provides interesting evidence for the locus of their genesis and their subsequent development.

2 The Philippines

The earliest known and dated document in an SSP script is the 1593 *Doctrina Christiana* (henceforth DC) from Manila, one of the most extensive known records of old Philippine (Ph) script. Though it is a woodcut print, the range of variants found in the book are likely modelled on handwriting from the same period or earlier. The only authentic samples of Ph handwriting that have survived are land deeds from 1613 and 1615 and several dozen individual signatures from miscellaneous documents. Contemporary versions of the script are in use among the Mangyan of Mindoro and, until recently, the Tagbanuwa of Palawan.

The last four rows of letters illustrated in (1) bring out their overall similarity of form. Samples are from the DC, images of Tagbanuwa (Tb) from Kroeber (1919) and drawings based on Francisco (1973), plus images of early 17th century handwriting (Hw) from Villamor (1922) and Potet (1987). Mangyan (Mn) is represented here with the publicly available Buhid and Hanunoo typefaces which represent fairly typical shapes. Tagbanuwa seems overall more conservative and similar to DC than Mangyan scripts, while the latter appear to have developed from Hw variants and are in practice more curvilinear than the typeface variants.

The wide range of variants shown and the general structure of the letters provide a basis for comparison with (likely early variants of) Gujarati script and

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reveal relationships of a systematic nature observed with no other plausible antecedent. Hypothetical early Gujarati (Gj) forms (most attested, some reconstructed from correspondences with Kaithi and Devanagari) are shown in the first row. Reconstructed proto-script (PS) forms are shown in the second row.

	a	р	у	m	b	w	ng	g	t	1	n	s	d	k	i	u	h
Gj	эU	u	บ	ਮ	G	С	Ⴢ	ວເ	ત	*~	ન	સ	*2	*4	ઇ	ઉ	Ş
PS	扒	v	ン び	9 ९	53	с С	r	21	ς	3	ջ	х, х	۲	s	৯	З	S
DC	むむ	S	8	Ъ	Q	ข	<u>5</u> 5	r r n	ç	ج	ര	Vs	5	ĸ	0 (}	3	S
Tb	25522	ş	20	S	0	Ś	>~	from	ş	n Ser	Ŧ	S.	ß	+	Silv	/ww	n/a
Hw	よくていよ	× 5 5 5 F	5 2 20 20 20 20 20 20	N & R R R	00000	~~~~	3 2 2 2	N 71 7 75 92	5 3 7 9 3	1 5 5 CM 5	ででであれ	13 X 18 16 8	1 1 1 1 1 1	Y G H	13 12 14 24 21	3	* 8 6 7 5
Mn	ປ 1/	U V	2Л И	Ц Х	ב 7	ם \	ナ ド	Ч И	נת] W	ф Ц	T 71	3 14	1/ ∜	- f = x	⊻ 1⁄	7 3	L V

Strikingly, all the Gujarati letters with a cup plus a right-hand stem correspond to a Ph variant with a similar cup plus short downward tail. An old Gj $\langle a \rangle^1$ variant has a prefixed reversed "E" to the left of the cup, also found in DC and likely the origin of similar elaborations in other Ph variants. Gujarati $\langle y \rangle$ is distinguished from $\langle p \rangle$ by a left-concave arc at the top left of its cup; in Ph, the left hand side is identical, but the tail of $\langle y \rangle$ curls into a loop whereas the tail of $\langle p \rangle$ is distinguished by the addition of a diagonal tick on the right. It seems plausible that the initial loop of Gj $\langle y \rangle$ could have moved rightward to result in Ph $\langle y \rangle$.

¹ Departing from the general practice in literature on Indic scripts, I represent letters by only their invariant content and without the default vowel, which is predictable by rule.
Gujarati (m) is basically cup+stem, with a loop forming a small closed counter whose Ph counterpart is formed by a cross-stroke closing the top of the cup. A plausible intermediate variant would have a loop larger than in Gujarati. Again basically cup-shaped, Gj (b) and (w) begin with a curve from the upper right; in Ph these end in a rising leftward curl instead of a tail (but note Tb (w)).

Ph $\langle ng \rangle$ doesn't correspond directly to Gj S $\langle ng \rangle$, but does have a tail for the stem on the right of Gj A $\langle ny \rangle$ (shown in (1) as the Gujarati model for Ph $\langle ng \rangle$). Gujarati $\langle ny \rangle$ and $\langle ng \rangle$ being rarely used letters, they could plausibly have been easily confused; in addition S $\langle ng \rangle$ is nearly identical to S $\langle d \rangle$, thus favoring the choice of A $\langle ny \rangle$. Gj A $\langle g \rangle$ is similar but for the cross-stroke, and has a vertical stem attached at the top instead of the usual short tail. While clearly related to their Gj counterparts, an added squiggle on the tail of $\langle ng \rangle$ and elaborations to the left half of $\langle g \rangle$ help to contrast the two Ph letters.

Other Ph letters relate less directly to their Gujarati equivalents, but systematic correspondences can still be detected. Gujarati $\langle t \rangle$, $\langle l \rangle$ and $\langle n \rangle$ all begin with a stroke curving from the lower left to join the stem. Rotating $\langle t \rangle$ and $\langle l \rangle$ leftward and elaborating the rotated stem gives forms similar to DC. The typical Ph squiggle in some Hw $\langle l \rangle$ variants is especially similar to the (early) Gj double arch and may be an elaboration of the Gj structure. Ph $\langle n \rangle$ has a squiggle similar to that of $\langle l \rangle$ instead of the Gujarati curl; the arch may have developed for contrast.

Ph $\langle i \rangle$, $\langle k \rangle$, and $\langle h \rangle$ also relate to their Gj counterparts, if rotated to the left. $\langle i \rangle$ is segmented into two separate stroke sets (avoiding a large leftward return stroke), $\langle k \rangle$ has an additional horizontal (losing the vertical in Mn), and the bottom stroke of $\langle h \rangle$ is absent. Keeping the regular rotation effect in mind, it appears plausible that the tail on the cup-shaped ($\langle p \rangle$ class) letters is what remains of a cursive rendition of the Gujarati stem when these letters are rotated to the left.

Assuming that Ph letters descend from a rotated rendition of early Gj helps explain the form of Ph (s). Rotated leftward and with a short tail for the stem, Gj (s) takes on a shape similar to the several Ph variants. However, instead of a tail *in situ*, there is a short squiggle attached to the the outside of the right arm. A plausible explanation would be that at some point the tail moved rightward (cf the initial curl of (y)), then was elaborated into the typical squiggle.

These systematic structural correspondences are strong evidence that Ph variants likely derive fairly directly from an early version of Gujarati script. We have seen that the systematic correspondences in form between the two scripts are mediated by two principal systematic differences: Ph letters appear overall to be rotated leftward, and the Gujarati stem is reduced to a short tail in most Ph letters. Discounting unsystematic differences as likely later developments, we can derive plausible intermediate proto-script (PS) forms in the second row of (1), through which Gujarati letters would likely have evolved into the Philippine forms.

3 Sulawesi

One important piece of evidence makes it unlikely that Gujarati script was introduced directly to the Philippines. Though like Gujarati, Philippine languages have coda consonants of all types, Ph scripts do not represent coda Cs despite the wide range of means available in Gujarati script (conjunct consonant shapes, virama, and full consonant letters read "bare," without the default vowel).

The same case is found in the old script used to write the Bugis and Makassarese languages of south Sulawesi. While this is an anomaly for a script used to write Philippine languages, it is less so for Bugis and Makassarese. Coda consonants in these languages are restricted to a nasal final (word final [ŋ] or a nasal homorganic to a following onset) and a "stopped" final (the coda half of a geminate except voiced stops, otherwise [?]). In Bugis-Makassarese (BM) as in Ph script, there is no means to represent coda Cs. The resulting frequency of homographs has in fact been exploited as part of a genre of riddle literature (Tol 1992). Given this anomaly and their geographic proximity, Scott (1984) proposes that the immediate origin of Ph script was likely Sulawesi.

Further evidence for a relationship comes from vowel doubling. Instead of writing a repeated consonant twice, the consonant could be written only once, but with a separate vowel mark for each syllable. This is fairly common in both BM and old Makassarese script, and to my knowledge is not attested elsewhere apart from the Philippines. It occurs twice in a 1615 land deed (Villamor 1922:97) and also in a signature given in Scott (1968:54). That this phenomenon exists only in the Philippines and Sulawesi is further evidence for a close relationship.

Kern (1882) and others have already noted similarities for certain letters, but the many differences between BM and Ph letter shapes lead to doubts about their relatedness (Postma 1972, cited in de Casparis 1975). However, if Ph script were adopted from Sulawesi a century or so before contact with the Spanish, it stands to reason that letter variants attested in the Philippines from that period would be similar to early BM forms, from which modern BM forms would logically descend. With the range of authentic Philippine variants illustrated in (1), a better basis for comparison is found in a large range of BM variants that disappeared after standardization of the script in the mid-1800s. These variants provide clues to older stages of the script that correlate with Ph and Gujarati forms.

Central to the argument for a relationship between BM and Ph/Gujarati variants are the placement of dots in BM letters and their relation to structural elements in corresponding Ph letters, and final rising swashes in certain letters.

Noorduyn (1993) discusses an old variant of $\langle a \rangle$ with a single dot under the left arch rather than under the right arch as in standard \sim , which he attributed to individual scribal variation. However, several manuscripts illustrated in Tol (1996) show evidence for a left-dotted $\langle a \rangle$ and there is evidence from at least one manuscript (National Library of Indonesia No. VT 129, figure 231 in Tol 1996)

that at some point a left-dotted (a) may have contrasted with a (y) bearing a single dot under its right arch (distinct from the standard ∞). Although this is the only clear example of a right-dotted (y) I have seen, this may simply indicate early disappearance of this variant, partly under the pressure for maximum contrast with (a). Just such pressure may explain why in manuscripts with double-dotted (y), it contrasts with any one of three variants of (a): left-dotted, right-dotted, or a single midline dot in palm leaf script and some old Makassarese documents. If the original form was right-dotted, variability in the dot position of (a) may have triggered the development of a double dotted (y) to avoid ambiguity.

A characteristic of modern BM script is an upward-leftward flourish at the end of (a) (g), (a) (c), (a) (p) and the derivative (a) (mp) and (a) (nr). No contrast with other letters hinges on the flourish; in fact, it is a final position variant of a plain up-angled stroke that follows an up-down stroke sequence. It is absent in some variants shown in Noorduyn (1993), in palm leaf script, and some early documents, and in the modern script never occurs on letters with a final upstroke preceded only by a downstroke. We may assume it is a later development and the earlier forms more closely approximate the original letter shapes.

	(a)	у	g	n	d	1	р	m	b	ng	s	t	k	с	j	r	w	h
Gj	эU	ื่น	วเ	ы	*১	*~ł	U	н	G	31	સ	ત	*4ı	ચ	q	ຊ	С	n/a
PS	¥^	ン \widetilde{v}	21	ջ	۲	R	v	g S	ა ე	ን	ر ک	ς	s	31	6	2	с С	n/a
OP	とと	2020	えていう	ጠ ጥ	504	S- F- V.	Ś	У	0	5 1 2	いろう	۲ 3 3	х <u>-</u> Х				022	
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BM	~	~~~	\$? ?	•	~	~ 	\$ 7 \$	5 2	272	x , , ,	S °	~	×	667 Q	505	к (г «	~	~

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BM, Ph, proto-script and Gujarati shapes are compared in (2) along with likely intermediate (Im) forms.² The first systematic correspondence involves a dot inside an enclosing cup or arch in BM script, which corresponds regularly to a straight stroke or a tick *in a similar position* in Ph. We can conclude that the BM dot is a simplification of more complex strokes in an earlier BM variety similar to Ph. This conclusion is reinforced by the dot on the palm-leaf script (1) (Noorduyn 1993, Tol 2008) that appears instead of the usual arch. The curling stroke on the underside of the Ph and proto-script (1) has disappeared rather than turn into a dot in BM, perhaps to maintain contrast with (n), whose PS and Ph shapes have more complex strokes under the arch. Similarly for (m), the cross-stroke above the Ph cup has no dot in BM, plausibly a deletion to ensure contrast with \lor (d).

Other letters correspond to Ph or earlier forms in more individual ways. BM (b) is reminiscent of the Gujarati and proto-script shapes, but unlike Ph (b) it abbreviates the left side of the bottom up-down sequence so that the tail projects from the left-hand loop itself. The similar (ng) resembles the proto-script and Ph shapes but with a short tail. Standard \diamond (s) has several palm-leaf style variants, including the " \int " shape. Variation between these shapes is consistent with the hypothesis that Ph (s) developed by moving the tail to the end of the letter: modern standard \diamond (s) corresponds to a form with the tail attached *in situ* to the "V" body of the letter, whereas the palm leaf ribbon variants, as in Ph, result from moving the tail. Variants of (k) include a cross shape (Noorduyn 1993) and the usual double dash, both with close counterparts in Mangyan scripts.

Since indigenous Philippine phonologies lack the corresponding phonemes, (a), (b), (a), (b), and (a) (c), (a), (c), (a), (c), (a), (c), (a), (c), (a), (c), (a), (c), (c),

Apart from letters for prenasalized consonants, likely derivative or borrowed from another script, only (ny), (w) and (h) show no obvious relation to Ph or Gujarati letters. These also are likely borrowed from other scripts, as mentioned below; (h) clearly developed from variants of the Arabic letter.

In general, evidence from the early history of BM script connects it directly to older forms similar to Ph and/or reconstructed proto-script variants (including <c>, <j> and <r> proto-forms), and thence ultimately to an early Gujarati variety. The following two sections illustrate the predictive power of the proto-script: although reconstructed on the basis of regular Gujarati-Philippine correspondences and augmented to account for the extra BM letters, it provides a clear basis for

² Photoreproductions of the topmost BM $\langle g \rangle$, $\langle l \rangle$, $\langle ng \rangle$ variants are from Tropenmuseum, Amsterdam 668-216; other BM photoreproductions are from Noorduyn (1993).

explaining the origins of scripts of Sumatra and clarifying their otherwise unclear connections with Ph and BM scripts.

4 Batak (North Sumatra)

The north Sumatran Batak scripts are a family of closely related varieties that differ slightly from north to south. In what follows, I will refer only to the more conservative varieties, thus excluding Simalungun forms apart from the reversed tilde-like $\langle p \rangle$.³ Several Batak letters have long been recognised for their similarity to Ph or BM counterparts, but resemblances are difficult to find for most others. Starting with the proto-script and interpolating changes for the most part already observed in BM and Ph, we can follow the likely evolution of Batak variants (3).

	h/a	k/h	t	у	m	w	ng	d	j	s	h	g	1	i	u	ny	n	p	b	r
PS	ß	s	5	v	૪	S	r	Ъ	n/a	r	ß	5	3	રુ	З	n/a	৯	\mathbf{v}	ŝ	2
Im	S [°] S	s	J	υ	g'y		ソナイ	て	<d> ≺</d>		S ^r S	30	દર	1312 (N	(NC)	?	જ	22		כוני
Bk	s 2	R R	x 1 5 9	₽	K	8 V C C	<	۲	¢	ح	s 2	^	ſ	(÷	÷	٤	0 2 g	5 (]	ß	6
(3)																			

Batak letters show two kinds of off-strokes that reflect the structure of the corresponding proto-script letter. Proto-script letters with minimal structure preceding the off-stroke correspond to Batak letters with an off-stroke curling down and back toward the body of the letter as in northern \mathbf{v}_{0} (\mathbf{v}_{1} , \mathbf{v}_{2} (\mathbf{h}), and (\mathbf{k}) (both Karo \mathbf{v}_{2} and the more widespread \mathbf{v}_{2}). Proto-script letters with more structure preceding the off-stroke have Batak counterparts with either a short downward curl or a simple straight stroke sloping down to the right: (\mathbf{y}_{2} , (\mathbf{m}_{2} , (\mathbf{w}_{2})) (where the tail is on the left branch of the last two variants), (\mathbf{n}_{2}) and (\mathbf{d}). The off-stroke on (s) doesn't even turn downward.

The middle row shows that few cases require intermediate forms not already attested or likely in eastern scripts: this suggests that variants similar to 15th to early 17th century BM and Ph forms were used in Sumatra during that period.

³ Most Simalungun forms are fragmented counterparts of variants with connected strokes in other varieties.

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One striking deviation from the proto-script is the absence of the extra stroke on (h), (g), and (l). In Philippine script, only (h) shares this trait. Since Ph (h) could not have descended from any old BM form, this may be evidence that it was borrowed at a later period through contact with users of a Sumatran script.

The two older $\langle t \rangle$ variants plausibly developed from a shape little different from the proto-script form (in the intermediate row). The $\langle j \rangle$ letter appears to be derived from $\langle d \rangle$ by the addition of a stroke. The letter is unlike the BM (∞) and Gujarati (\mathfrak{S}) shapes: Batak languages have no phonemic /c/ and (except for Karo ∞) no completely distinct $\langle c \rangle$ letterform. The evidence in van der Tuuk (1971) is not entirely clear, but it may be that originally there was no phonemic /d_z \sim _j/ either to motivate the adoption of the corresponding proto-script letters.

In general, the strong to direct shape correspondences for most letters, and the fact that distinctions in the shape of Batak off-strokes relate systematically to the structure of their proto-script counterparts, together form strong evidence for the hypothesis that the Batak scripts, like the Sulawesi-Philippine scripts, derive from the neo-Gujarati proto-script.

5 *Surat Ulu* (South Sumatra)

South Sumatra is home to four closely related varieties known as S(urat) U(lu)'upriver writing' among other names. Known from the early colonial period are Rejang (Marsden 1811, Jaspan 1964) and Kerinci (Westenenk 1922) in the west, and a range of Lampung varieties in the southeast (van der Tuuk 1868). Kozok (2002a, 2004a,b) has published images of another variety, from Kerinci, plausibly from before the 16th century. The old Makassarese "bird" script of south Sulawesi turns out to be directly related to these four and only indirectly to BM script.

The basic (non-prenasalized) SU letters are compared in (4) together with conservative old Makassarese (Mk) and proto-script variants, and intermediate (Im) forms. Mk letters in general are directly related to SU equivalents rotated leftward or flipped over, with a slight reordering of strokes: whereas most (conservative) SU letters are made up of the base shapes found in $\langle g \rangle$ and $\langle p \rangle$, Mk letters are formed by drawing as much as possible of the letter in a single sequence from the lower left to the upper or lower right. Mk $\langle k \rangle$, $\langle g \rangle$, and $\langle y \rangle$ don't correspond directly to SU but contain forms that *do* correspond quite closely. The intermediate forms of $\langle k \rangle$ and $\langle g \rangle$, similar to $\langle s \rangle$ and $\langle n \rangle$, seem to have developed more complex shapes influenced in part by Javanese counterparts in the bottom row (in a Balinese typeface similar to a late 16th century style). To start with, $\langle w \rangle$ seems to be a direct loan from the Javanese letter.⁴ The first two arches of $\langle k \rangle$ appear to have been added to the Mk base, the final downstroke being fragmented

⁴ And likely the source for BM $\langle w \rangle$.

from the rest. The first arch of MK $\langle g \rangle$ corresponds to the first arch of the Javanese letter and the final two have been added on top. The plausible intermediate $\langle y \rangle$ is now essentially identical to this shape, and appears to have added extra strokes on the model of $\langle k \rangle$.

	a	k	g	ng	c	j	ny	t	d	n	p	b	m	s	у	r	1	w	h	h/a
PS	٦८	s	21	r	37	6	n/a	ς	۲	ջ	v	კ კ	r	¥	v	2	3	S	ß	
Im	רי גי גי	Л	s S	~,	5 *	T				ð ?	$\sqrt[]{}$	G K	r e	ñ		ہ م	<i>К</i> с	n	ۍ ک	
SU	* + { { }	× F C F	111	NXXXXXXX	× 5 8 8 × 8 2	そららろう うち	N P I F	T & K	xx555 90	M I A	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	× / + + ど	& X X Y J	xx=+++++++++++++++++++++++++++++++++++	8 F 8	N = 4 + 4 × N	N N N N	NX + X K P	Z 2 Z	LN
Im		~	<u>^</u>	1%	51	þ	w	N	5	м	٦	\$ 0D	x	h	7 7	Ч Ч	14			£
Mk		R,	~	Ņ	♠	মি	m	^	ø	^	4	\$	ŝ	۶	æ,	2	2	2		£
Jv		S																5		
(4	$)^{5}$																			

Having shown that Mk script is essentially derived from a pre-17th century variety of SU, we turn to the relation between the original SU letterforms and Gujarati and/or the proto-script, one that in general is fairly direct.

(k) shortens the cross-stroke, moving it below the main body of the letter, and (a) rotates leftward and distorts slightly to give the SU form. Just as in the Batak scripts, the extra stroke of (g), (l), and (h) is deleted. The (b) shape retained in Sulawesi is basically flattened out, though the rare Lampung variant (shared with Mk) points to early coexistence of a shape similar to the Batak/Ph form. As in Ph and BM palm-leaf script, the tail of (s) moves to the end of the letter. (m) has

⁵ SU letters are reproduced from Marsden (1811), Westenenk (1922), Kozok (2004b) and van der Tuuk (1868). Photo reproductions of OM letters are all from Tropenmuseum, Amsterdam 668-216.

flipped over: the loop is still present in one Rejang variant. The open counter followed by a tail of $\langle w \rangle$ relates to the proto-script form, but the bow has been flipped in the opposite direction in *Surat Ulu*. With this change, the letter can be written with two of the basic stroke types; not flipped, the resulting letter would likely have resembled $\langle d \rangle$. A third letter involving complex changes is $\langle ng \rangle$ in which the left-facing bow of the proto-script letter is reflected in the structure of the "underlined Z" shape, which plausibly then developed into the other "Z" forms shown. Incising the proto-script shape into bamboo would have been easiest by making a simple "Z" zigzag, then returning to add a line for the bottom segment of the bow.

 $\langle c \rangle$, $\langle j \rangle$ and $\langle r \rangle$ all share loops in the proto-script and enclosed counters in SU. Otherwise, all three are flattened out, similar to $\langle b \rangle$ when compared to BM. Proto-script $\langle j \rangle$ and $\langle r \rangle$ are very close in shape: the $\langle j \rangle$ has a larger loop though. $\langle c \rangle$ has a small loop like $\langle r \rangle$ plus a perpendicular tail. In SU, $\langle j \rangle$ also bears a tail that distinguishes it from the otherwise similar $\langle r \rangle$. It seems plausible that this tail might be a reflection of the phonological relationship between $\langle c \rangle$ and $\langle j \rangle$.

In $\langle n \rangle$, $\langle y \rangle$ and $\langle n y \rangle$, we see three closely related shapes. The shape of $\langle n \rangle$ shares a descending middle section reminiscent of Ph and BM variants, and the shape of $\langle y \rangle$ might possibly have derived from the proto-script form by flipping the letter vertically, preserving contrast with $\langle n \rangle$. Comparing these two with $\langle n y \rangle$, which has no obvious proto-script counterpart, it seems it might have been derived by merging their two lettershapes into one. The resulting shape is $\langle n \rangle$ (or alternatively $\langle y \rangle$) with an extra stroke, which might have been the inspiration for deriving prenasalized letters by adding an extra stroke, not only in *Surat Ulu* but also in Sulawesi, where the same means of deriving prenasalized consonant letters was used — though (as Noorduyn points out) at a relatively late stage in the evolution of the script. A SU source for the use of an extra stroke for BM derived nasal letters is all the more plausible considering that an early variant of BM $\langle nc \rangle$ has a shape very close to Kerinci $\langle c \rangle$ and may therefore possibly be borrowed from some SU variety.

6 Inter-script borrowing and the vowel marking system

The partial Javanese script borrowings in Mk suggest an alternative explanation for the shapes of $\langle n \rangle$, $\langle y \rangle$ and $\langle ny \rangle$. In many cases, the Gujarati and proto-script letters are striking similar to one or more Kawi counterparts due to a common Brahmi origin: 5th century North Indian Gupta and ca. 10th century *kuțila* letters closely resemble 9th century Kawi (cf. Faulmann 1880).

This suggests possible adstratal influence: during the introduction of Gujarati script, many users already familiar with a Kawi-based script, perceiving the similarities, may have modified the new script in ways bringing some letters closer to their Kawi-type equivalents. Hence the Sumatran loss of the extra line in

(g), (b) and (h) and shortening of the cross-bar in (k), and possible borrowing of (y) and (ny) from Kawi models. However, none of this weakens the case for the systematic and regular correspondences between the early Ph/BM scripts and Gujarati, nor the way the reconstructed proto-script reveals otherwise opaque correspondences between scripts. These extensive regularities remain obscure when we compare OP, BM, Batak, OM and SU scripts with Kawi.

Until now we have dealt entirely with autonomous letters, ignoring the vowel marks. Following the structure of Indic scripts in general, postconsonantal vowels are represented by smaller marks above, below, or on either side of the base letter (5). Most vowel marks are similar across the SSP scripts, Gujarati, and Kawi-based Javanese and Sundanese, but where there are significant differences, the SSP scripts all agree with Kawi-type marks and not Gujarati. Although several Batak marks appear to be written in positions that correspond to Gujarati rather than Kawi, this may be due to vertical incision on bamboo. Batak vowel marks share their form with conservative Lampung vowel marks (van der Tuuk 1868), which may indicate direct common origin: Batak shares with Lampung a spelling rule observed by van der Tuuk that moves vowel marks rightward from their logical host to a following consonant marked for a zero vowel. These facts point to an early Kawi-derived vowel marking system combined with Gujarati-derived base letters, simplifying and changing as it was adapted by users of each script.

	i (ī)	u	ĕ	e	0	-ṁ/-ng	-h	-r	-Ø
Guj	ි්	੍ਹ		े	ो	Ċ	ः	ঁ	Q
Kawi	ී	9	ိ	េ	ោ	ं	ः	័	୍ୱ
Jav-Bal	ී	9	б	γ	గు	े	್ರ	6	୍ୱ
Sunda	ं	਼	ò	₂	્ર	ံ	୍ଲ	ें	್ತ
SU-Lpg	ి	਼	6	દ	ر [*])	ି	04	ঁ	্স
Batak	ಂ	Ş	⊖×	Ò	⊖×	ਂ	ਂ		৲
Bugis	ò	Ò	े	、 〇	0^				
OP	Ó	Ģ							
(5)									

Given the strong evidence for a Gujarati origin for the consonant letters, the use of a Kawi vowel system is unexpected. One explanation might lie in the nature of North Indian mercantile scripts, which often did not mark word-internal

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short vowels (Diringer 1948) Gujarati traders conceivably used such a style, and when their script was adopted by their trading partners, Kawi vowel marks would naturally have been called upon to represent otherwise unwritten vowels.

7 Conclusion

Evidence seems strong for a mainly Gujarati origin for the SSP scripts. The key piece of evidence comes from resemblances between old Philippine and Gujarati scripts supplemented with reconstructions of early variants: these, with additional evidence from Sulawesi, form the basis for a reconstructed intermediate protoscript that clarifies previously unsuspected relationships between scripts of the SSP group. The evidence put forth in this paper strongly supports the view that (apart from the Kawi-type vowel markings) SSP scripts descend from an early, unvowelled mercantile variety of Gujarati script and are therefore closely related to modern Gujarati and Kaithi scripts within the Nagari script group.

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Christopher Miller 43 chemin du Grand Moulin Deux-Montagnes QC J7R 3C3 Canada

christophermiller@mac.com

A Quantitative Analysis of Nominative/Genitive Alternation in Japanese

SATOSHI NAMBU University of Pennsylvania

Introduction

Since Harada (1971) first noted and analyzed it using a generative grammar framework, one of the most prominent case alternations in Japanese is Nominative/Genitive Alternation (henceforth NGA) which is known as Ga/No Conversion. In this case of alternation, the nominative particle ga is variably substituted for the genitive particle *no* in certain embedded clauses (1), but not in main clauses (2).

- (1) Ken-ga/no kayotta gakkoo Ken-Nom/Gen went school 'the school where Ken went'
- (2) Ken-ga/*no hon-o kaita. Ken-Nom/Gen book-Acc write'Ken wrote the book.'

Based on his grammaticality judgment test, Harada (1971) claimed that there is an ongoing change, whereby the speakers of Tokyo Japanese increasingly prefer *ga* to *no* in relevant environments. This hypothesis has been left untouched until Nambu (2007) and Nambu and Matsuda (2007) analyzed NGA quantitatively. The studies found that there exists an ongoing change in the variation, as described in section 2. They used a corpus 'the Minutes of the Japanese Diet' (hereafter MJD) (Matsuda 2004, 2008), which provides access to decades of speech data.

In this paper, I present a quantitative analysis using the Corpus of Spontaneous Japanese (CSJ). The goal of this study is not only to validate the findings in Nambu (2007) and Nambu and Matsuda (2007), but also to give another perspective on the variation. As pointed out in Nambu (2007), using only the MJD corpus faces the caveat of a stylistic effect on NGA. Nakagawa (1987) indicates the possibility that stylistic difference might affect NGA. Comparing NGA in the two corpora, the

MJD and the CSJ, gives insight into the stylistic effect on NGA. In addition, the CSJ by itself can take into account the stylistic variation, investigating different speech types in the corpus. It provides a better understanding of the variation with respect to style effect.

Another aspect of this study is to identify the language external/internal factors that affect NGA. Previous studies on NGA claim several factors, but they do not take into consideration the correlations between the factors, which mask the independent effects of each factor. Taking these problems into consideration, I adopt logistic regression to identify the factors from a statistical point of view.

Section 1 describes the CSJ corpus and the data for the analysis. To see the ongoing change, section 2 presents the observation of uses of the variation over the years. Section 3 includes a discussion of stylistic effect on NGA. Section 4 provides the procedure of logistic regression analysis, including a brief explanation of language external/internal factors for the analysis. Section 5 presents the results and discussion.

1 Data

1.1 Corpus

I obtained data from the CSJ corpus. The entire CSJ contains 661 hours of spontaneous speech collected from 1999 to 2003, which corresponds to about 7 million words (Maekawa 2003). It consists of spontaneous monologues (95% of the corpus) and dialogues and readings (5%). The speech of spontaneous monologues consists of academic presentation speech, simulated public speaking, and other speech. The CSJ has information about speakers' birth years, although at 5-year intervals, and their hometowns.

1.2 Subjects and speech data

To verify Harada's language change hypothesis, Nambu (2007) and Nambu and Matsuda (2007) extracted uses of the variants *ga* and *no* from speech by all Diet members, who are native speakers of Tokyo Japanese, from the MJD corpus (76 speakers, 100 tokens from each speaker, 7,600 tokens in total). From the CSJ corpus, I extracted data from speech by all native speakers of Tokyo Japanese available in the corpus (80 speakers). I obtained all tokens (4,945) of the variants available from the speakers, which includes 405 tokens (8.2%) of the genitive *no*.

1.3 Envelope of variation

I counted the frequencies of the nominative *ga* and the genitive *no* in relevant environments. Following Nambu (2007) and Nambu and Matsuda (2007), I delineate

the environments where the variation is possible. The canonical environment for NGA, adnominal clauses, is shown below.

(3) Adnominal clauses
[Ken-wa musuko-ga/no yonda] hon-o katazuketa.
Ken-Top son-Nom/Gen read book-Acc cleaned.up
'Ken cleaned up the books which his son read.'

There has been an argument that NGA can be observed in clauses other than adnominal clauses (Hiraiwa 2001; Miyagawa to appear; Yoshimura and Nishina 2008). I included additional environments that have been raised in the literature to observe uses of the variation. One environment is subordinate clauses headed by *made* 'until' and *yori* 'than.' Watanabe (1996), Hiraiwa (2001, 2005), and Kikuta (2002) pointed out that NGA can occur in these clauses. Another environment that I included in the data is apposition clauses headed by *to-yuu/to-no*, discussed in Inoue (1976) and Ura (1993). The examples are as follows, showing uses of the nominative *ga* for variation.

- (4) *Made* or *yori* subordinate clauses
 - a. [Basu-ga kuru] made suwatte iyooka.
 bus-Nom come until sit be
 'Let's sit until the bus comes.'
 - b. [kyaku-ga kuru] yori hayaku nimotsu-ga tsuita. customers-Nom come than early luggage-Nom arrived
 'The luggage arrived before the customer came.' Kikuta (2002)
- (5) To-yuu and to-no apposition clauses [karera-ga buzi-datta] to yuu/to no sirase they-Nom safe-were COMP news 'the news that they were safe' Inoue (1976)

2 Ongoing Change in NGA

To see whether there exists a change in progress, counting frequencies of the variants in speech over the years is the most direct way. Figure 1 from Nambu and Matsuda (2007) presents the rate of *no* from 1870 to 1970 with respect to speakers' birth years. In the graph, each speaker is represented by a point which contains 100 tokens of the variants. The gradual decline of the overall trend is fairly clear, with speakers gradually switching from *no* to *ga*. The logistic regression line

(Y=1/(1+e(-(29.239-0.0162X)))) given in the graph supports this impression statistically. Thus, Harada's insight in the early 1970s was right, and NGA is indeed involved in a change in progress.

Figure 1: Scatterplot of the rate of *no* in the MJD corpus (Nambu and Matsuda 2007)



The data from the CSJ corpus is given in Figure 2. Because of the information available in the corpus, the speakers' birth years are given at 5-year intervals. The figure has a different distribution from Figure 1. This is mainly because all tokens of the variants from the 80 speakers were obtained and each dot in the figure contains different tokens from each other. Thus, it is difficult to compare the results from the two corpora from scatter plots. Introduced in section 4, a logistic regression analysis can take into account this difference in tokens per speaker in the CSJ corpus. In addition to the problem of inconsistent frequencies with respect to birth years, I need to take into consideration effects of language internal/external factors that previous studies omitted, as described in section 4.

3 Stylistic Effect

Although he does not specify the detail of the effect, Nakagawa (1987) states that there is a style difference between ga and no, and it is intuitively assumed that written language and formal speech promote the use of no rather than ga. Although a precise effect of style on NGA remains unclear, Nambu (2007) uses the MJD corpus and considers the stylistic effect with respect to the type of session and House type as a pilot study. However, the result of logistic regression analysis



Figure 2: Scatterplot of the rate of no in the CSJ corpus

in Nambu (2007) does not show a statistically significant effect. In this paper, I compare the frequencies of ga and no between the two corpora and also in speech types within the CSJ corpus.

Table 1 gives the frequencies of *ga* and *no* in the two corpora. The Pearson's chi-square test shows that the difference between the two corpora is statistically significant. The speech in the MJD are uttered by Diet members in sessions that may have been broadcasted on TV, and thus speech in the CSJ are described in section 1.1. These token uses can be considered to be more informal. This result supports Nakagawa (1987), in addition to the intuition of native speakers of Japanese which indicate that when the speech is more formal, the use of the genitive *no* increases.

Table 1: Frequency of ga and no in MJD and CSJ

	MJD	CSJ	
ga	87.7% (6,662/7,600)	91.8%(4,540/4,945)	
no	12.3% (938/7,600)	8.2%(405/4,945)	
		$X^2 = 54.03$, d.f.	=1, p < 0.001

Table 2 gives the frequencies of NGA for each speech type in the spontaneous monologues.¹ As described in section 1.1, the spontaneous monologues in the CSJ

¹ The data only contains the spontaneous monologues. I excluded the dialogues from the data,

Table 2: Speech Type in CSJ (SPS = simulated public speaking, APS = academic presentation speech, OS = other speech)

	SPS	APS	OS
ga	90.9%(3213/3,533)	92.6%(838/905)	96.4%(489/507)
по	9.1%(320/3,533)	7.4%(67/905)	3.6%(18/507)
	•		

 X^2 =18.8, d.f.=2, p < 0.001

consist of academic presentation speech (APS), simulated public speaking (SPS), and other speech as lecture (OS). The result of the chi-square test shows a statistically significant difference in Table 2. I will discuss the effect of stylistic difference within the CSJ more in detail based on the results from the logistic regression analysis in section 5.

Thus, the comparison between the MJD and the CSJ provides clear evidence that there is a stylistic effect on NGA and that the more formal speech style contains a higher frequency of the genitive *no*. In addition, different speech types in the CSJ show a different frequency of *no*, indicating an effect of style on NGA.

4 Logistic Regression Analysis

I conduct a logistic regression analysis in order to verify whether there exists an ongoing change in NGA, excluding effects of other language external/internal factors that I will introduce in this section. As Rietveld and van Hout (1993) explain, a logistic regression model consists of several independent variables and one dependent variable. In the case of NGA, the dependent variable has two values, *ga* and *no*, and the independent variables correspond to language external/internal factors that affect NGA. The logistic regression model can detect which independent variable has an effect on NGA and compute their values.

As mentioned in section 2, several factors have been proposed for NGA in the literature. In the following sections, I briefly describe the language internal/external factors. After glancing over the factors, I explicate the procedure of logistic regression analysis.

4.1 Language External Factors

Birth year and style are considered as language external factors for this analysis. Including birth year as an independent variable, logistic regression computes its

because they do not contain enough data for this analysis. Also, I excluded the reading speech from the data, because there are very few uses of the variation in the readings, and in addition, as for NGA, all of the readings are exactly the same as the reading material.

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effect independently, and based on the result of this analysis, we can confirm the ongoing change. I converted the speakers' birth years into numerical values with 5-year intervals. As I mentioned earlier, the CSJ corpus only provides information on birth years with 5-year intervals, thus the conversion of birth years makes it possible to compare the result with the one from the MJD corpus. For style, the values for the logistic regression analysis are APS, SPS, and OS.

4.2 Language Internal Factors

4.2.1 Adjacency

Harada (1971) argued that disrupting adjacency by having intervening elements between the subject NP and the predicate affects the acceptability of NGA, as in (6). He insisted that if there exist intervening elements, the genitive *no* cannot appear as a subject marker. To consider the effect of adjacency which is about the subject NP and the predicate, I categorize NGA into two environments: adjacent and non-adjacent.

(6) kodomotati-ga/*no minna-de ikioiyoku kakenobotta kaidan children-Nom/Gen all-with swiftly run.up stairs
 'the stairs which all children run up swiftly'

4.2.2 Transitivity Restriction

Watanabe (1996) proposes a transitivity restriction. The claim is that if a direct object exists as an argument of the predicate in the embedded clause, as in (7), the genitive *no* cannot appear in the same embedded clause as a subject marker. Comparing two environments, one with a direct object and the other without, I consider the transitivity restriction as an independent variable.

- (7) a. Ken-ga hon-o katta mise Ken-Nom book-Acc bought store'the store where Ken bought a book'
 - b. hon-o Ken-ga katta mise
 book-Acc Ken-Nom bought store
 'the store where Ken bought a book'

4.2.3 Stativity of Predicate

Horie and Kang (2000) argue that the acceptability of NGA follows a hierarchy of stativity: Verb > Existential predicate, Adjective > Copula (the frequency of *no* from highest to lowest). Their data, however, only consists of the frequency of the

genitive *no* as opposed to having both frequencies of *ga* and *no*. Thus the frequency of *no* is completely dependent on the frequency of the predicate type. Their claim is still worth checking with the data in this paper. I add adjectival verb as one of the categories for predicate and consider the effect of stativity on NGA.

4.2.4 *To-yuu/To-no* **Clauses**

As shown in (5) in section 1.3, Inoue (1976) observes that NGA cannot occur in *to-yuu* and *to-no* clauses. To confirm the claim, the existence of *to-yuu* and *to-no* is considered as independent variable.

4.2.5 Subject NP Type

The variable accusative case markers (o/zero) in the colloquial speech of Tokyo Japanese is partially determined by the object NP type (Matsuda 1995). The use of the zero-form increases in the order of the hierarchy, wh-word > lexical noun > pronoun > nominal clause. It can be inferred that NGA would also have preference for the subject NP type. I follow this categorization of NP type to consider the effect on NGA.

4.2.6 Nominal Head

The nominal head of the embedded clauses where NGA occurs can be categorized as either a grammatical noun (8) or other nouns (9).

- (8) Grammatical noun *koto* as nominal head [Taro-ga kita] koto Taro-Nom came thing 'the thing that Taro came'
- (9) Other nouns as nominal head [Taro-ga kaita] hon Taro-Nom wrote book
 'the book that Taro wrote'

Masuoka and Takubo (1992) state that the meaning of grammatical nouns is bleached and their main roles shifted to a grammatical function. If the grammatical nouns do not have enough characteristics as noun, the expected result is that the use of the genitive *no* with grammatical nouns is lower than that with other nouns. This is because the adnominal clause should be a crucial environment for NGA (Hiraiwa 2001; Yoshimura and Nishina 2008). The nouns *koto*, *no*, *tokoro*, *wake*, *yoo*, and *mono* are considered as grammatical nouns in this paper, following Nambu (2007). In addition, it should be also considered whether the clause has a nominal head or not. As shown in (4) in section 1.3, Watanabe (1996) and Kikuta (2002) claim that *made* and *yori* clauses, which do not have a nominal head, can be environments for NGA. Thus, the logistic regression analysis contains these environments as independent variables.

4.2.7 Animacy

Croft (1990) discusses the effect of animacy on grammatical phenomena. From cross-linguistic observation, he gives the extended animacy hierarchy in (10) that is for number distinction. In his discussion, more highly ranked items on the hierarchy are more likely to show number distinction.

(10) Extended Animacy Hierarchy in Croft (1990)
 first, second-person pronouns > third-person pronoun > proper names > human common noun > nonhuman animate common noun > inanimate common noun

Although there has been nothing claimed for NGA in terms of animacy, it might be the case that NP ranked higher in the hierarchy should be more likely to allow the use of the genitive *no*, assuming that the higher ranked items can occur with grammatical elements more in general.

4.2.8 No Precedence Environment

"*No* precedence environment" refers to an instance when *ga/no* follows an NP that has *no* at the end of the word, as in (11) below. If the NP is marked by the genitive *no*, the sound concatenation becomes *no-no*. To avoid the sequence of identical sounds *no-no*, the alternative *ga* may be preferred.

(11) ookii mono-ga/no aru mise big thing-Nom/Gen exist shop 'the shop which has big things'

4.3 Procedure

Table 3 is a summary of candidates for independent variable in a logistic regression analysis, showing categories/values of each variable.

Before conducting a logistic regression, I need to exclude "knockout factors" from the analysis. As discussed in Paolillo (2002), a knockout factor is an independent variable that contains a value yielding only one fixed value for the dependent variable. Such a variable results in a problematic calculation. The transitivity restriction is a knockout factor, because there are not any examples of the genitive

Independent Variables	Categories/values
Birth Year	numerical (5-year intervals)
Style for CSJ	SPS, APS, OS
*Transitivity Restriction	with a direct object, without a direct object
Adjacency	adjacent, non-adjacent
Predicate type	adjective, nominal adjective, verb, existential verb,
	*copula
Animacy	first/second-person pronouns, third-person
	pronoun, proper names, human common noun,
	nonhuman animate common noun, inanimate
	common noun
Subject NP Type	*wh-word, lexical noun, pronoun, nominal clause
To-yuu/to-no Clauses	with to-yuu/*to-no, without to-yuu/*to-no
Nominal head	*no, koto, *tokoro, mono, *wake, yoo, others,
(Grammatical Noun)	*non-existence of nominal head (made/yori)
*No Precedence	subject NP with no ending, without no ending

Table 3: Candidates for Independent Variables

no with a direct object in the data (0/179). This supports the claim by Watanabe (1996). *No* precedence environment is also a knockout factor; there is no use of *no* when the subject NP ends with *no* (0/390). This follows the prediction that the sequence of the same sound should be avoided if there is an alternative.

Furthermore, there are no examples of *no* in clauses with a nominal head *wake* (0/209) and *tokoro* (0/10), with a copula as a predicate $(0/288)^2$, with a wh-phrase as a subject (0/40), in *to-no* (0/0) clauses, *made* clauses (0/14), and *yori* clauses (0/4). Therefore I do not include examples of the environments to avoid any undesirable effects on the analysis. They are marked with * in Table 3.

In addition, dependency between independent variables is excluded from the analysis. Dependency here means that one value of an independent variable is dependent on values of other variables. In the data, dependency is observed with three variables: subject NP type, animacy, and *no* precedence environment. They all have a subject NP that is in the clause with NGA. I excluded *no* precedence environment as a knockout factor. Instead of using the two separate variables, subject NP type and animacy, I combined them into one factor "SA", following Nambu (2007) to take into account dependency. For SA, the subject NP is divided into categories: inanimate common noun, human pronoun, clause, human common noun, non-human animate common noun, and proper name. Because the category proper

² The copula does not occur with the genitive *no* for an independent reason, which is "NP-*no*-NP" constraint by Shibatani (1975). The constraint mentions that the genitive *no* as a subject marker cannot occur when it can be interpreted as possessive in that position.

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name does not occur with no in the data, I excluded it from the analysis.

In this paper, I used SPSS following Nambu (2007). Computing the regression model, the SPSS setting for logistic regression was taken as a stepwise analysis. The stepwise analysis excluded factors that do not affect NGA, as reported from the regression model.

5 Results and Discussion

Table 4 shows the results of the logistic regression analysis, giving the regression coefficient (B), the standard error for the Wald test (S.E.), Wald test for regression coefficients (Wald), the degree of freedom for the Wald test (d.f.), the statistically significant difference as probability computed by the Wald test (P), odds ratio (Exp(B)), and the confidence intervals of Exp(B). The value of Exp(B) shows an effect of each variable on NGA, excluding effects of other variables. In the case of the categorical variables, the value of Exp(B) is calculated by comparing two or more categories of each variable, one of them serving as the reference for Exp(B). To clarify the values of Exp(B), I provide the reference category for each variable. For example, the category non-adjacent environments is a reference for the variable adjacency. The value 40.6 of Exp(B) indicates that the rate of *no* in the adjacent environments is 40.6 times more than that in the non-adjacent environments. This demonstrates a strong effect of adjacency on NGA.

The rest of the variables in Table 4 are as follows. The variable to-yuu apposition clause compares to-yuu apposition clauses with clauses without to-yuu, having its reference as clauses without to-yuu. The value of Exp(B) shows that to-yuu has a negative effect on the use of the genitive no. For the variable predicate type, verb is a reference, and the value of Exp(B) shows that the frequency of *no* is adjective > existential verb > nominal adjective > verb (from highest to lowest). This result shows an effect of stativity, the more stative the predicate, the higher the use of genitive no. The reference for SA is non-human animate common nouns. The value of Exp(B) shows that the frequency of *no* is human pronoun > inanimate common noun > human common noun > non-human animate common noun >clause (from highest to lowest). This reflects an effect of subject NP type where the frequency of *no* is pronouns > lexical nouns > clause (from highest to lowest). Unlike Nambu (2007), animacy does not show a consistent effect on NGA in the data. The noun *mono* is a reference for the variable nominal head. The value of Exp(B) shows that the frequency of *no* with grammatical nouns is lower than non-grammatical nouns. This supports the idea that grammatical nouns are less nominal than non-grammatical nouns and that NGA is less likely to occur in clauses with grammatical nouns that are different from canonical adnominal clauses. The stylistic effect shows the frequency of *no* as OS > APS > SPS (from highest to lowest), which is different from Table 2. As described in the manual for the CSJ corpus, the APS variant is used by specialists in the academic audience and SPS is

	В	S.E.	Wald	d.f.	P	Exp(B)	Confide	nce interval
							of l	Exp(B)
							Lower	Upper
Style			6.38	2	.04			
(APS)	27	.17	2.37	1	.12	.77	.55	1.08
(SPS)	62	.29	4.69	1	.03	.54	.31	.94
Adjacency	3.70	.59	39.98	1	.000	40.60	12.88	128.00
To-yuu clause	-4.78	1.01	22.45	1	.000	.008	.001	.061
Predicate Type			100.73	3	.000			
(Adjective)	1.52	.16	91.54	1	.000	4.56	3.34	6.23
(Existential Verb)	1.20	.21	33.08	1	.000	3.31	2.20	4.97
(Nominal Adjective)	.87	.31	7.80	1	.005	2.38	1.30	4.39
Nominal Head			119.80	4	.000			
(Yoo)	-1.26	.43	8.68	1	.003	.28	.12	.66
(Koto)	24	.33	.52	1	.47	.79	.42	1.50
(No)	-4.57	.56	67.53	1	.000	.010	.004	.031
(Others)	.41	.25	2.70	1	.10	1.51	.92	2.46
SA			37.81	4	.000			
a	1.20	1.05	1.31	1	.25	3.32	.42	26.03
b	1.68	1.06	2.53	1	.11	5.37	.68	42.62
С	62	1.11	.31	1	.58	.54	.06	4.70
d	.94	1.06	.78	1	.38	2.56	.32	20.49
Constant	-6.42	1.22	27.82	1	.000	.002		

Table 4: The output of logistic regression for the CSJ data

For a category of SA, a = inanimate common noun, b = human pronoun, c = clause, d = human common noun

used by non-specialists to a public audience; and thus APS is more formal than SPS. This is reflected in the frequency of *no*; formal speech prefers *no* to *ga*, as discussed in section 3. OS is used by specialists to a public audience, and also has the highest frequency of *no*. As OS contains a variety of speech type and has a idiosyncratic property, it is difficult to attribute the high frequency of *no* to one specific factor. The logistic model was judged as statistically good (Hosmer-Lemeshow test, $\chi^2 = 8.28$, d.f.= 8, and p = .407). The value of Nagelkerke's R² is 0.495 and the probability of prediction of NGA is 91.1%.

In Table 4, the independent variable birth year is not included. This is because the stepwise method statistically judged that the variable does not affect NGA and therefore it was excluded from the regression model. This result is different from the logistic regression analysis using the MJD data in Nambu (2007) that showed a significant effect of birth year, indicating an ongoing change in NGA as seen in Figure 1 in section 2. This discrepancy between the two corpora could be attributed to an effect of individual speakers' variation which this analysis and Nambu (2007)

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did not take into consideration. As explicated in Johnson (2008), the analysis considering inter-speaker variation might provide a more precise effect of language external factors such as birth year and resolve the inconsistency observed in a comparison of the CSJ with the MJD, and this is an issue worth investigating in future research.

With respect to the factors adjacency, stativity, and the transitivity restriction, the quantitative analysis shows that they have significant effects on NGA. Adjacency requires that the genitive *no* be used for a subject that is adjacent to its predicate. Stativity indicates that the genitive *no* is likely to be used with a stative predicate. The transitivity restriction restricts the occurrence of the genitive *no* to a clause without a direct object. Each factor affects NGA independently, but this does not imply that their effects derive from independent or distinct reasons. In fact, they suggest that the occurrence of NGA is restricted to stative/nominal environments rather than verbal/clausal environments. In addition to that, the effect of grammatical nouns demonstrates that NGA most often occurs in adnominal clauses. Thus, the analysis in this paper shows that the effect of each factor indicates the NGA's preference for stative/nominal environments.

6 Conclusion

I considered the effects of language internal/external factors reported in previous studies, focusing on the effect of stylistic difference on NGA. By comparing the two corpora, this study considered stylistic effects from two perspectives. The comparison between the two corpora provides evidence that more formal speech shows a high frequency of the genitive *no*. In addition, the stylistic difference in the CSJ also shows the effect of formality on NGA. Thus, this study offers evidence that there is a stylistic effect on NGA. Based on the findings from the logistic regression analysis, the effects of language internal factors indicate that NGA prefers stative/nominal environments. Additional analyses are needed to investigate whether or not language change is occurring in NGA, specifically with respect to inter-speaker variation.

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Satoshi Nambu University of Pennsylvania Department of Linguistics 619 Williams Hall Philadelphia, PA 19104-6305

satoshin@babel.ling.upenn.edu

A Sibling Precedence Approach to the Linearization of Multiple Dominance Structures

DAVID POTTER Simon Fraser University

1 Introduction

A current trend in syntactic theory explores of the use of multiple dominance structures in the analysis of right-node raising and across-the-board movement, as well as in the formal description of movement. One effect of the introduction of multiple dominance structures is the complication of the mapping of syntactic structure to strings of terminals, as the multiply dominated element has syntactic dependencies in more than one location. In this paper, I propose that the nontangling condition of Partee et al. (1990) can be revised to permit the linearization of a range of multiple dominance structures. In addition, this revised nontangling condition restricts the possible configurations of multiple dominance structures and predicts a peripherality condition in sharing coordination constructions: elements shared between conjuncts must appear at the periphery of those conjuncts.

In across-the-board movement, an element appearing at the left periphery of a coordinate structure appears to have syntactic and semantic dependencies in both conjuncts. In (1) *Alexi* is the subject of, and *should* is the modal for, both *brine* and *bard*. *Alexi* can be said to be shared between the conjuncts. Right node raising constructions reflect a rightward mirroring of across-the-board movement. In (1), *the turkey* and *for Thanksgiving* are shared between the conjuncts.

(1) Alexi should brine and bard the turkey for Thanksgiving.

The *prima facie* similarity between these two constructions has lead several authors to the claim that they are derived from a single underlying mechanism (Wilder 2008; Vries 2009). I will refer to these constructions collectively as sharing coordination constructions and reserve the terms left sharing constructions for across-the-board movement and right sharing constructions for right node raising. While the analysis of sharing coordination constructions remains a topic of much debate, one

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approach that has garnered significant attention is the multiple dominance analysis (Wilder 2008, Vries 2009, Gracanin-Yuksek To appear).

In multiple dominance analyses, shared elements are literally present in both conjuncts simultaneously. These elements have at least two parents; one at each site of syntactic dependency. Nodes that have more than one parent are said to be multiply dominated, in contrast to singly dominated nodes, which have a single parent. In (2), the nodes D and G are multiply dominated. Note that the children of multiple dominated parents are not necessarily multiply dominated; d and g are not multiply dominated themselves, as each has exactly one parent. In future examples, for reasons of space and clarity, (2) will be equivalently depicted as (3), in which a copy of every subtree rooted by a multiply dominated node will be included as child to each of the multiply dominated node's parents.



Multiple dominance structure has also been applied beyond sharing coordination constructions, to the formal description of movement (Nunes 2001, Starke 2001, Vries 2009). In these analyses, a moved element is not copied or moved. Instead, a new dominance relation is added to the 'moved' node. As a result, the 'moved' node acquires a new parent at the target site in addition to its original dominance relations. In the case of head movement, I will represent the category of the head as X/Y where X and Y are the head categories.

Under such a multiple dominance analysis, the shared elements in (1), *Alexi, should, the turkey, for Thanksgiving* are present in both conjuncts. The shared subject DP *Alexi*, for example, is child to the *TP* in each conjunct. Assuming the internal subject hypothesis, the DP *Alexi* is also dominated by each *vP* node. Thus, the DP *Alexi* has a total of four parents.

Finally, for concreteness, I also make several assumptions about the nature of the coordinate structures involved in sharing coordination constructions. Specifically, I will assume that the coordinator *and* is the head of an asymmetric functional projection *ConjP* (Johannessen 1998), that the conjuncts involved are full CPs, i.e. the *large conjunct hypothesis*, following Wilder (1997), and that the shared elements are located in their canonical positions within these conjuncts, i.e. an *in situ* analysis. Thus I am assuming the structure presented in (4) for the analysis of (1). With the exception of asymmetric coordination, these assumptions are simply for concreteness and exposition. I describe in the last section how the analysis presented here is compatible with other assumptions about the structure of sharing



coordination constructions.

Once multiple dominance structures are admitted, the theory must account for the problem of linearization – the formal characterization of the relationship between multiple dominance structures and the precedence relations of the terminal nodes in these structures. Because a multiply dominated element has two (or more) parents, but is only pronounced once, it is not evident what dictates where the element is to be pronounced. For example, in (4), it is not intuitive why *Alexi* should be pronounced in the left conjunct before *should*, or why *the turkey* should be pronounced after *bard* instead of immediately after *brine*. I will call the mechanism which dictates precedence relations between terminals on the basis of syntactic structure a linearization algorithm.

2 The Nontangling Condition

Partee, ter Meulen, and Wall define a linearization algorithm based on a number of relations between nodes and conditions on structure, which yields precedence relations between terminals in any well-formed, linearizable syntactic structure (Partee et al. 1990). However, one of the structural conditions, the nontangling condition, excludes just the types of structure we are concerned with here: multiple dominance structures.

The two principal syntactic structure relations defined by Partee et al. are dominance and precedence. Dominance and the related relation immediate dominance are given in (5). In (6), node E immediately dominates nodes f, G, and E, while dominating nodes f, G, h, i, and E. It will be helpful to talk about the "connected sequence of branches"; I will call such a sequence a *path*, following Wilder (2008).

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- (5) a. **Dominance:** A node *x* dominates a node *y* if there is a connected sequence of branches in the tree extending from *x* to *y*.
 - b. **Immediate Dominance:** A node *x* immediately dominates a node *y* if there is no distinct node between *x* and *y*.

$$(6) \qquad A \\ B \qquad E \\ c \quad d \quad f \quad G \\ h \quad i$$

Partee et al. also define the precedence relation between nodes in a tree. The precedes symbol, \prec , denotes precedence: the expression $x \prec y$ indicates that *x* precedes *y*. Precedence and dominance are mutually exclusive, which Partee et al. call the Exclusivity Condition. Informally, for a pair of nodes $\{x, y\}$, if *x* dominates *y* then $x \not\prec y$ and $y \not\prec x$. If $x \prec y$, then neither *x* nor *y* dominates the other.

The precedence relation is both transitive and symmetric, characteristics described in (7). Transitivity ensures that all of the nodes in the precedence relation must be ordered with respect to each other. Asymmetry, in conjunction with transitivity, ensures that a node may not precede itself, either directly or indirectly.

- (7) a. Transitivity: A relation R is transitive if and only if for all ordered pairs $\langle x, y \rangle$ and $\langle y, z \rangle$ in R, the pair $\langle x, z \rangle$ is also in R.
 - b. Asymmetry: A relation R is asymmetric if and only if for every ordered pair $\langle x, y \rangle$ in R, the ordered pair $\langle y, x \rangle$ is not in R.

Precedence, together with dominance and the exclusivity relation, allows Partee et al. to define a notion of sibling precedence, which states that siblings are in the precedence relation. For concreteness, I will adopt the definition given in (8). Note that siblings are also ordered pairs. By convention, the preceding sibling is drawn to the left of the succeeding one.

(8) For a pair of nodes x and y, x and y are siblings iff there is some node z which immediately dominates both x and y and if $x \prec y$.

Finally, Partee et al. define the nontangling condition, given in (9). Given the structure (6), the nontangling condition, along with precedence, dominance, and the other conditions, yields the string of terminals: c d f h i.

(9) The Nontangling Condition: In any well-formed constituent structure tree, for any nodes x and y, if $x \prec y$, then all nodes dominated by x precede all nodes dominated by y.

The nontangling condition excludes structures such as those in (10) and (11). (10) is ruled out because d would be required to precede itself as it is the child of

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two nodes in the precedence relation, while precedence is defined as asymmetric. (11) is excluded because d should precede e, yet e precedes d as depicted—the edges are crossed. The structures in (10) and (11) violate the what Partee et al. correctly identify as "defining" and "essential" properties of trees: in (10), node d has two parents, nodes B and C, while in (11), the edges between C and e and between B and d are tangled. However, as Sarkar and Joshi (1996) note, multiple dominance structures are not trees but acyclic graphs, and the configurations in (10) and (11) are intrinsic to multiple dominance structures.



In the multiple dominance structure (3), the admission of multiply dominated nodes, such as D and G, will yield asymmetry violations under the Nontangling condition, as we saw with (10). Terminal d would precede itself, being dominated by both D and E. (3) also contains tangled edges: as G is dominated by preceding sibling B it should precede the children of the succeeding sibling C, including the terminal h. Yet G must also succeed h, as it is the child of succeeding sibling I. The edges in (3) are thus necessarily tangled, and multiple dominance structures are in principle unlinearizable by the nontangling condition.

3 The Revised Nontangling Condition

In light of this limitation of the nontangling condition, I will propose in this section a linearization algorithm, based on that of Partee et al., that is capable of linearizing multiple dominance structures, including left and right sharing, and movement as multiple dominance. In addition to revisions to the nontangling condition itself, a novel structural relation is introduced, and other well-known relations are modified.

Some structural relations outlined by Partee et al. will be carried over unchanged. Precedence remains as described above, a transitive asymmetric relation between two nodes, written $x \prec y$. Likewise, the exclusivity condition is as above.

Dominance and immediate dominance are slightly modified, as given in (12) below. Dominance makes reference to a *path*, which is a chain of dominance relations. I assume that a path includes its endpoints: the path from x to y includes nodes x and y. The definitions in (12) also make explicit reference to the possibility of multiple paths between any two given nodes; this will become important in the discussion of the parent dominance relation. As our primary interest here is the linearization of terminals, it will be useful to define functions which return sets of terminals: the function d(x) returns the set of terminals dominated by node x.

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- (12) a. **Dominance:** A node *x* dominates a node *y* if there is at least one path extending from *x* to *y*.
 - b. **Immediate Dominance:** A node *x* immediately dominates a node *y* if *x* dominates *y*, and for at least one path from *y* to the root that includes *x*, there is no node *z* such that *z* dominates *y* and is dominated by *x*.

In the multiple dominance structure (3), *B* dominates nodes *B*, (*D*), *d*, *E*, (*G*), and *g*. d(B) returns the set $\{d,g\}$. Similarly, *I* immediately dominates nodes J, (*G*), and itself. The root node *A* dominates the terminal *g* through two different paths. One path is the chain from *g* though (*G*), *C*, *I*, and ending in *A*, while the other begins with *g* but passes though (*G*), *E*, *B*, and ends in *A*.

This definition of path entails that dominance is a reflexive relation: the path from x to x includes x. It also follows that a node x dominated by y may be dominated by a node which does not dominate or is not dominated by y. There may be some path from node x which does not pass through y. In (3), node G is dominated by B and also by C, though B and C are not in any dominance relation.

Immediate dominance is also reflexive: no distinct node intervenes between node x and itself. This characteristic requires that multiple and single dominance be modified slightly, as given in (13). It is also worth reiterating that children of multiply dominated nodes are not necessarily themselves multiply dominated.

- (13) a. **Multiple Dominance:** A node *x* is multiply dominated if it is immediately dominated by more than two nodes
 - b. **Single Dominance:** A node *x* is singly dominated if it is immediately dominated by one or two nodes

The notion of sibling precedence given in (8) are carried over from Partee et al. 1990. In multiple dominance structures, such as that in example (3), some nodes may have more than one sibling. Node (G) has two siblings: (D) and J. Note however that siblinghood is not transitive; (D) and J are not siblings because there is no node that immediately dominates them both.

Along with dominance and immediate dominance, the relations full dominance and parent dominance are also necessary. Full dominance has been described in various formulations in the multiple dominance literature, e.g. in Wilder 2008. Here it is defined as in (14). The set of terminals fully dominated by a node x is denoted by the function fd(x).

(14) **Full Dominance:** A node *x* fully dominates node *y* iff every path from *y* to the root passes through *x*.

In (3), the subtree rooted by (G) is dominated by nodes A, B, E, C, I, and (G). The only nodes that fully dominate (G) are the root node A and node (G) itself. Node A fully dominates (G) because all paths to the root node must pass through A, as A is the root. Similarly, G fully dominates itself because all paths from G to the root must pass through G.

Parent Dominance, defined in (15), is a novel dominance relation. The set of terminals parent dominated by a node x is denoted by the function pd(x).

(15) **Parent Dominance:** A node *x* parent dominates node *y* iff *x* dominates *y* and no node on any path from *y* to *x* is sibling to a node dominating *x*.

In (3), node *B* parent dominates node *d*. There are two paths from *d* to *B*: one from *d* through (D) to *B* and another from *d* through (D) and *E* to *B*. No node on either of these paths has a sibling that dominates *B*. Node *B* also parent dominates nodes (G) and *g*. Thus pd(B) yields the set $\{d,g\}$ Turning to node *E*, it parent dominates nodes (G) and *g*; however, it does not parent dominate nodes (D) or *d* because (D) is sibling to *E*, which dominates itself. fd(E) therefore yields $\{g\}$.

In addition to the relations adopted above, I propose the revised nontangling condition, given in (16).¹ The condition dictates precedence relations between sets of terminals on the basis of the multiple or single dominance status of siblings. It is interesting to note that the revised nontangling condition does not make reference to a "conjunct" at all, as it operates on purely structural information, completely abstracted from category information. The application of the revised nontangling condition to a syntactic structure is presented in the form of a table. The left column delineates all of the sibling relations in the structure, while the middle column identifies the functions which return the relevant sets of terminals. The right column lists these sets of terminals in the precedence relations dictated by the algorithm.

(16) **Revised Nontangling Condition:**

For all siblings $\langle x, y \rangle$:

- a. if *x* and *y* are both singly dominated then $fd(x) \prec fd(y)$
- b. if *x* and *y* are both multiply dominated then $pd(x) \prec pd(y)$
- c. if x is multiply dominated and if y is singly dominated then $fd(x) \prec pd(y)$
- d. if x is singly dominated and if y is multiply dominated then $pd(x) \prec fd(y)$

Table 1 gives the output of the algorithm for example (3). The siblings $\langle B, C \rangle$ are both singly dominated, so the fully dominated terminals of *B*, i.e. *d*, precede

¹ Though it does not figure into this discussion, the notion of c-command can be revised to accommodate multiple dominance structures, as given in (i), to ensure that a moved element is ccommanded only at the highest position it occupies.

i. C-command: A node x c-commands node y if the sibling of x parent dominates y.

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Sibling Precedence	Terminal Relations	Terminal Precedence
$B \prec C$	$fd(B) \prec fd(C)$	$d \prec h, j$
$(D) \prec E$	$fd((D)) \prec pd(E)$	$d \prec g$
$(D) \prec (G)$	$pd((D)) \prec pd(G)$	$\emptyset \prec g$
$H \prec I$	$fd(H) \prec fd(I)$	$h \prec j$
$J \prec (G)$	$pd(J) \prec fd((G))$	$j \prec g$
Final Line	dhjg	

Table 1: Sibling and Terminal precedence relations for (3)

those of *C*, i.e. *h* and *j*; neither *B* nor *C* fully dominates *g*. For the siblings $\langle (D), E \rangle$, *E* is singly dominated, while (D) is multiply dominated; therefore $fd((D)) \prec pd(E)$. *g* is parent dominated by *E*, but *d* is not. The path between *d* and *E* contains (D), which is sibling to *E* and dominates *d*. Thus, $d \prec g$. In the pair $\langle (D), (G) \rangle$, both siblings are multiply dominated, so it is the parent dominated terminals of (D) and (G) that are ordered. However (D) does not parent dominate any terminals: there is a sibling on the path from *d* to (D), namely (D) itself, that has a sibling pair. The final linearization is the conjunction of these terminal precedence relations. I present here this conjunction simplified to the linearized string of terminals: *d h j g*.

Returning to the structure (4), it is clear that the revised nontangling condition is capable of linearizing both left and right sharing coordination constructions, as well as movement as multiple dominance. Table (2) outlines the sibling precedence relations, and the terminal precedence relations as dictated by the revised nontangling condition. Instead of walking through every pair, I will simply point out several siblings that contribute key precedence relations to the final linearization.

As both of the siblings in the pair $\langle CP, Conj' \rangle$ are singly dominated, it is their fully dominated terminals which are linearized, yielding *brine* \prec *and*, *bard*. Between the pair $\langle (DP), T' \rangle$ in the left conjunct, (DP) is multiply dominated, while T' is singly dominated, and so it is the fully dominated terminals of the former, *Alexi*, which precede the parent dominated terminals of the latter: *should*, *brine*, *the*, *turkey*, *for*, *Thanksgiving*. The terminal *should* precedes the vP due to the pair $\langle (T), vP \rangle$. The siblings $\langle vP, (PP) \rangle$ yield the vP preceding the adjunct PP, and the verb *brine* precedes its argument due to $\langle (v/V), VP \rangle$. The structural relations in the right conjunct are similar, and the final linearization is precisely as expected: right shared elements appear in the right conjunct, left shared elements surface in the left and moved elements appear at their highest moved position.
Sibling Precedence	Terminal Relations	Terminal Precedence	
$CP \prec Conj'$	$fd(CP) \prec fd(Conj')$	brine \prec and, bard	
$C \prec TP$	$fd(C) \prec fd(TP)$	$\emptyset \prec \text{brine}$	
$(DP) \prec T'$	$fd((DP)) \prec pd(T')$	Alexi \prec should, brine, the,	
		turkey, for, Thanksgiving	
$(T) \prec vP$	$fd((T)) \prec pd(vP)$	should \prec brine, the, turkey, for,	
		Thanksgiving	
$vP \prec (PP)$	$pd(vP) \prec fd((PP))$	brine, the, turkey \prec for, Thanks-	
		giving	
$P \prec DP$	$fd(P) \prec fd(DP)$	for \prec Thanksgiving	
$(DP) \prec v'$	$fd((DP)) \prec pd(v')$	Alexi \prec brine, the, turkey	
$(v/V) \prec VP$	$fd((v/V)) \prec pd(VP)$	brine \prec the, turkey	
$(v/V) \prec (DP)$	$pd((V/V)) \prec pd((DP))$	$\emptyset \prec$ the, turkey	
$D \prec NP$	$fd(D) \prec fd(NP)$	the \prec turkey	
$Conj \prec CP$	$fd(Conj) \prec fd(CP)$	and \prec bard	
$C \prec TP$	$fd(C) \prec fd(TP)$	$\emptyset \prec \text{bard}$	
$(DP) \prec T'$	$fd((DP)) \prec pd(T')$	Alexi \prec should, bard, the,	
		turkey, for, Thanksgiving	
(T) > vP	$fd((T)) \prec pd(vP)$	should \prec bard, the, turkey, for,	
		Thanksgiving	
$vP \prec (PP)$	$pd(vP) \prec fd((PP))$	bard, the, turkey \prec for, Thanks-	
		giving	
$(DP) \prec v'$	$fd((DP)) \prec pd(v')$	Alexi \prec bard, the, turkey	
$(v/V) \prec VP$	$fd((v/V)) \prec pd(VP)$	bard \prec the, turkey	
$(v/V) \prec (DP)$	$pd((v/V)) \prec pd((DP))$	$\emptyset \prec$ the, turkey	
Final Linearization:	Alexi should brine and bard the turkey for Thanksgiving.		

Table 2: Sibling and Terminal precedence relation for example (4)

4 Comparison with Linear Correspondence Axiom based approaches

The linearization algorithm of Kayne (1994), the Linear Correspondence Axiom (LCA), has been broadly applied in syntactic theory, and so it is worth briefly comparing the revised nontangling condition with the LCA and two revisions of the LCA, that of Wilder (2008) and that of Gracanin-Yuksek (To appear).

The LCA eschews the notion of sibling precedence, in favour of asymmetric c-command to derive precedence relations between terminals. In essence, the terminals dominated by a node X precede those terminals dominated by the nodes

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asymmetrically c-commanded by X. Like the original nontangling condition, the LCA was not designed to accommodate multiple dominance structures. As noted by Sabbagh (2007), these structures pose a problem for the LCA, in that, if a node y is dominated both by X and by a node asymmetrically c-commanded by X, it must precede itself, yielding an asymmetry violation.

To permit linearization of multiple dominance structures, Wilder (2008) modified the LCA by introducing a notion of full dominance: essentially, the terminals fully dominated by X precede those fully dominated by nodes asymmetrically ccommanded by X. However, several aspects of this analysis are problematic. First, as Wilder notes, the revised LCA is unable to linearize many examples of movement as multiple dominance, thus limiting the application of multiple dominance structures to the relatively rare sharing coordination constructions. Second, the revised LCA requires that left sharing constructions be analyzed *ex situ*. That is, a left shared element must be moved out of the coordinate structures in order to be linearized. Therefore, left shared elements are singly dominated, as movement is not analyzed as multiple dominance. However, examples such as those in (17) demonstrate that such an analysis would require the ConjP to exhibit the bizarre behaviour of taking intermediate level projections as complement and specifier. Finally, if right adjoining is a permitted syntactic structure, then structures such as (1), with right shared adjuncts in combination with another right shared element, e.g. an argument or another adjunct, are unlinearizable. If we assume that adjuncts are asymmetrically c-commanded by their hosts, these examples are unlinearizable because the shared material dominated by the host is, by definition, not *fully* dominated by the host and thus will not be linearized with respect to the adjunct material.

- (17) a. What $[_{C'}$ will Alexi cook] and $[_{C'}$ won't Tim eat]?
 - b. Tim [$_{T'}$ has called] and [$_{T'}$ hasn't told him the truth].

Gracanin-Yuksek (To appear) has also modified the LCA to accomodate multiple dominance structures. Gracanin-Yuksek adopts Wilder's changes to the LCA, adapts a version of full dominance, and further modifies the definition of c-command with notions of highest mother, highest sister, and shortest path. These changes permit the linearization of sharing coordination and movement analyzed as multiple dominance, but again, some serious caveats apply. Gracanin-Yuksek's algorithm does not actually give precedence relations, only "ordering" relations which may correspond either with precedence or subsequence. No indication is given as to how this is to be resolved. Furthermore, this revised LCA requires that right shared adjuncts, and only adjuncts, raise out of the coordinate structure. Not only are we not provided with independent motivation as to why only adjuncts instead of e.g. arguments must move, but arguments have also been provided against such an *ex situ* analysis, see for example Abels (2004).

In this brief comparison, certain merits of the revised nontangling condition are clear. Whereas the revised nontangling condition can linearize all kinds of sharing

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coordination constructions and movement as multiple dominance, Wilder's revised LCA is wanting in several empirical and conceptual respects and that of Gracanin-Yuksek falls short of providing a complete linearization algorithm, in addition to requiring controversial analyses of shared adjuncts.

5 The Peripherality Condition

In addition to linearizing sharing coordination constructions and movement as multiple dominance, the revised nontangling condition also constrains the possible configurations of multiple dominance structures. Here I discuss one aspect of this constraint: that any shared material in a sharing coordination construction must appear at the periphery of its conjunct. This *peripherality condition* is stated in (18). Though not all sharing coordination construction analyses derive the peripherality condition, e.g. Vries (2009), the existence of some sort of peripherality constraint has been recognized at least since Oirsouw (1987). Interestingly, the peripherality condition in (18) differs from that in other recent works, e.g. Sabbagh (2007) and Wilder (2008).

(18) **Peripherality Condition:**

In the configuration: [[*A*....*X*...] Conj. [*B*...*X*...]] if *X* is left shared, then it must be at the left edge of A and if *X* is right shared then it must be at the right edge of B (adapted from Sabbagh 2007).

The peripherality condition dictates that shared material appear at the edge of the conjunct. Contrasting the sentences in (19), we see the example become ungrammatical if the shared element is followed by non-shared material. Likewise, in the ungrammatical (20b), the shared *Spencer* is preceded by the non-shared *What did*; compare with the grammatical (20a) where the shared material is peripheral.

- (19) a. Alexi likes and Angela hates espresso.
 - b. * Alexi likes and Angela hates **espresso** in the evening. (Under reading where *in the evening* does not modify *likes*)
- (20) a. What did Spencer cook and grill?
 - b. * What did **Spencer** barbecue and what did grill?

(21) illustrates the structures that the peripherality condition is designed to rule out: shared nodes (F) and (G) are not peripheral. Such examples are unlinearizable; f and g are not linearized with respect to the other terminals. At the left periphery, the problem lies with the siblings $\langle D, E \rangle$. As both of these nodes are singly dominated, the revised nontangling condition dictates that $fd(D) \prec fd(E)$. But, as neither f nor g are fully dominated by E, these nodes are never ordered with respect to d. Similarly, the siblings $\langle J, L \rangle$ fail to order f and g with l.

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This example can also illustrate how the revised nontangling condition predicts that the shared element need not be peripheral in the conjunct where it does not surface. As H and I are both singly dominated, they yield $fd(H) \prec fd(I)$. f is not in fd(I) and is thus not ordered with respect to h. Thus, shared element (F)tolerates non-peripherality within the right conjunct.

Recently, Sabbagh proposed a more restrictive formulation of the right peripherality condition, simplified somewhat and given in (22) (Sabbagh 2007). This stronger condition can be used to rule out examples such as (23), where the shared element is right peripheral, but the gap is not.

(22) **Right Edge Restriction**

In [A...X...] Conj. [B...X...], X must be rightmost within A and B.

(23) * Alexi likes __ with milk and Angela hates espresso.

The revised nontangling condition does not rule out these cases, as it concerns the peripherality of the shared element, not the gap. I would suggest however, that examples such as (23) should be ruled out due to the constraints on prosodic and information structure. Féry and Hartmann (2005) argue that certain coordinate structures, including right sharing and gapping, must contain contrastively focused elements that immediately precede the coordinator and the shared element. However, in examples such as (23), the element immediately preceding the coordinator, i.e. *with milk*, is not semantically contrastive with the element immediately preceding the shared element, i.e. *hates*. Thus, examples where the gap appears to be nonperipheral will be ruled out, and Sabbagh's stronger right edge constraint appears unnecessary. While I leave for future work a more detailed study of the interaction of linearization constraints and focus and syntactic parallelism, it is interesting that the constraints proposed by Féry and Hartmann (2005) are independently motivated for gapping, yet complement the constraints on sharing constructions induced by this linearization algorithm.

Another formulation of the right peripherality condition comes from Wilder (2008), who claims that for a shared element x, the gap corresponding to x must be at the right edge of the non-final conjunct, providing examples such as (24) as support. However, it is not clear that (24) is a typical case of right sharing. Ha (2008) suggests that these examples may be due to some sort of reanalysis of the

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verbs as complex predicates. Compare (24) with the degraded examples in (25), where the verbs cannot be easily understood as members of a complex event. Likewise, these types of examples are impossible with distinct subjects, as in (26). The unacceptability of these examples is unexpected if the right edge constraint were to generally allow non-peripherality of right shared elements in the right conjunct.

- (24) John should fetch __ and give the book to Mary
- (25) a. * Mary congratulated ___ and gave the winner a prize.
 - b. ?* John should critique __ and give the book to Mary.
- (26) * John should fetch ___ and Peter will give **the book** to Mary

I remarked earlier that recent research has focused on the right peripherality condition, as these authors assume some form of the small conjunct hypothesis, which renders a left peripherality condition unnecessary. Any shared material which originates within, and is subsequently moved out of, the coordinate structure will necessarily appear at or past the periphery of the coordinate structure. Any material which is merged outside of the coordinate structure will presumably take scope over or apply to both conjuncts, thus also giving the appearance of being shared. In (27), the left shared elements *What did* have raised out of the coordinate structure, and thus naturally appear at the left periphery. (28) would be ruled out by whatever device ensures that left shared material raise out of the coordinate structure.

- (27) [*_{CP}* What did [*_{ConjP}* [*_{TP}* Spencer barbecue] and [*_{TP}* his friends eat]]]?
- (28) * $[_{ConjP} [_{CP} What did Spencer barbecue] and <math>[_{CP} what did __ grill]]?$

However, once the large conjunct hypothesis is assumed, a left peripherality condition is necessary to rule out examples like (28). As previously noted, the revised nontangling condition derives the left peripherality condition. What was mentioned only briefly in the introduction is that the revised nontangling condition is also compatible with *ex situ* analyses and the small conjunct hypothesis. A schematic example will suffice to illustrate. In (29), take the subtrees (D) and (H) to be the conjuncts. (B), then, is a shared element which has raised out of the coordinate structure. $b \prec e, g, i$ as a result of < (B), C >.



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The proper analysis of sharing coordination constructions still enjoys much debate in the literature, and I take it as an advantage of the revised nontangling condition that it can linearize both *ex* and *in situ* analyses and both large and small conjuncts. This flexibility will allow the complex facts at work in this debate, instead of the formalism, to dictate the analysis. Alternatively it could be said that the robustness of this analysis predicts that both large and small conjunct hypotheses and both *ex* and *in situ* analyses are in principle possible. Thus, it could be that the complexities in the data result from some underlying structural ambiguity.

6 Conclusion

This paper has explored a revision of the nontangling condition, Partee et al. 1990, to linearize sharing coordination constructions and movement as multiple dominance. Several structural relations, including dominance and full dominance, have been modified and the novel relation parent dominance has been introduced to suit this purpose. The nontangling condition has also been modified, with the net result being that a host of multiple dominance constructions are rendered linearizable. I briefly compare these results with those of other algorithms designed to linearize multiple dominance structures, and conclude that the revised nontangling condition compares favorably. Certain configurations of multiple dominance structures are categorically excluded by the revised nontangling condition, including structures which violate the peripherality condition. I discuss how this condition is derived in this proposal, and compare it to other formulations of the peripherality condition.

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David Potter Department of Linguistics 8888 University Drive Simon Fraser University Burnaby, BC V5A 1S6 Canada

dkp1@sfu.ca

Surface Faithfulness Phenomena and the Consonantal Root in the Modern Hebrew Verb System

TOM RECHT University of California, Berkeley

Introduction

The nature of Modern Hebrew verbal morphology is the subject of an ongoing debate. As a Semitic language, Hebrew has traditionally been considered a rootand-template language, in which most native words and all verbs are formed by the combination of a purely consonantal root and a template consisting of vowels, prosodic information (stress location), and zero or more affixes. However, it has been repeatedly observed (e.g. Bat-El 1994, Schwarzwald 2003, Bolozky 2005) that a number of phenomena in the modern verb system cannot be analyzed as resulting from templatic structures, since they appear to reflect surface faithfulness to forms other than a putative root. This has led some linguists, notably Bat El (2003a, 2003b) and Ussishkin (2005), to argue that Modern Hebrew should not be considered a templatic language at all, and that its morphological system can be adequately described using concatenation and 'melodic overwriting' (the replacement of a base vowel by a different vowel in inflection). This approach runs into at least two difficulties. An internal difficulty is the 'problem of the source' (Prunet 2006): it turns out that no single verbal category can be consistently selected as a base from which all others are derived, so that such theories must posit different bases to suit the requirements of different verb classes and paradigms. An external difficulty is that psycholinguistic studies have consistently shown that verbal roots have a real status in Hebrew speakers' minds. This fact can be disregarded by models that aim at pure formalization of the phenomena and nothing more, but any theory that aspires to insight into Hebrew verb morphology as a living system cannot, it seems, do without a concept of the root.

This paper argues that from the point of view of speakers Modern Hebrew must be described as a hybrid system, possessing elements of both templatic and concatenative morphology, and that more generally, templaticity and concatenativity are not absolute, binarily opposed categories, but stand for bundles of morphological characteristics, of which a given language may possess a combination and which are subject to piecemeal diachronic change.

1 Surface Faithfulness Phenomena in the Modern Hebrew Verb System

At least three distinct sets of phenomena in the Hebrew verb system present features that can only be analyzed as preserving faithfulness to some other surface form, and thus cannot be captured in a purely templatic model. All are restricted to loan verbs (*i.e.* verbs directly borrowed from other languages) and to denominal verbs, which are often themselves formed from borrowed nouns. Two of these faithfulness phenomena — consonant cluster preservation and vowel preservation — have been described in the literature (e.g. Bolozky 1999, Schwarzwald 2003); a third, stress preservation, which is restricted to one or two colloquial verbs, has not to my knowledge been described before.

All these phenomena are new developments in Modern Hebrew — that is, they date from the 20^{th} -century revival and later. To understand them, a brief description of the traditional Hebrew verb system, as presented in standard grammars (e.g. Gesenius 1910), will be useful.

The lexical portion of a Hebrew verb is a consonantal root, most often consisting of three consonants, but sometimes of two or four. This root is discontinuously combined with one of several paradigms of vowel sequences and affixes to produce a verb inflected for tense and for person, number and gender of the subject. These paradigms, known in the Hebrew grammatical tradition as *binyanim* ('constructions'; singular *binyan*), are traditionally said to be seven in total, though there are some additional minor subcategories and hybrid forms. The *binyanim* correspond quite loosely to grammatical categories such as voice, causativity and intensivity. Though generalizations of varying strength (mostly concerning thematic roles) are possible, it is often impossible to predict in which of the *binyanim* a given verb root will be inflected. Most verbs are realized in some subset of the seven *binyanim*; few are realized in all. (For an attempt at semantic and syntactic characterization of the *binyanim*, see Horvath 1981).

Importantly for the developments to be described, already in pre-Modern Hebrew different *binyanim* could accommodate different numbers of consonants: though most were limited to three (putting aside biliteral roots), some could contain either three or four. This flexibility in the consonantal structure of some of the *binyanim* arose from the fact that they contained geminate C-slots, *i.e.* slots in which a root consonant surfaced as a geminate. Presumably due to a reinterpretation based on equivalence of timing units, already in the earliest attested Hebrew these slots had come to accommodate not only geminated root consonants but clusters of two distinct root consonants. This was the basis for the existence of quadriliteral roots, which could thus only be realized in the subset of *binyanim* (three out of the total seven) that contained geminate slots. In Modern Hebrew phonology, distinctive gemination has been lost, so that the timing-unit equivalence in these slots no longer holds; the possible significance of this fact will be considered below.

Table (1) shows the vowel and affix templates of the seven major *binyanim*, with their traditional names and characterizations, in the past, present, and future tenses. Within the past tense, some *binyanim* show vowel alternations between the third person (III) and the other persons (I, II). Subject-agreement affixes are the same in all *binyanim* and are not shown. C stands for a consonant slot, underlined \underline{C} for a geminated consonant slot.

	Traditional <i>binyan</i>	Past	Present	Future, impera-
				tive, infinitive
1	pa'al "simple"	CaCaC-	CoCeC-	- <i>i</i> -CCoC- ~
				-i-CCaC-
2	nif'al "passive"	ni-CCaC-	ni-CCaC-	-i-CaCeC-
3	hif'il "causative"	hi-CCiC- (III) ~	ma-CCiC-	-a-CCiC-
		hi-CCaC- (I, II)		
4	huf'al "causative	hu-CCaC-	mu-CCaC-	-u-CCaC-
	passive"			
5	pi'el "intensive"	Ci <u>C</u> eC- (III) ~	<i>me</i> -Ca <u>C</u> eC-	-e-Ca <u>C</u> eC-
		Ci <u>C</u> aC- (I, II)		
5a	polel	$Co\underline{C}eC$ - (III) ~	me-	-e-Co <u>C</u> eC
		Co <u>C</u> aC- (I, II)	Co <u>C</u> eC-	
6	pu'al "intensive	Cu <u>C</u> aC-	me-	-e-Cu <u>C</u> aC-
	passive"		Cu <u>C</u> aC-	
7	hitpa'el "reflexive"	<i>hit</i> -Ca <u>C</u> eC- (III) \sim	mit-	-it-Ca <u>C</u> eC-
		<i>hit-</i> Ca <u>C</u> aC- (I, II)	Ca <u>C</u> eC-	

(1) Templates of the seven traditional *binyanim*.

It will be seen that *binyanim* 5-7 contain a geminated middle C-slot; quadriliteral roots can thus be realized in these three *binyanim*, as CiCCeC *etc*. Note also that stress, although not shown in the table, is completely predictable: in unsuffixed forms, the second vowel of the template (that is, the last vowel in the word) is stressed; in forms with a subject-agreement suffix, some such suffixes attract the stress (e.g. $pa'al-\dot{u}$ 'they acted'), others do not (e.g. pa'al-ta 'you (m. sg.) acted').

The seven *binyanim* are divided in Table (1) into three groups based on productivity relations. Within each group, if a verb is realized in one of the *binyanim*, it will usually be realized in the others, but not necessarily in *binyanim* outside that group. Thus any verb with a form in *binyan* 5 is likely to have a passive in *binyan* 6 and a reflexive in *binyan* 7, but it will not necessarily have forms in *binyanim* 1-4.

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The *binyan* shown as 5a is a minor and largely unproductive pattern, in which the second and third consonants are always identical; it is traditionally considered a subtype of *binyan* 5.

In terms of general productivity, the second and third groups of *binyanim* are productive in forming new verbs, while the first group (*binyanim* 1-2) and the minor pattern 5a are largely though not completely unproductive. The productivity of these latter *binyanim* seems to be restricted to cases in which their vowel structure contributes to maximal source faithfulness, as is described below.

I will now proceed to describe the three sets of surface-faithfulness phenomena in Modern Hebrew: consonant cluster preservation, vowel preservation and stress preservation. In all three cases, 'preservation' refers to the faithful reflection in some or all verb forms of a feature of some other, related form: either a noun, usually a loanword, from which the verb is denominalized, or a foreign source word of a loan verb. For brevity, I will refer to this form as the 'source' or 'source word' of the verb.

1.1 Consonant Cluster Preservation

In this type of surface faithfulness, the verb form preserves the consonant adjacency patterns of its source: clusters in the source word appear as clusters throughout the paradigm of the verb, rather than being broken up by template vowels. In many quadriliteral verbs this can be regarded as merely a side effect of the structure of the *binyan*, and therefore as analytically straightforward; in other verbs, however, some reference to properties of the source seems required. Consider first the following verbs in *binyanim* 5 (CiCCeC) and 7 (*hit*CaCCeC):

diskes 'discuss' (5) < Eng. *discuss firmet* 'format' (5) < Eng. *format* (v.) or Heb. loanword *format* (n.) *nitrel* 'neutralize' (5) < *netrali* 'neutral' *hitmastel* 'become intoxicated' (7) < *mastul* 'intoxicated' (Arabic loan)

It will be seen that the source words contain a medial consonant cluster, and that this is accommodated naturally by the medial C-slot of the relevant *binyan* (an originally geminate slot). Such forms therefore pose no difficulty in terms of a templatic analysis. Others, however, do:

Pibstrekt 'make abstract' (5) < *Pabstrakti flirtet* 'flirt' (5) < Eng. *flirt hišprits* (3) < *šprits* 'spray' (Yiddish loanword)

Pibstrekt and *flirtet*, both *binyan*-5 forms (CiCCeC), depart from the traditional form of this *binyan* in two ways. The medial C-slot in *Pibstrekt* contains not

two consonants but four — an impossibility in pre-Modern Hebrew, where clusters of more than two consonants were not allowed. Also, clusters appear in the final C-slot (*?ibstrekt*) and the initial C-slot (*flirtet*) of the same *binyan*; these are not originally geminate slots, and could not have contained clusters in pre-Modern Hebrew. Similarly, *hišpric* (*binyan* 3, *hi*CCiC) contains three consonants in two C-slots, neither of which is a geminate slot, so that one slot (presumably the second) must be regarded as containing a cluster.

The motivation for these structural departures is clear: in all cases, they preserve the consonant clusters of the source. Thus these forms cannot be analyzed as derived from a root (which would contain no information about segment adjacency) plus a template. The case of *flirtet* is especially instructive. The source word *flirt* contains four consonants; it would thus be possible to form this verb, in the same *binyan*, on the normal pattern CiCCeC, yielding **filret*. This does not occur; instead the initial cluster is preserved, with reduplication of the final consonant (an existing native morphological resource) to fill what would otherwise remain an empty C-slot. Similarly the source word *špric* 'spray', with its four consonants, might have yielded **šiprec* in *binyan* 5; the actually occurring form is preferable only in the fact that it preserves the cluster *špr*. (As the verb is not causative, there is no semantic reason for the choice of *binyan* 3.) It would be impossible to account for these verbs without reference to the form of the source, as any analysis must require ascribing a higher value to cluster preservation (seen as a sourcefaithfulness constraint) than to canonical template structure.

It seems, then, that in Modern Hebrew any C-slot, whether originally geminate or not, can accommodate consonant clusters when this is necessary for source faithfulness. The question arises why such departures from traditional template structure are allowable in Modern Hebrew at all. This is essentially a diachronic question, as we are dealing with a set of structural changes in the template system that have had the effect of increasing the flexibility of C-slots. A surely relevant factor is the fact that Modern Hebrew, unlike earlier forms of the language, permits complex syllable margins; this phonotactic flexibility is a necessary condition of the expansion of C-slot into cluster slots. Also relevant would seem to be the loss of distinctive gemination in the modern period. Before this change, the timing-unit equivalence between geminates and two-consonant clusters meant that the latter were limited to appearing only in geminate slots (and longer clusters could not appear at all, given the ban on complex margins). Once gemination was lost, nothing remained to distinguish the medial slots of binyanim 5-7 (the original geminate slots) from any others, and there would no longer have been any reason for speakers to learn that only those slots could accommodate clusters — a seemingly arbitrary restriction. The loss of gemination thus produced an equivalence between single consonants and clusters, which, once established, could spread into all C-slots in all binyanim.

1.2 Vowel Preservation

A second strategy employed to increase faithfulness to the phonological form of source words exploits the fact that in some cases an element of a *binyan* (in some or all of its inflectional forms) happens to be identical to a substring of the source word. These serendipitous identities, which mostly involve vowels, often draw such words into the relevant *binyan*, even when it is otherwise generally unproductive as a template for new verbs. The result is that such a verb then contains a segment or string of segments which can be equally well analyzed as part or the template or as part of the root.

Many examples occur in *binyan* 3 (*hi*CCiC), in cases where the *i* vowel of the template corresponds with an identical vowel in the source word:

hiflik 'hit, slap' (3) < flik 'blow' (Yiddish loanword) hišpric (3) < špric 'spray' hisnif 'snort' (3) < Eng. sniff hiklik 'click' (3) < Eng. click</pre>

This is a productive *binyan*, as mentioned above. Other cases, however, involve verbs formed in otherwise unproductive *binyanim*. These include verbs formed from source words containing the vowel *o*, which (as Table 1 shows) only occurs as a template element in two *binyanim*: the minor *binyan* 5a, whose first vowel is *o* in all forms; and the non-past forms of the frequent but largely unproductive *binyan* 1. Both these *binyanim* attract verbs based on source words containing *o*:

koded (5a) < *kod* 'code' (English loanword) *šnorer* 'thieve' (5a) < *šnor* 'theft, fraud' (Yiddish loanword) *laxrop* (inf.) (1) < *xrop* 'sleep' (Slavic loanword)

The choice between *binyanim* 1 and 5a in such cases seems to be based on both phonological and argument-structure criteria. Source words of the form CCoC, like *šnor* and *xrop*, can fit into either *binyan*, but those of the form CoC can only go into 5a, where the missing third consonant can be supplied by reduplication. In the case of CCoC words, the choice of *binyan* seems to be a question of the verb's argument structure: 5a, like its parent 5, is a strongly transitive *binyan*, while 1 contains both transitive and intransitive verbs. Since only a handful of relevant verbs exist, there is insufficient data for a positive conclusion, but it seems a plausible generalization that intransitive verbs based on CCoC words are formed in *binyan* 1, transitive ones in *binyan* 5a.

A phenomenon similar to vowel preservation, but in which the element shared between source and template is longer than a single vowel, occurs in one word known to me: *mesandzer* 'make a messenger of'. The relevant template is *meCaCeC*, the present form of *binyan* 5 (where *me*- is a present-tense prefix). Here the identity between the *me*- prefix of the template and the first two segments of the source word is exploited to create a phonologically highly faithful denominal verb from a five-consonant source which is otherwise difficult to fit into any of the *binyanim*.

It should be noted that in most such cases, the identity between template elements and source-word segments only holds in part of the verbal paradigm, because template elements vary in inflection. Thus, as Table 1 shows, verbs like *hiklik* do not contain the relevant *i* in the first- and second-person past forms, where the form is *hiCCaC*-; verbs like *laxrop* only contain *o* in the infinitive and future; verbs like *mesandzer* have a *me*- prefix only in the present tense. *Binyan* 5a verbs like *koded* are exceptional in that the shared *o* appears in all paradigm forms, but even such verbs will have non-faithful forms because of inter-*binyan* productivity: as described above, verbs in 5 (including 5a) regularly form passives in 6, where the shared *o* does not occur (*kudad* 'was coded').

The strategy thus appears to be to realize such verbs in paradigms where at least some of the forms will be source-faithful. In some such verbs the choice of *binyan* is straightforward because only one *binyan* affords the necessary phonological element: a verb 'to make a messenger of' can only be formed faithfully in *binyan* 5, as no other *binyan* contains the prefix *me*-. Where competition between *binyanim* does arise, as in the case of source words of the form CCoC, the choice seems to be motivated by the fit between the verb's argument structure and the prototypical lexical semantics of the *binyan* (cf. Horvath 1981).

Nonetheless, in parts of the paradigm where source faithfulness does hold, the result of this preservation strategy is to produce verb forms which can in principle be analyzed as composed of a stem, identical to the source word, plus affixes. Thus *laxrop* 'to sleep' and *hiklik* 'clicked', though still analyzable traditionally as consisting of the triliteral roots *x*-*r*-*p*, *k*-*l*-*k* in the templates *la*CCoC and *hi*CC*i*C, can also be seen as the stems *klik* and *xrop* (identical to borrowed nouns) preceded by the verbal inflection prefixes *la*- '*binyan* 1 infinitive' and *hi*- '*binyan* 3 past'. This stem-based analysis, though not extendible to the entire paradigms of these verbs, has the advantage, in those forms where it does apply, of accounting for the identity with the source words, which must otherwise be seen as coincidental. The faithfulness-increasing enlistment of serendipitously appropriate template elements thus has the effect of creating what is in effect stem-and-affix morphology in part or all of the verbal paradigm.

Just as in the case of cluster preservation, then, vowel preservation and associated phenomena present cases where a templatic analysis falls short. A templatic account, unable as it is to refer to related surface forms, cannot explain the choice of *binyan* in these forms, which is clearly motivated by source-word faithfulness.

1.3 Stress Preservation

A final, recent development, not yet described in the literature to my knowledge, occurs in colloquial registers and is still very restricted in scope. This is the appearance of lexically determined stress in verbal forms. In traditional Hebrew morphology, the location of stress is as much a part of the verbal template as the vowel structure, and is completely predictable as described above (being either on the second template vowel, or on the suffix if that is one of the suffixes that attract stress). However, one or two colloquial loanword-based verbs (probably originating within the past twenty or thirty years, though such spoken-language innovations are hard to date) have an anomalous stress pattern:

histálbet 'make fun' (7) < *stálbet* 'fun, humor' (Arabic loanword)

This verb should be expected to receive regular second-template-vowel stress as *histalbét. That it does not do so, in violation of a strong morphophonological generalization, is surely related to the location of the stress in the base noun, which the verb thus preserves. Similarly to the case of vowel preservation, the result of stress preservation is that a form like histálbet is analyzable as a stem stálbet with inherent stress, preceded by an inflectional prefix hi-. The existence of the noun stálbet provides an argument for positing such a stem (and note that the choice of binyan 7, hitCaCeC¹, for this verb also has the effect of preserving both vowels of the source noun, so that the anomalous placement of the accent completes the identity between noun and verb stem). The alternative, templatic account is unable to refer to this noun and so cannot explain the anomalous location of stress in the verb. In the case of histálbet it is thus unavoidable to say that stress, which is normally specified by the template and affixes, is here specified lexically.

2 Theoretical Accounts

The phenomena just described are obviously difficult to account for in terms of Semitic root-and-template morphology as traditionally conceived, where consonantal slots are restricted to a single consonant each while vowels and stress are provided by the template alone. Some scholars have reacted to this difficulty by modifying or adding to the traditional account; others have taken the more drastic step of abandoning templatic morphology as a theoretical resource altogether, and attempting a purely concatenative account of the Hebrew verb system.

Bolozky (2005) accounts for cluster preservation by proposing the concept of the *shorshan* (pl. *shorshanim*), which he defines as "consonants or consonant sequences that are never split within the paradigm". These are intended as a way

¹ The metathesis ts > st is a regular phonological process.

of capturing the structural significance of consonant clusters, which the traditional single-consonant slots fail to do. Bolozky's *shorshanim* differ from what I have referred to above as 'cluster slots', however, in that they are not stable across all verbal forms derived from a root. For example, a regular verb in *binyan* 1 has a past form CaCaC and an infinitive *la*CCoC; in Bolozky's terms, the former has three *shorshanim* but the latter only two, since the first two root consonants form a cluster. Likewise, a verb in *binyan* 5 (*hi*CCiC) and a verb from the same root in *binyan* 1 (CaCaC) have different *shorshanim* — two in the former case, three in the latter. Obviously this misses the morphological similarity that the concept of a root is intended to capture; for Bolozky, then, the *shorshan* does not analytically replace the root, but complements it. It seems, however, that a simpler way of achieving the same result would be to modify the possible structure of the 'root' so that it consists of C* units, *i.e.* either single consonants or clusters, than to posit two competing structures, a root and a set of *shorshanim*.

Several scholars, mostly working within Optimality Theoretic frameworks, have proposed the radical idea of dispensing with the consonantal root altogether in accounts of Hebrew (and Semitic) morphology. Instead, they favor the idea of 'melodic overwriting', in which a syllabic (rather than consonantal) input form serves as the basis for derivation, and other forms are produced by replacing or 'overwriting' the vowels of the base with the vowels of an affix. This approach has the advantage of accounting naturally both for cluster preservation and vowel preservation: the former because clusters contain no vowel that can be overwritten, the latter by positing a higher Optimality Theoretic constraint ranking for faithfulness to vowels present in the source word (which thus cannot be overwritten) than for other vowels. Proponents of such analyses include Bat-El (1994, 2003a, 2003b) and Ussishkin (2005).

A weakness of this type of analysis is that it offers no principled reason to choose one verb form rather than another as the 'base'. For a verb like *gadal* 'grow' it is equally possible to posit as the base form the past *gadal* and derive the present *godel* from it by melodic overwriting, or vice versa; neither alternative seems preferable. Bat-El concedes this, stating that the choice of base can vary between speakers and even at different stages of the same speaker's development, and that "semantic considerations may lead the learner to choose one form rather than the other" (2003b:24). Elsewhere she says:

I propose a structural interpretation of stem modification which expresses the morphological relations between stems in Semitic languages. The analysis takes a fully specified surface stem as the base of the operation rather than root and *binyan*. In many cases the phonological operations involved do not provide the clue for selecting the base and, for our purposes, it is actually not at all relevant. Lexical-semantic considerations ... are often responsible for selecting the base. (Bat-El 2003a:49-50) Tom Recht

But the 'base' is only useful as a morphological construct; the reason for positing the existence of a base form is not that speakers ever show evidence of deriving one verb form directly from another, but that Optimality-Theoretic models like the one Bat-El uses require an input form. Absent independent evidence for its existence in the minds of speakers, the necessity for a concept of the 'base form' is unclear.

Ussishkin (2005) provides a similar 'melodic overwriting' theory of Hebrew verb derivation to that of Bat-El, with the difference that he identifies a single category — namely, the past tense of *binyan* 1, considered the least marked form — as the base. However, as he admits in a footnote (183), this poses the difficulty that the vowels of some verbs are unpredictable based on the past tense of *binyan* 1. Thus for example:

Binyan 1, III m. sg. past	Future
kam 'get up'	ya-kum
sam 'put'	ya-sim
gar 'live'	ya-gur
šar 'sing'	ya-šir
lamad 'learn'	yi-lmad
lakad 'trap'	yi-lkod

As these examples show, the vowel of the future forms (and similarly of the infinitive and imperative) cannot be predicted based on the past forms: it varies between u and i in biliteral verbs, and between a and o in triliterals. This fact in itself seems sufficient to rule out any model which takes the *binyan* 1 past form as base and derives all others from it; and other candidates for the base are ruled out by Ussishkin himself on markedness grounds.

This 'problem of the source' — the lack of a single, fully informative form that can serve as a base for derivation — is the same argument advanced by Prunet (2006:45) against derivational accounts of verb morphology in other Semitic languages. It would seem that theories which necessitate a unidirectional derivation based on a single input form are simply not very fruitful as accounts of how speakers of Semitic languages actually produce verb forms.

In addition to these theory-internal problems encountered by proposals to do away with the consonantal root, there is ample external evidence from experimental studies in favor of the reality of the root as a psycholinguistic entity in Hebrew speakers' minds. Ravid and Bar-On (2005:234-236) provide a comprehensive review of such root-reality studies, both oral and written:

Studies of the acquisition of word-formation in Hebrew indicate an early ability to manipulate roots within spoken word structure. Berman (1990) shows that young Hebrewspeaking children rely on tri-consonantal roots as the least marked and most accessible option when forming denominative verbs. ... Similarly, both Berman (1994) and Ravid and Nir (2000) found that non-linear root-and-pattern affixation precedes linear suffixation in the acquisition of Hebrew adjectives. ... Berent and Shimron (1997) tested Hebrew readers' sensitivity to roots by obtaining ratings for vocalized nonce words with nonce roots. They found evidence of morphological decomposition and inferred the existence of the root morpheme as a separate representation in the Hebrew word. ... Frost, Forster and Deutsch (1997) studied the lexical representation of Hebrew words by testing adults on reading non-vocalized Hebrew words. They found that previous exposure to the root letters facilitated lexical access and naming of targets that were derivations of the root. Deutsch and Frost (2002) review a series of studies which suggest that regular root morphemes are lexically represented in the Hebrew mental lexicon. ... These studies, taken together, all indicate that roots are 'real' psychological entities in the sense that they play an important role in the organization of the Hebrew mental lexicon.

In light of these studies, it seems an unavoidable conclusion that any model of Hebrew verbal morphology that aims at psycholinguistic verisimilitude (rather than formal completeness only) must include a concept of the root. On the other hand, a pure root-and-template model is unable to account for the surfacefaithfulness phenomena described above. The only way out of the impasse, then, is to abandon the idea that templatic and concatenative systems are mutually exclusive, and describe the Modern Hebrew system as a hybrid of the two.

3 Gradient Templaticity and Language Contact

The idea that a morphological system can combine a degree of templaticity with a degree of concatenation is not, of course, a new one: Bat-El (2003a:30) herself states that 'the difference between Semitic and non-Semitic languages is not a matter of type but rather a matter of degree and combination.' But she assumes that the existence of the consonantal root depends on an all-or-nothing view of templaticity, and therefore takes these facts as militating against it, despite the root's experimentally demonstrated validity as a psycholinguistic entity. Yet if templaticity is a gradient, composite phenomenon, a more fruitful approach would be to seek the components that define the scale, *i.e.* the specific features that make a language more or less templatic. The surface-faithfulness phenomena considered above, all of which appear to have the effect of pulling the Hebrew system away from the maximally templatic pole of the continuum, may thus serve to identify some of the features of 'canonical' templaticity.

I suggest that each of the three sets of surface-faithfulness phenomena corresponds to the loss or erosion of a single canonical feature of maximally templatic languages, namely the following: Tom Recht

1. Surface adjacency relations are templatically determined. In a prototypical templatic language, segment adjacency relations are never lexically specified: phonological structure derives from the template alone, so that the same root in different templates can yield (for example) the structures $C_1C_2VC_3$ or $C_1VC_2VC_3$. A fully templatic language cannot specify lexically that C_1 and C_2 must, or may not, surface adjacent to each other. But consonant cluster preservation in Modern Hebrew does exactly this: e.g. in *flirtet* 'flirt', the consonants *fl* always surface adjacently, regardless of the template.

2. No overdetermination. By 'overdetermination' I mean a situation in which a single segment in a word appears to owe its existence to both the template and something else (a root or stem). In a canonical templatic language, all segments are singly determined: thus in 'ordinary' Hebrew verbs such as *katav* 'he wrote', the consonants *k-t-v* are determined or contributed by the root alone, the vowels *a-a* by the template alone. But vowel preservation (and the similar phenomenon exemplified by *mesandyer*) produces forms in which the preserved segment or string can — in fact, must — be ascribed both to the template and to the source noun. Thus the second *i* of *hiklik* 'he clicked' reflects both the structure of the template *hi*CCiC as well as that of the source noun *klik* 'click'

3. **Prosody is templatically determined**. In a maximally templatic language, there is no lexical stress; the location of stress (if not fixed phonologically) is determined by the template. This is the case in practically all Modern Hebrew verbs; but in the case of *histálbet* 'made fun', the anomalous location of the stress must be ascribed to the source noun and is thus lexically determined.

All three sets of phenomena, then, represent cases in which some feature previously determined exclusively by the template ceases to be so, nudging Modern Hebrew a notch down (so to speak) on the templaticity scale.

The notion of a templaticity scale raises a number of distinct sets of questions: can such a scale be fully defined, and if so, what features define it? What constitutes a maximally templatic language? What factors cause languages to move up or down the scale? It would be beyond the scope of this paper to attempt to provide general answers to these questions, but the Hebrew data do indicate a possible partial answer to the last question, that of diachronic language change.

In the Hebrew case the motivation for all three types of 'anti-templatic' phenomena seems clear: speakers' desire to faithfully reflect the phonological structure of source words which, because of their foreign origin, are otherwise difficult to fit into the verbal system. An obvious fact about almost all the verbs in question, the relevance of which seems not to have been explicitly noted in previous work (oriented as this mostly is toward morphological theory), is that they are loan verbs: that is, either direct borrowings of foreign verbs or else denominal verbs formed from borrowed nouns. Their phonological structure is thus not straightforwardly 'translatable' into a native-like triliteral or quadriliteral root, either because they contain too many consonants, and/or because features other than the order and identity of the consonants (vowels, consonant adjacencies) are deemed important enough to merit preservation. Such difficulties tend not to arise in the case of denominal verbs formed from native nouns, as these are themselves generally based on a consonantal root which the verbal templates can easily accommodate.

Ultimately, then, the erosion of templaticity in Modern Hebrew is a language contact phenomenon, due to the influx of loanwords in the period dating from the modern revival. In terms of diachronic typology, the tentative generalization suggests itself that templatic systems are peculiarly vulnerable to such piecemeal erosion caused by lexical borrowing. Any morphological system that demands that lexical elements conform to a highly specific structure will be unfitted for accommodating loanwords that do not possess the required structure. In situations of language contact, such a system will therefore present speakers with an unusually sharp conflict between faithfulness to the shape of the source word and well-formedness in terms of the traditional morphology. The pragmatic effect of violating the former constraint is likely to be more serious than that of violating the latter: a verbal form which is insufficiently similar to its source word may not be understood (saying **filret* for 'flirt' would probably stump most Hebrew speakers), while a form which merely presents a morphological anomaly will still be perfectly comprehensible.

With this in mind, it is unsurprising that comparable developments to those described here for Hebrew have been observed in other Semitic languages. Maltese has gone further than Hebrew along the path of loan verb accommodation, so that one Maltese conjugation class allows the wholesale importation of foreign stems which are then inflected with native affixes (Mifsud 1995, esp. ch. 5-6; Borg and Azzopardi-Alexander 1997:258ff.). Newton (1964; cited in Wichmann and Wohlgemuth 2008) describes a heavily Greek-influenced Arabic dialect of Cyprus in which Greek verbs are borrowed along with their native conjugations, so that all forms of these verbs are the same in both languages. Both of these cases, of course, represent situations of prolonged, intense contact with non-Semitic languages.

Finally, to return to the question of the status of the consonantal root. Both the synchronic analysis of templaticity as composite and the diachronic facts of gradual change along a templatic 'scale' indicate that an all-or-nothing view of the root (as either nonexistent or solely operative) is correspondingly misguided. Such a view would imply either that a language moving 'down' the templaticity scale must at some point lose all its roots in one fell swoop, or else that the root does not exist even in a maximally templatic language where no surface-faithfulness phenomena occur (such as pre-Modern Hebrew), even though these

are the chief argument against its existence. It seems clear that we will have to speak of coexisting domains of root-and-template and stem-and-affix morphology within the same language, or of competing templatic and concatenative subsystems; the nature and interaction of these subsystems in a given language cannot be defined *a priori* but can only be identified through psycholinguistic studies.

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Tom Recht

Tom Recht University of California, Berkeley Department of Linguistics 1203 Dwinelle Hall Berkeley, CA 94720-2650

trecht@berkeley.edu

Partial Wh-Movement and Wh-Copying in Dutch: Evidence for an Indirect Dependency Approach

ANKELIEN SCHIPPERS University of Groningen

1 Introduction

This article reports on a magnitude estimation experiment investigating the grammatical status of partial wh-movement and wh-copying versus standard longdistance movement in Dutch. The results show that long-distance wh-movement is rated most acceptable, followed by wh-copying and finally partial whmovement. Of interest is the significant difference in acceptability in partial whmovement and wh-copying. It is argued that these results speak in favor of a socalled Indirect Dependency Approach to partial wh-movement in which partial wh-movement is analyzed as a structurally altogether different construction from long-distance wh-movement. Wh-copying, on the other hand, is argued to be a surface alternative to long-distance movement, where an intermediate movement copy has been spelled out.

2 Background

2.1 Syntactic analyses of partial wh-movement and wh-copying

It is well known that certain languages have alternative forms next to (or instead of) standard long-distance (LD) movement constructions. Two of these alternatives concern the so-called partial wh-movement and wh-copy construction. These constructions show up in a wide variety of languages, including Hindi, Romani, Hungarian, Russian, Polish and various Germanic languages such as German, Frisian and Afrikaans.¹ Below in (1) and (2) are examples of partial wh-movement and wh-copying in German. In these constructions, a wh-phrase is moved only partially to the embedded SpecCP, and not all the way up to the matrix scope position. Instead, the highest SpecCP is

¹ For an extensive overview of languages that have partial wh-movement, see Fanselow (2006).

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either occupied by what is traditionally called a scope marker (*was* in example 1), or by a copy of the wh-phrase, as in (2). In both constructions, the medial wh-phrase takes matrix scope, and the constructions therefore have the same interpretation as the LD wh-movement construction in (3).

- (1) [_{CP1} Was meinst du [_{CP2} wen Maria liebt?]] what think you who Maria loves
- (2) [_{CP1} Wen meinst du [_{CP2} wen Maria liebt?]] Who think you who Maria loves
- (3) [_{CP1} Wen meinst du [_{CP2} dass Maria liebt?]] Who think you that Maria loves?'
 - (1) (3) : 'Who do you think Maria loves?'

Regarding partial wh-movement, two different analyses have been proposed: the Direct Dependency Approach (DDA) (cf. van Riemsdijk, 1983; McDaniel, 1989 and many others) and the Indirect Dependency Approach (IDA) (cf. Dayal 1994, 2000 and many others). ² These analyses are sketched below in (4) and (5) ('SM' stands for scope marker):

(4)
$$\begin{bmatrix} CP1 & SM & [VP & V & [CP2 & wh & ... & t_{wh} & ... &]] \end{bmatrix}$$

$$[5] Indirect Dependency Approach (5) [CP [CP1 SM [VP t_{SM} V]] CP2 wh ... t_{wh} ...]$$

Within the DDA, partial wh-movement is essentially analyzed as a surface alternative to LD wh-movement. This idea originates from the fact that partial wh-movement and LD wh-movement yield identical interpretations, suggesting the two constructions are also structurally similar. Furthermore, partial whmovement, just like LD wh-movement, is subject to locality constraints. For these reasons, the DDA assumes that there is a direct link between the scope marker and the wh-phrase in the subordinate clause. How this link between the scope marker and the true wh-phrase is established exactly differs somewhat in the several types of DDAs that have been proposed. Broadly speaking, two main

 $^{^{2}}$ There are numerous variants of both types of analyses, and it is beyond the scope of this paper to discuss all of them in detail. The interested reader is referred to the volume by Lutz et al. (2000).

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analyses can be distinguished: it is either assumed that a chain has been created between the scope marker and the true wh-phrase at some level of syntactic representation (e.g. by coindexation, cf. McDaniel; 1989; Van Riemsdijk, 1983 and many others), or alternatively, the scope marker is seen as a spell-out of part of the true wh-phrase or a feature of the wh-phrase (cf. Barbiers et al., 2008; Cheng, 2000; Hiemstra, 1986; Sabel, 1998). What these DDAs have in common is that in all cases, partial wh-movement is analyzed as being structurally similar to LD wh-movement.

The IDA, conversely, does not assume that this kind of structural similarity between partial wh-movement and LD wh-movement exists. Here it is assumed that the scope marker is base generated in an argument position of the matrix clause, from which it may move to SpecCP, and that the scope marker is linked to the whole embedded clause, not just to the wh-phrase contained in it. Dayal (1994, 2000), who was the first to propose an analysis along these lines, assumes the scope marker in the matrix clause questions over propositions, and that the complement clause functions as its restriction. This is accomplished by coindexation of the scope marker and the embedded clause. Other proponents of the IDA assume the scope marker is an expletive generated in object position, which is replaced by the embedded CP at LF (cf. Fanselow & Mahajan, 2000; Herburger, 1994; Horvath, 2000; Mahajan, 2000; Sternefeld, 2002; Stepanov & Stateva, 2006). A third type of IDA is proposed in Felser (2001), who argues that the scope marker is not an expletive subject to replacement, but that it is a true argument that is theta-licensed by the matrix verb. She assumes that the matrix verb and the embedded CP form a syntactically complex predicate, of which the scope marker is the semantic subject.

The main difference between the two types of analyses that is relevant to the current discussion is that the IDA assumes the scope marker originates in a low position in the matrix clause, and is linked only indirectly to the wh-phrase in the embedded clause. Within the DDA, however, the scope marker and the lower wh-phrase are presumed to be linked directly, under the assumption that the scope marker and the lower wh-phrase are part of the same movement chain.

The wh-copy construction, conversely, is almost invariably analyzed as a direct dependency, in which the medial wh-phrase is analyzed as a spelled-out movement copy. Some proponents of the DDA have argued that the wh-copy construction speaks against an IDA of partial wh-movement (cf. Bayer, 1996; Brandner, 2000; Höhle, 2000). This view is mainly based on German, which has both partial wh-movement and wh-copying. Since these constructions behave alike in many respects (notably, in both cases a wh-phrase is moved partially to a non-interrogative SpecCP), it is argued that partial wh-movement and wh-copying are essentially the same, the only difference being that in case of partial wh-movement, the matrix SpecCP is occupied by a scope marker, and in case of the wh-copy construction by a copy of the partially moved wh-phrase. Since copies of

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the wh-phrase cannot be considered to be clausal expletives, the argumentation is that medial wh-movement constructions like partial wh-movement and whcopying cannot involve an indirect dependency in which the highest wh-phrase is a clausal expletive that is linked semantically to the entire embedded clause.

Recently, it has also been proposed that wh-copying may involve a type of indirect dependency as well, in particular by Den Dikken (2009) and Koster (2009). Den Dikken and Koster both assume that partial wh-movement and wh-copy constructions involve a type of secondary predication along the lines of Felser (2001). Koster assumes wh-copy constructions are essentially a kind of pseudo-clefts, whereas Den Dikken assumes they are genuine scope marking constructions. In this latter analysis, the fact that wh-copy constructions involve apparent "copying" of the true wh-phrase follows from the idea that concord obtains between the scope marker and the true wh-phrase. This way, the scope marker may obtain certain features from the true wh-phrase, which causes it to look surface-identical to it.

Of relevance to the current discussion is the fact that the different analyses make different predictions about the availability of the constructions in (1) - (3) in particular languages. Under the DDA, where partial wh-movement and wh-copying are essentially analyzed as spell-out alternatives to LD wh-movement, there is no principled reason why a language allowing LD wh-movement would not allow partial wh-movement and wh-copying. Under the IDA, conversely, partial wh-movement is not generally expected to surface in LD wh-movement languages, since it is an altogether different structure from LD wh-movement.

2.2 Partial wh-movement and wh-copying in Dutch

In this paper, I discuss the availability of partial wh-movement and wh-copying in Dutch. The Dutch language is an interesting subject of inquiry, because it has been claimed that Dutch does not have partial wh-movement and wh-copying (cf. Fanselow, 2006; Müller, 1997; Van Kampen, 1997). This observation seems to be corroborated by a recent elicitation study by Jakubowicz & Strik (2008), where Dutch adult subjects predominantly produced standard LD wh-movement constructions, contrary to Dutch children, who produced a considerable amount of partial wh-movement and wh-copying in Dutch is however surprising, since these constructions do show up in closely related languages including German, (McDaniel, 1989), Frisian (Hiemstra, 1986) and Afrikaans (Du Plessis, 1977), and also in a large number of Dutch dialects (cf. Barbiers et al., 2004; Schippers, 2006). Furthermore, partial wh-movement and wh-copying also surface in Dutch child language. Finally, grammaticality judgment data from Strik (2009) has shown that a considerable number of Dutch speakers actually judge partial wh-

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movement and wh-copying to be acceptable. This suggests that partial whmovement and wh-copying are actually possible in Dutch.

One of the aims of this study is to determine what the grammatical status of partial wh-movement and wh-copying in Dutch is. If partial wh-movement and wh-copying are indeed not possible in this language, the question that must be answered is why this is the case. This latter issue bears directly on the syntactic analyses of partial wh-movement and wh-copying. The broader question this study therefore addresses is which syntactic analysis of partial wh-movement and wh-copying should be adopted accordingly.

3 Magnitude estimation

To determine the relative acceptability of partial wh-movement and wh-copying versus LD wh-movement in Dutch, a magnitude estimation experiment was carried out. Magnitude estimation is a method borrowed from psychophysics, where it was developed to provide scales for measuring impressions of physical continua, such as the brightness of light or the length of a line. In a magnitude estimation experiment, subjects are asked to judge the relative magnitude of a particular feature of a series of stimuli. For example, when subjects have to estimate the length of a series of lines, subjects are first shown a reference line of a particular length. This reference item is called the modulus. The subject is asked to give this modulus an arbitrary rating, say 100. Subsequently, the actual stimuli are presented, and the subject is asked to give each stimulus a rating relative to the modulus. The magnitude estimations can be as large or small as the subject likes, provided no negative numbers are used.

This magnitude estimation method has been fruitfully applied to linguistic stimuli as well (cf. Bard et al. 1996; Cowart, 1997). Instead of judging the differences between physical stimuli, subjects are asked to judge the differences between sentences. Specifically, they are asked to what degree sentences differ in acceptability. What is thus invoked is a scale reflecting the relative acceptability of the stimulus sentences. This scale of relative acceptability should reflect the relative grammaticality of the stimuli under consideration.

In the current study, the package WebExp (Keller et al., 1998) was used to determine the relative acceptability of the constructions under consideration. Subjects rated sentences as in (7)–(9) relative to a reference sentence. They could use any number greater than zero they liked and were instructed to focus on syntactic wellformedness (and not on semantic, pragmatic and stylistic issues).

(7) LD wh-movement

Wie denk je dat het verhaal aan Jan heeft verteld? Who think you that the story to Jan has told 'Who do you think has told the story to Jan?'

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- (8) Partial wh-movementWat denk je wie het verhaal aan Jan heeft verteld?What think you who the story to Jan has told'Who do you think has told the story to Jan?'
- (9) Wh-copying

Wie denk je wie het verhaal aan Jan heeft verteld? Who think you who the story to Jan has told 'Who do you think has told the story to Jan?'

Before the actual experiment started, subjects first went through a practice phase, which consisted of judging the relative acceptability of 5 arbitrary sentences. They then proceeded on to the actual experiment.

The subjects were 40 native speakers of Dutch (21 male, 19 female). Most of them had received higher education, and their mean age was 26 (SD 5.4). The materials consisted of 10 LD wh-movement constructions, 10 partial wh-movement constructions and 10 wh-copy constructions. Half of these items concerned subject extractions, the other half object extractions. Furthermore, 30 filler items were added to the dataset, which varied in degrees of grammaticality.

The data were normalized by dividing each numeric judgment by the value a subject had given to the reference sentence. The data per subject were subsequently transformed to z-scores. The table in (10) and the graph in (11) show the results. Since there were no significant differences between subject and object extractions, and also no interaction between the type of argument extracted and the type of movement construction, I abstract away from subject vs. object extractions.

Condition	Mean	SE (subject analysis)	SE (item analysis)
LD wh-movement	.409	.079	.044
Partial wh-movement	530	.049	.016
Wh-copying	078	.079	.028

(10) Means and standard errors per condition

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(11) Mean normalized scores and 95% confidence intervals per condition

As can be seen from this graph, LD wh-movement was rated higher than partial wh-movement and wh-copying, while wh-copying was rated higher than partial wh-movement. To determine whether these differences were statistically significant, a repeated measures ANOVA was carried out. The ANOVA showed a significant effect for TYPE, but nor for ARG and also not for the interaction TYPE x ARG. The effect for TYPE was significant in the by-subject analysis [F(2, 78) = 34.846, p < 0.001] and in the by-item analysis [F(2, 8) = 322.811, p < 0.001]0.001]. To determine which of the levels within the factor TYPE differed significantly from each other, post-hoc pairwise comparisons using a Bonferronicorrected alpha-level of (.05/3=) .017 were carried out. The means and standard errors per condition can be found in (10). In the by-subject analysis, the difference between LD wh-movement and partial wh-movement was significant [p < .001], as well as the difference between LD wh-movement and wh-copying [p < .001]. Moreover, there was also a significant difference between partial wh-movement and wh-copying [p < .001]. In the by-item analysis, all these differences also turned out to be significant [p < .001].

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Summarizing, the results show that LD wh-movement is judged significantly more acceptable than partial wh-movement and wh-copying and that wh-copying is judged more acceptable than partial wh-movement.³

4 Discussion

The fact that LD wh-movement was rated highest is in accordance with earlier claims in the literature that partial wh-movement and wh-copying are not allowed in Dutch. It must be noted though that the magnitude estimation technique only measures relative, and not absolute acceptability. Hence, the current study does not provide evidence for the view that partial wh-movement and wh-copying are impossible in Dutch. Interestingly, the results found in this study appear to be in line with judgments reported in Strik (2009), which did involve absolute acceptability. Strik interviewed 649 Dutch speakers using an online questionnaire. The participants were confronted with LD wh-movement, partial wh-movement and wh-copy constructions and asked whether these were sentences they could use in spoken Dutch. If they answered yes, they were asked to give the sentence in question a rating from 1-5, 1 indicating they felt the sentence was very uncommon in Dutch, 5 that it was very common. The results showed that virtually all informants considered LD wh-movement to be possible in Dutch, and about half of the informants also accepted wh-copy constructions. Partial whmovement, though, was only accepted by approximately a third of the informants. This pattern was also mirrored by the ratings the informants gave to the constructions under consideration. The average rating for LD wh-movement was 4.7, for wh-copying 3.5 and for partial wh-movement 3.1. The results of Strik are hence in accordance with the pattern of acceptability found in the current study. It thus appears that partial wh-movement and wh-copying are not impossible in Dutch, although they are certainly less acceptable and common than LD whmovement.

Of particular interest in both the current and Strik's study is the significant difference in acceptability between partial wh-movement and wh-copying. This suggests that there are some important underlying differences between these

³ While the individual data of the participants mirrored the overall pattern of relative acceptability for almost half (19) of the participants, there were also a considerable amount of participants that showed ratings different from the general pattern: 11 participants showed the order wh-copying > LD wh-movement > partial wh-movement, 7 participants showed the order LD wh-movement > partial wh-movement > wh-copying, 2 participants the order wh-copying > partial wh-movement > LD wh-movement and one participant the order partial wh-movement > wh-copying > LD whmovement. Note that none but one of the participants rated partial wh-movement highest. There was however a considerable amount of participants (13) who preferred wh-copying over the other types of wh-movement, but this result was most likely leveled out in the overall means.

constructions. As such, the results speak against analyses that equate the two constructions. This concerns the DDA in general, but also IDAs that assume that both partial wh-movement and wh-copying concern indirect dependencies.

As mentioned earlier, DDAs generally fail to explain why partial whmovement (and wh-copying) would not be available in LD wh-movement languages, and hence also do not explain why these constructions would be less acceptable than LD wh-movement. Moreover, the DDA does not explain why there would be a difference in acceptability between partial wh-movement and wh-copying. Under the DDA, the difference between partial wh-movement and wh-copying is that in the first case, the wh-chain is spelled out by means of a scope marker, and in the second case by means of a copy. Note first of all that it does not seem to be the case that spelling out a wh-phrase in the intermediate SpecCP causes the low unacceptability of partial wh-movement. If this were true, wh-copying should be judged equally unacceptable. The data also argue against DDAs in which both the scope marker and wh-copies are partial spell-outs of the lower wh-phrase. An analysis along these lines has been proposed by Barbiers et al. (2008), who claim that wh-words have an internal phrasal layering, which makes it possible to spell out parts of the wh-phrase separately. In their analysis, the scope marker wat 'what' is part of the wh-phrase's QP-layer, while wh-copies like wie 'who' are in a PhiP-layer. Assuming these layers may be spelled out separately, one derives the partial wh-movement and wh-copy construction. However, this analysis does not explain why partial wh-movement and whcopying are less acceptable than LD wh-movement and also does not explain why there is a significant difference in acceptability between partial wh-movement and wh-copving.

In conclusion, under the DDA, the difference in acceptability between partial wh-movement and wh-copying is difficult to explain. This is mainly due to the fact that it is assumed that both types of constructions are mere spell-out alternatives to LD wh-movement, hence predicting these constructions should generally be possible in LD wh-movement languages.

The same is true for analyses were it is assumed that both partial whmovement and wh-copying are indirect dependencies, which is the position held by Den Dikken (2009) and Koster (2009). If both constructions are a type of scope marking construction, then there is again no principled reason why there would be a significant difference in acceptability between partial wh-movement and wh-copying. Furthermore, there are independent reasons to believe that whcopying does not involve the same kind of indirect dependency as partial whmovement. One of the main arguments in favor of an IDA to partial whmovement concerns the fact that these constructions are out with complex objectverb predicates and predicates selecting for a sentential expletive (e.g. 'it', cf. Reis, 2000). This would follow quite naturally under the IDA, since this analysis assumes the scope marker originates in object position of the matrix verb. If this

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position is already occupied by another object (such as a sentential expletive), it follows that insertion of the scope marker is blocked. If wh-copying involves the same kind of indirect dependency, one would also expect it to be out with such predicates. This, however, is far from clear. According to Reis (2000) and Felser (2004), wh-copying is much better with these predicates than partial whmovement. There are also other differences between partial wh-movement and wh-copying suggesting the two are not both scope marking constructions. For one, it appears that copies of the wh-phrase cannot extend the scope of partially moved wh-phrases in the same way as the scope marker can. That is, in German, was 'what' can extend the scope of two or more conjoined wh-questions, while wh-copies cannot (cf. Dayal, 2000; Felser, 2004; Höhle, 2000). This is to be expected if only the scope marker but not a copy of the wh-phrase can extend the scope of a partially moved wh-phrase. Further arguments against analyzing whcopying as a variant of partial wh-movement are presented in Rett (2006). She mentions that wh-copying and LD wh-movement pattern alike in that both allow for cross-clausal quantifier binding, and that both show the same types of semantic ambiguities, contrasting with partial wh-movement in that sense.

In sum, there are strong reasons to believe that partial wh-movement and whcopying are different constructions. In particular, it appears that partial whmovement involves an indirect dependency, and wh-copying a direct dependency. This hypothesis is also corroborated by the crosslinguistic distribution of LD whmovement, partial wh-movement and wh-copying. The DDA is mainly based on German, which shows all three types of wh-dependencies. This has strongly fueled the idea that the three constructions are mere spell-out variants of each other. However, partial wh-movement and LD wh-movement are usually in complementary distribution, whereas LD wh-movement and wh-copying are not. In German, LD wh-movement is out for the majority of speakers and in the standard language and northern German, partial wh-movement is preferred (cf. Fanselow et al., 2005). In other so-called 'mixed' languages, like Russian, Polish and Hungarian, LD wh-movement is again severely restricted and partial whmovement is used alternatively (cf. Stepanov, 2005; Den Dikken, 2009). Finally, Hindi, another partial wh-movement language, allows no LD wh-movement at all. Wh-copying, conversely, always shows up in languages that also allow LD whmovement (i.e. German, Frisian, Romani, Passamaquoddy and Afrikaans), but not necessarily in languages that allow partial wh-movement (Russian, Polish, Hungarian, Hindi).

⁴ That is, copying and long-distance wh-movement constructions are both ambiguous between individual and pair-list readings in questions with a quantifier in the matrix clause (cf. Pafel, 2000); both allow de re and de dicto readings (cf. Dayal, 2000) and both allow inconsistent and consistent readings (cf. Reis, 2000), whereas partial wh-movement constructions do not show these kinds of ambiguities.

Partial Wh-Movement and Wh-Copying in Dutch

In conclusion, both the crosslinguistic distribution as well as the result of the magnitude estimation experiment suggest that wh-copying, but not partial wh-movement is a surface alternative to LD wh-movement. I therefore adopt an IDA to partial wh-movement, whereas for wh-copying, I assume it involves a direct dependency (i.e. LD wh-movement). The particular version of the IDA that I adopt here is along the lines of Felser (2001). She assumes the scope marker is an object expletive, which originates in matrix SpecVP. In her analysis, the matrix verb and the embedded clause together form a complex predicate, of which the scope marker is the semantic subject. The proposed structure is sketched in (12):

(12) $[_{CP} SM [_{VP} t_{SM} V [_{CP} Wh...t_{wh...}]]]$

Importantly, under the IDA, partial wh-movement is altogether different from LD wh-movement, which explains why these constructions are usually not used interchangeably. This would also explain why Dutch favors LD wh-movement and wh-copying over partial wh-movement. Since Dutch is a LD wh-movement language, it follows that wh-copying should in principle be possible too.

The question is then why it is rated less acceptable than standard LD whmovement. Looking again at the crosslinguistic distribution of LD wh-movement and wh-copying, it seems that wh-copying is secondary to LD wh-movement in general. That is, all the languages that show wh-copying also have LD whmovement, but not vice versa (English, Scandinavian). This strongly suggests that wh-copying is contingent upon LD wh-movement, and that it is secondary to it.

An interesting question is what makes spell-out of intermediate copies possible. As is well-known, the spell-out of more than one movement copy is something that is normally prohibited. This is usually subscribed to some kind of economy constraint that prevents spell-out of more than one copy. Wh-copy constructions, however, are not strongly ungrammatical, even though they may be marked for some speakers.

There are two main types of analyses that have attempted to explain why spell-out of intermediate copies in wh-copy constructions is allowed. In one kind of analysis (cf. Fanselow & Mahajan, 2000 and Nunes, 2004), it is assumed that the intermediate copy undergoes fusion with the embedded complementizer, which renders the two wh-phrases distinct. But in such an analysis it has to be assumed that only head-like wh-phrases can be copied (since these are the only ones that may undergo fusion with C). However, it is well-known that more complex wh-phrase (e.g. PP wh-phrases) can also be copied, which forms an important counterargument to this analysis.

The other type of analysis is the one proposed by Den Dikken and Koster. In their account, the higher and lower wh-phrase are not true copies of each other, but distinct lexical items, explaining why (apparent) wh-copying would be

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allowed. But as mentioned earlier, their analysis is problematic because it is not clear at all whether wh-copying involves a true indirect dependency.

The idea that the embedded SpecCP is a terminal landing site would nonetheless solve many problematic issues regarding wh-copying, as argued in Schippers (2009). But whether wh-copying truly involves an indirect dependency is something that merits further research. Of particular interest is the type of matrix predicate restrictions in this construction, specifically, whether wh-copying patterns with partial wh-movement in terms of complex object-verb predicates and predicates taking sentential expletives. I leave this open for further research.

5 Conclusion

The results of the magnitude estimation experiment showed that LD whmovement was rated most acceptable, followed by wh-copying and finally partial wh-movement. I argued that these results follow from an analysis that treats whcopying, but not partial wh-movement as a surface alternative to LD whmovement. This is also corroborated by the crosslinguistic distribution of the constructions under consideration.

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Ankelien Schippers Institut für Anglistik / Amerikanistik Fakultät 3: Sprach- und Kulturwissenschaften Carl von Ossietzky Universität Oldenburg Postfach 2503 26111 Oldenburg Germany

ankelien.schippers@uni-oldenburg.de

Computational Cognitive Morphosemantics: Modeling Morphological Compositionality in Hebrew Verbs with Embodied Construction Grammar

NATHAN SCHNEIDER Carnegie Mellon University

Introduction

This paper brings together the theoretical framework of construction grammar and studies of verbs in Modern Hebrew to furnish an analysis integrating the form and meaning components of morphological structure. In doing so, this work employs and extends Embodied Construction Grammar (ECG; Bergen and Chang 2005), a computational formalism developed to study grammar from a cognitive linguistic perspective. In developing a formal analysis of Hebrew verbs (section 3), I adapt ECG—until now a lexical/syntactic/semantic formalism—to account for the compositionality of morphological constructions, accommodating idiosyncrasy while encoding generalizations at multiple levels. Similar to syntactic constructions, morpheme constructions are related in an inheritance network, and can be productively composed to form words. With the expanded version of ECG, constructions can readily encode nonconcatenative root-and-pattern morphology and associated (compositional or noncompositional) semantics, cleanly integrated with syntactic constructions. This formal, cognitive study should pave the way for computational models of morphological learning and processing in Hebrew and other languages.

1 Form and Meaning in the Binyanim

Semitic languages are well known for their templatic verbal morphology, traditionally modeled as combining a consonantal root with a pattern belonging to one of a handful of paradigms (e.g. Berman 1978; McCarthy 1979; Bat-El 1989).¹ Modern Hebrew has seven such paradigms, or *binyanim*, summarized in Table 1. Each

¹ The consonantal root view is not uncontested—see Prunet (2006) for a review—but will be adopted here, in part because of the representational challenge it poses.

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Hebrew verb is a lexicalized combination of a root and a paradigm, with a specific meaning. For example, the triconsonantal root /g/n/n/b/ when combined with binyan pa'al means 'steal.' Applying the past tense stem template yields /ganab/ (ganav) '(he) stole.' Other inflections are obtained via regular affixation to the stem (subject to phonological considerations that are not of concern here).²

Whereas verb *forms* are quite predictable, the *semantic* relationships across paradigms of verbs with a given root are, in general, far murkier. For example, the pa'al-hif'il alternation from Table 1 is illustrated below:

- (1) zehavit ganva ?et ha-daysa (me-ha-bayit).
 Goldilocks stole.PA'AL.3.F.SG ACC the-porridge (from-the-house)
 'Goldilocks stole the porridge (from the house).'
- (2) zehavit higniva ?et ha-daysa Goldilocks stole.HIF'IL.3.F.SG ACC the-porridge (*la-bayit/me-ha-bayit*). (into.the-house/from-the-house)
 'Goldilocks smuggled the porridge (into the house/from the house).

It is difficult to imagine a precise relationship between 'steal' and 'smuggle' that could explain all pa'al-hif'il alternations in other roots. How, then, do the root and paradigm share in contributing meaning to the composite verb (if at all)? Why do speakers converge on a given root-paradigm pair to convey a particular meaning?

Most studies of the binyanim have focused on form to the exclusion of meaning. However, a few recent contributions bear on the issue of binyan/root semantics. In a corpus survey, Arad (2005) found that roots tend to be lexicalized with certain clusters of paradigms. For example, two common patterns were for the hif'il verb to be a causative counterpart of the pa'al verb with the same root, and for the nif'al verb to be the passive counterpart of the pa'al verb. At the very least, these alternations belie the notion that the formation of verbs in certain binyanim is completely arbitary. Moreover, evidence that Hebrew speakers can use the binyanim productively comes from experiments in which subjects were asked to coin novel verbs from nouns: not only did they adapt the nouns to match (or at least resemble) the conventional forms of the binyanim—they also were remarkably consistent in their choice of certain binyanim to convey certain meanings (Bolozky 1999).

Mandelblit (1997) addresses the semantics of the binyanim in the framework of grammatical blending (Fauconnier and Turner 1996). She argues that the prototypical meanings of the binyanim contrast with regard to their framing of a construed causal scenario. Consider the following two examples (Mandelblit 1997, ch. 4):

² About Hebrew transcriptions: Symbols follow IPA, except *y* is used instead of *j*. Words given in italics are broad phonetic transcriptions, with ayin as *S* and aleph as *?* (not always pronounced). Mnemonic paradigm names, which by convention inject /p/□/S/□/l/ 'do, act' into the pattern, use an apostrophe instead of *S* for readability.

Binyan	Transitivity: always (often) (Arad 2005)	Past Stem Pattern ³	Present Stem Pattern	Future Stem Pattern	/g/¤/n/¤/b/ Verb (Bolozky 1996)
PA'AL	(Transitive)	●a●a●	•o•e•	i●●O●	ganav 'steal'
NIF'AL	Intransitive	ni∙∙a∙	ni∙∙a•	i∙a∙e∙	nignav 'be stolen'
	(Passive)				
PI'EL	(Transitive)	●i●○e●	mə∙a∙∘e∙	ə∙a∙∘e∙	ginev 'steal repeatedly'
					(lit.)
PU'AL	Passive	∙u∙∘a∙	mə∙u∙∘a•	ə∙u∙∘a∙	gunav 'be stolen/taken
					stealthily' (lit.)
HIF'IL	(Transitive)	hi●●i●	ma∙•i∙	a∙•i•	higniv 'smuggle in, in-
					sert stealthily'
HUF'AL	Passive	hu∙∙a∙	mu●●a●	u●●a●	hugnav 'be smuggled
					in/inserted stealthily'
HITPA'EL	Intransitive	hit•a•∘e• ⁴	mit∙a•∘e• ⁴	it∙a•∘e• ⁴	hitganev 'sneak (in, out,
	(Passive)				or away)'

Table 1: Modern Hebrew binyanim (verbal paradigms). • marks the position of a root consonant; • represents the additional consonant(s) in 4- or 5-consonant roots.

- (3) ha-xayal rats misaviv la-migraf. the-soldier ran.PA'AL.3.M.SG around to.the-courtyard 'The soldier ran around the courtyard.'
- (4) ha-məfaked herits ?et ha-xayal misaviv the-commander ran.HIF'IL.3.M.SG ACC the-soldier around *la-migraf*. to.the-courtyard

'The commander made the soldier run around the courtyard.'

"The causative *hif'il* verb pattern," she writes, "is used to mark a single sub-event (the *effected* sub-event) within a conceived causal sequence of events. Marking other sub-events entails the usage of other *binyanim*" (Mandelblit 1997, ch. 4). The two subevents for (4) are depicted in boxes within "Input 1" of Figure 1a: an unspecified action on the soldiers by the commander causes them to run. Binyan hif'il is said to instantiate the blending schema of Figure 1a in that it profiles, or **highlights**, one of the participants and one of the subevents in the sequence, causing these to be made prominent in constructions (e.g. the transitive construction in "Input 2"). In this model, the root is interpreted as expressing the highlighted

³ The stem given here is that of the citation form, the 3rd person masculine singular inflection. In some paradigms there are vowel changes within the stem depending on the conjugation, such as pi'el—*ginev* (3.M.SG.PAST) but *ginav-ti* (1.SG.PAST). For the present purposes this variation will be treated as symptomatic of a general phonological process.

⁴ If the root begins with a sibilant consonant, it will metathesize with the preceding /t/ in the hitpa'el stem, and the /t/ will assimilate in voicing: e.g. *hizdaken* 'grow old' (/z/□/k/□/n/).

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subevent, and the noun phrase in subject position as expressing the highlighted protagonist. Thus, voice—and its correlation with the binyanim—is a consequence of highlighting one of the two participants over the other; and causativity alternations are due to a difference in subevent highlighting indicated by the alternative binyanim. Highlighting is shown in Figure 1 for the four binyanim at the heart of these contrasts.⁵

Mandelblit's analysis offers a concrete starting point for representing the meanings of the binyanim. The generalizations expressed in her account are only prototypes, in the sense of Lakoff (1987); it is impossible to fully predict the idiosyncratic variations on the prototype, such as the alternation in (1) and (2). A complete account necessitates modeling the prototypical interpretation and deviations from it. I will endeavor to show that ECG is capable of representing both.

Figure 1: Blending schemas for causal binyanim. Adapted from (Mandelblit 1997).



2 Construction Grammar Framework

In the tradition of Construction Grammar and related cognitive approaches to linguistic structure (e.g. Fillmore et al. 1988; Lakoff 1987; Langacker 1990; Goldberg

⁵ Mandelblit (1997) describes pa'al and nif'al as sometimes framing the meaning of the verb as a single, integrated event, and sometimes highlighting neither subevent over the other. Hitpa'el is described as serving many functions, including cases where both subevents have the same protagonist (reflexive) or two individuals are alternately protagonists for both subevents (reciprocal).

1995, 2006), I will treat linguistic knowledge as an organized collection of **constructions**, symbolic units that together constitute the conventions of a language. Each construction maps a form to a meaning: forms include words, bound morphemes, syntactic phrases and clauses, idiomatic expressions, and even some gestures; while meaning ranges from the semantics to the discourse and pragmatic functions of an expression. Constructions are learned and organized within the grammar-lexicon ("constructicon") of a language at many levels of generality; for instance, a general construction might govern the formation of *wh*-questions, while a more specific subcase like *What's X doing Y?* is imbued with added (or idiosyncratic) form and/or meaning (Kay and Fillmore 1999).

A growing body of work has applied construction grammar principles to morphology (Rubba 1993; Orgun 1996; Booij 2005; Gurevich 2006; see the latter for a review). The present study is similar to Rubba (1993) and Orgun (1996) in describing morphemes as compositional constructions. Gurevich (2006) counters that productive morphological behavior is best described as an online analogical process among full words, and bound morphemes should therefore not be modeled as constructions. My view is that, from a representational perspective, it is useful to model morphological productivity as constructional composition, whether or not the productivity-inducing generalizations encoded therein are in fact memorized.⁶

For the purposes of this paper, I will set aside many of the phonological complexities of Hebrew and the associated representational concerns. Among others, Bybee (1985, 2001); Orgun (1996); Inkelas (2008) provide insight that would no doubt be useful in developing an ECG approach to (morpho)phonology.

2.1 Embodied Construction Grammar

This work employs and extends Embodied Construction Grammar (ECG), a formalism developed to study grammar from a cognitive linguistic perspective (Bergen and Chang 2005; Feldman 2006; Feldman et al. 2009). The rationale for ECG is twofold. First, it is believed that a standardized, precise formalism is a descriptive asset to the cognitive linguist. Dodge (2010) uses ECG to that effect in her analysis of motion-related constructions in English. Second is the premise that such a formalism affords us the opportunity to incorporate these constructions in computational models of human language processing, as in Bryant's (2008) psychologicallyplausible parsing model and models of language learning (Chang 2008; Mok 2008).

The ECG representation for construction grammars fits within an analysis-andsimulation model of human language understanding. The analysis phase consists of processing that is most directly governed by language, and as such makes direct use of ECG. As input, the analysis phase takes an ECG grammar, an utterance to be processed, and (possibly) contextual information. The desired output is a collection

⁶ See Schneider (to appear) for additional discussion.

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of bound schemas representing the frame semantics of the most likely interpretation of the utterance. This can be modeled computationally with an analyzer program such as that of Bryant (2008).⁷

We will be concerned with two types of ECG primitives: **schemas** (frames) and **constructions**.⁸ Our goal is to develop a limited grammar describing mappings from morphosyntax to frame semantics in a particular language (Modern Hebrew).

One contribution of this paper is a proposal to close the morphology gap in ECG's expressive repertoire: until now there was no way to define constructions smaller than words. The adopted approach is flexible enough to accommodate non-concatenative morphology in Hebrew verbs, as illustrated below, and is intended to generalize to other morphological phenomena (in Hebrew and other languages) as well. It allows for morphological constructions to be integrated cleanly into a grammar alongside their phrasal counterparts. Though considered previously (Bergen 2003), this is the first work to describe and implement a general solution.

3 Constructional Analysis of Hebrew Verbs



Figure 2: Layers of Hebrew verb constructions.

What follows is an overview of the proposed ECG analysis of Hebrew verbs (for additional detail see Schneider, to appear). The approach will be to decompose a verb into morphemes—root, stem, and affix—and to represent these morphemes as constructions. Constructional **composition** (constituency) will be used to incorporate the form and meaning of a root in its host stem, and in turn to incorporate that stem into an inflectional affix. Moreover, generalizations over these constructions will allow for efficient organization of information specified by the various categories of roots, binyanim/stems, and affixes. Figure 2 summarizes the four primary sources of verbal information (root, binyan, stem, inflected verb) and their organization via composition and inheritance.

We next visit each of these components in turn, and then in section 3.5 look at the interaction between verbs and argument structure constructions.

 $[\]overline{}^{7}$ The analysis phase also interacts with other ("deeper") inference in the simulation phase.

⁸ ECG also supports other semantic representations, including metaphors and mental spaces.

3.1 Root

Frame semantics is realized in ECG through definitions of interrelated schemas. Consider the following (simplified) representations of events:

schema Process	schema TransitiveAction	schema Steal
roles	subcase of Process	subcase of Transfer
protagonist : Entity	roles	evokes
schema Transfer	agent : Entity	Rulebreaking as rb
subcase of TransitiveAction	on theme : Entity	roles
roles	constraints	thief : Person
source : Person	protagonist ↔ agent	victim : Person
recipient : Person	schema Rulebreaking	constraints
goods: Entity	roles	agent \leftrightarrow thief
constraints	action : Process	rb.perpetrator \leftrightarrow thief
theme \leftrightarrow goods	perpetrator : Person	recipient \leftrightarrow thief
	authority : Entity	theme \leftrightarrow goods
	rule : Entity	source \leftrightarrow victim
	motive : Reason	rb.action ↔ self

These schemas characterize events with different degrees of abstractness. Roles allow the event to be elaborated with participants, props, and attributes. Process, the most abstract, generalizes over all events, and includes a protagonist role for its main participant. The rest of the above schemas are more refined types of processes: e.g. in Steal, the expression **subcase of** Transfer indicates that all instances of stealing are special cases of transfer; thus Steal is thus said to *inherit* from Transfer.⁹

Steal uses *binding* (unification) constraints such as agent \leftrightarrow thief to indicate equivalences of roles defined in different schemas. Additionally, it *evokes*¹⁰ the Rulebreaking schema, because stealing typically entails that the thief is violating a moral or societal rule of some kind. In a Steal event, thief, agent (inherited from TransitiveAction), protagonist (from Process), recipient (from Transfer), and perpetrator (from the evoked schema Rulebreaking) are all aliases of the same individual. The ECG keyword **self** in the expression rb.action \leftrightarrow **self** refers to the containing schema (Steal), allowing it to be bound in its entirety to a role (action) of another schema (Rulebreaking).

When a schema such as Steal is used in an analysis of an utterance, it is said to be *instantiated*, at which point its roles may be filled (elaborated) with other schema instances via binding. Some roles are defined with type constraints; e.g. any thief

⁹ We are assuming that other necessary schemas have been defined as well: for example, the Person schema represents the category of all people, and inherits from Entity, the category of all things.

¹⁰An *evoked* schema is one which may or may not be indicated directly by some other linguistic expression, but is recruited as part of understanding the schemas denoted by the utterance. Just as Steal evokes Rulebreaking, the Transfer schema could be said to evoke a Motion schema, etc.

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must be a *subtype*¹¹ of Person for the analysis to be valid under this grammar. Thus, the analysis process entails finding a best interpretation of the input, subject to structures and constraints in the grammar. Assuming the necessary schemas for Goldilocks and porridge, the desired interpretation of the (Hebrew or English) sentence in (1) would resemble the *semantic specification* shown in Figure 3.

Figure 3: Semantic specification—schema instances and bindings—for an interpretation of (1), *Goldilocks stole the porridge*. (Tense information is not shown.)



In our framework, root constructions map an ordered series of consonant phonemes onto a semantic schema. Because the form of the root is complex, we represent its structure as a **form schema** with roles for phonemes, as in Figure 4. Like semantic schemas, form schemas are organized in an inheritance hierarchy: threeconsonant and four-consonant schemas are related under a common supertype.

Each construction in Figure 4 maps a form to a meaning. The form for consonantal roots is a subtype of RootForm, which provides slots for consonant phonemes. The construction for /g/-/n/-/b/, Root_GNB, assigns these consonants as expected and specifies the semantic schema Steal as its meaning. The other two are abstract, or **general**, constructions: they generalize over roots, but are underspecified on their own, and as such cannot be used directly in an analysis. Importantly, Root imposes an ordering on the roles denoting the consonants with the expression r1 **before** r2 **before** r3. The **before** keyword imposes a relative ordering but permits intervening material; **meets** is used elsewhere to denote strict adjacency.

3.2 Base

Now we need a way to augment the roots with binyan-specific contributions to the form and meaning of the resulting verb. I will represent each binyan as a construction that composes with a root to yield the compositional (prototypical) meaning.

¹¹Every schema/construction is its own subtype, along with all of its descendants.



Figure 4: Root schemas and constructions.

This essentially formalizes Mandelblit's (1997) blending schemas as constructions.

Base constructions that pertain to the hif'il paradigm appear in Figure 5. Base specifies a root constituent and three roles. The first, highlightedProtagonist, will be set by specific binyan constructions (e.g. Hif'ilBase) depending on their voice; the argument structure construction will therefore have access to the highlighted protagonist (whether it is the causing or affected protagonist) to put in subject position. The second, highlightedProcess, will similarly be set by the binyan to encode the highlighted process. The constraint highlightedProcess \leftrightarrow root.m specifies that the meaning of the root is that of the highlighted process. Finally, intransitiveOnly ("false" by default, but overridden where necessary) will be used by transitive argument structure constructions to avoid licensing verbs in intransitive-only binyanim.

CausationBase categorizes the binyanim with prototypically causal construals (primarily pi'el, pu'al, hif'il, and huf'al). Its meaning is the Causation schema, also in Figure 5. Causation enacts roles for the two subevents in the causal sequence.

Individual binyan constructions such as Hif'ilBase introduce the highlighting of participants/subevents and vocalic templates for the stem. These templates generalize over the binyan's three tensed stems, and hence will be partially abstract. Binyanim that only host 3-consonant roots enforce this with a type constraint on the root constituent.

Hif'ilBase is a general construction because it is not commonplace to derive a new root-binyan pair (to do so amounts to coining a new word). Lexicalized rootbinyan pairs like Hignib inherit from the appropriate binyan construction, and typeconstrain the constituent to be the root in question. Such constructions need not specify a meaning if it is fully compositional. On the other hand, an idiosyncratic meaning is easily achieved by replacing the inherited meaning, as in Hignib: recall Figure 5: Base constructions and the Causation schema.

general construction Base
constructional constituents
root : Root
meaning : Process
roles
highlightedProtagonist: Entity
highlightedProcess : Process
intransitiveOnly
constraints
intransitiveOnly - "false"
highlightedProcess \leftrightarrow root.m

general construction CausationBase subcase of Base meaning : Causation roles unhighlightedProtagonist : Entity construction Hignib

subcase of Hif'ilBase constructional constituents root:Root_GNB meaning : Smuggle







subcase of Stem, Hif'ilBase constructional constraints form constraints "a" meets root.r1 meets root.r2 meets "i" meets root.r3

that hignib means 'smuggle' rather than 'cause to steal.'

Schemas for the idiosyncratic /g/n/n/n/b/ verbs are not provided here for want of space. A Smuggle schema would be similar to Steal: both involve illicit transfer, though Smuggle requires deceitful entry/exit of some container or region, might not involve a victim, and requires only that the smuggler be the agent (not necessarily the recipient) of transfer. The Hebrew Sneak schema would involve illicit, deceitful locomotion—though not necessarily transfer—with respect to some landmark. (These similarities suggest that it might be useful to model each *root's*, as well as each *binyan's*, verbs as a prototype-based category; this is left to future work.)

3.3 Stem

Some example stem constructions are shown in Figure 6. These incorporate the tense and fully specify the form of the stem. There are 21 binyan-tense combinations, each of which will need its own construction (e.g. Hif'ilFutureStem) to specify a specific form. HignibFutureStem needs only to inherit from Hif'ilFutureStem and Hignib to acquire all of its form and meaning properties.

3.4 Inflected Verb

Figure 7: Verb constructions and an illustration of constructional composition.





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Figure 8: Argument structure constructions. PGN is short for personGenderNumber and Prot for Protagonist.

construction ArgumentStructure	
constructional	
constituents	
subject : NP	
verb : Verb	
constraints	
subject.PGN ↔ PGN	
subject.case ← "nom"	
form constraints	
subject before verb	
meaning constraints	
self.m \leftrightarrow verb.m	
subject.m ↔ verb.m.highlightedProt	



Finally, we are ready to compose the stem within an inflectional affix to arrive at the fully-inflected verb. Figure 7 shows examples of full-verb constructions. The general construction Verb takes a stem constituent and defines roles for inflectional features. Then, inflectional constructions like Future3FsgVerb specify inflectional affixes along with their morphological properties.

TAGNIB illustrates a construction definition for a fully-inflected verb. The compositionality of this verb is depicted at the bottom of Figure 7. Because in ECG constructional composition can be a productive (online) process, it is not strictly necessary to define the fully-inflected form in the grammar: our morphological analyzer will be capable of parsing all inflections of a known verb. Nonetheless, the ability to define fully compositional constructions such as TAGNIB is desirable in light of *usage-based* theories, which claim that frequent enough patterns are memorized even if they are fully predictable from more general patterns (Langacker 1990; Bybee 2001; Tomasello 2003; Goldberg 2006).

3.5 Verbs in Argument Structure Constructions

A major advantage of our representation is that morphological constructions are easily integrated within syntactic constructions. Figure 8 shows two argument structure constructions that specify the relative ordering of subject, verb, and object; enforce case marking and subject-verb agreement; and prevent verbs in alwaysintransitive binyanim from appearing in the transitive argument structure. As a whole, each argument structure construction takes on the meaning of its head verb.

4 Conclusion

I have outlined a construction grammar analysis of templatic morphology in Modern Hebrew verbs, and used it to introduce a representation that augments the Embodied Construction Grammar formalism with support for morphological phenomena. This analysis captures compositionality of both form and meaning; it is notable in its support for many levels of generalization, category prototypes, and idiosyncratic special cases. The representation is flexible enough to encode nonconcatenative phenomena, and allows for clean integration with syntactic constructions.

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Nathan Schneider Carnegie Mellon University – Language Technologies Institute 5000 Forbes Ave. Pittsburgh, PA 15213

nathan@cmu.edu

Some Hypotheses About Possible Isolates within the Atlantic Branch of the Niger-Congo Phylum

GUILLAUME SEGERER LLACAN - CNRS - INALCO - Université Sorbonne Paris-Cité

Introduction¹

The Atlantic branch of the Niger-Congo phylum is known to display much internal diversity as well as a kind of typological coherence, namely the presence of noun classification (as opposed to the neighbouring Mande languages). There has been a continuous (although only among a few scholars) debate over the last 40+ years about the position of Atlantic within Niger-Congo (NC hereafter) and its internal classification (Dalby 1965, Sapir 1971, Wilson 1989, Childs 2003). Despite the lack of solid evidence of genetic relationship, common scholarship still considers Atlantic to be a valid unit, at least when indicating the genetic affiliation of a particular language. Let aside what Childs (2003:47) terms "scholarly inertia", this can probably be explained by an implicit preference for areal factors over the use of the regular comparative method, because of the lack of reliable data. Today the situation has changed, at least concerning the volume and quality of available data, which allow for a more refined assessment of the relationships between these languages. This paper deals with the status of some potential isolates, i.e. languages that have no more than 20% of common basic vocabulary with any other so-called Atlantic language (from the figures in Sapir 1971). Four candidates may be proposed: Bijogo, Nalu, Sua and Limba. To these we may Bayot, which we will examine in more detail (data from Diagne 2009).

Bayot, which is not listed in Sapir 1971, is said to be a marginal member of the Joola cluster (Carlton & Rand 1993). Bayot is a very good case to start with: while at first sight it seems only distantly related to other members of the Joola cluster (12 to 18% of the core vocabulary), a more detailed investigation shows that regular phonetic correspondences do exist and are relatively numerous,

¹ This paper has been written in 2010. While the opinions and hypotheses expressed here still hold, the classification chart in example (1) represents the accepted views of that time. It needs serious revision, which is in progress (Pozdniakov & Segerer to appear).

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enough to constitute clear evidence of genetic relatedness. Still, a large part of the Bayot vocabulary is apparently specific to this language. In addition, other features of the language (phonology, TAM markers) are quite different from common Joola: for example, the presence of a complete order of retroflex consonants is unique within Atlantic. Thus, Bayot is arguably both related to and divergent from Joola. The hypothesis is that Bayot was once a different language, and that centuries of continuous contact (today the Bayot people occupy a handful of villages surrounded by speakers of Joola varieties) have resulted in important borrowing in both lexicon and grammar. The Joola influence is such that at present, Bayot may be regarded either as a Joola language with a substrate or as an isolate with a Joola superstrate.

In both cases we would like to know the origin of the "first layer". It seems obvious that it belongs to the Niger-Congo stock, but on the other hand its typical NC features, e.g. noun classes or verbal extensions are mostly identical to those of common Joola (including lexical items widespread in NC languages). Hence, there is little evidence that proto-Bayot (i.e. Bayot prior to Joola influence) was of the classic NC type.

A quick assessment of the position of other possible Atlantic isolates such as Sua, Nalu, Limba and Bijogo will be made.

1 The Atlantic Languages

Spoken on the westernmost coast of Africa, the languages known as Atlantic form a group for which there is no convincing evidence of genetic relationship. Instead, they have been put together on the basis of a few lexical resemblances, and, above all, because they contrast with the neighbouring Mande languages as they display more or less complex noun class systems. It is therefore not surprising that, so far, no serious attempt has been made to elaborate a thorough classification of these languages based on the standard comparative method. Though, some of the proposed subgroups have been given special attention and may be considered as valid genetic units, even if one cannot say to what level these units pertain. Figure (1) on next page presents a simplified overview of the Atlantic languages, based on Sapir 1971 (the bricks left to the labels represent individual languages).

1.1 Atlantic Subgrouping

The table in Sapir (1971) gives lexicostatistical counts for 34 Atlantic languages. Most of the figures are below 20%. This 20% threshold may be used to identify the most "solid" subgroups, namely : Fula-Sereer-Wolof, Cangin, Tenda-Nyun, Bak, Mel, some of which are shown on table 1. 20% is a very low figure for establishing genetic relationship, and if we now set the threshold at, say, 50%, only those clusters whose internal coherence is obvious at first glance still

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emerge.

It is not possible, within the limits of this paper, to give a full assessment of the problems that one faces comparing Atlantic languages. They display a great variety of phonological and morphological features. For example, some of these languages have a complex system of consonant mutation; some of them have noun class suffixes, others have noun class prefixes and others have both; some have tones and some don't; some have ATR-based vowel harmony and some don't.



(1) Internal structure of the Atlantic branch of Niger-Congo

1.2 Identifying Cognates

The diversity of these languages makes it difficult to find lexical resemblances, and may explain the very low figures found in lexicostatistical counts. The way these figures were obtained is made explicit by Sapir in a footnote (op. cit. p. 49):

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The relevant feature in a count of this sort is the relative and not absolute percentages. As a rule of thumb matches were accepted as putative cognates if each phoneme in a CVC sequence was either identical in the compared forms or varied by no more than a single phonetic feature.

Resemblances of the kind stated by Sapir is considered putative cognacy, which means that they are supposed to reveal common genetic origin. Actually, they are based on mere similarity of segments. There is a paradox in this method: if two languages share only 10% of basic vocabulary, as do Bijogo and Joola Kasa for instance (Sapir op. cit), their common ancestor, if any, can only be a very distant one. In such a case, one should expect many sound changes having taken place, leading to modern forms showing relatively few resemblances. Consequently, the 10% of identical (or nearly identical) lexical stems must fall in one of two cases : either they contain segments that have not changed a lot, and these segments, probably scarce, should be present in most of the resembling items (unfortunately Sapir 1971 does not show the items he considers as cognates); or these are borrowed forms, be it from one of the two languages toward the other or from a third language. In this latter case, the common basic vocabulary is not an evidence of common origin anymore. I will illustrate this with examples taken from Bijogo and Joola Kasa, two languages usually considered not to be directly related. Bijogo alone constitutes one of the three branches of Atlantic while Joola Kasa is part of the Bak group of the Northern branch. The two lexical items presented below show how a few sound changes may lead to very different forms. The sound changes in question are based on sound correspondances which, although not found in a large number of items, may still be considered regular and not ad hoc.

(2)

		*bu-gof head *di-ges eye		
Bijogo		•		Joola Kasa
* $g > \eta$, * $d > n$	*bu-ŋof *ne-ŋes		*bu-kof *di-kis	*g > k
*C[fric, vls] > Ø / -#	*bu-ŋo *nɛ-ŋɛ		*bu-kow *di-kil	*C[fric, vls] > glide / -#
* $\eta > \emptyset / V$ -V	*bu-o *nɛ-ɛ		ji-cil	C > C[pal] / -V[front]
V1V2 > V1	bu ne	actual forms	fu-kow ji-cil	class change (optional)

*Rii-Rak

As can be seen on table (2), the actual pair of forms bu / fu-kow 'head' and ne / ji-cil 'eye', although most probably coming from a common origin via a few sound changes, don't show the kind of resemblance required to be counted as cognates in Sapir 1971. In other words, Sapir counts as cognates some resemblances that are probably not, and doesn't count true cognates which do not show enough resemblance. It is therefore very difficult to rely on the 1971 table to get a detailed internal classification of the Atlantic languages. Be that as it may, this table proves useful to draw a general picture: if one only looks at figures above 20%, only a few language clusters emerge. These clusters, generally accepted as genetic units, are: Fula-Sereer-Wolof, Cangin, Bak, Tenda-Nyun and Mel. They are shown on figure 3 below, where all figures below 20% are greyed, respectively from top-left to bottom-right. These clusters are of course quite different as for internal homogeneity: the Cangin languages, with figures ranging from 55 to 79 are much closer to each other than the Mel languages for which the lowest figure is only 20.

(3) D. Sapir's 1971 lexical count for Atlantic

FL	Ful	a																																
SR	37	Sei	rer																															
WF	24	25	Wo	lof																														
LR	14	12	16	Lei	ar																													
SN	11	13	18	79	Saf	fen																												
NN	12	10	17	75	71	No	n																											
NT	13	13	18	55	55	61	Nd	ut																										
FY	12	17	13	10	12	9	10	Fog	jny																									
HF	19	17	13	13	16	11	13	76	Hul	uf																								
GY	18	19	15	11	15	11	12	62	62	Gu	silay	y																						
KN	16	18	14	13	15	12	14	50	58	50	Kaı	on																						
KW	18	17	13	10	10	11	13	45	54	40	49	Kw	aat	ay																				
MK	12	12	12	8	9	8	10	28	27	23	23	23	Ma	njal	a																			
ΡL	12	17	10	9	10	9	10	25	27	24	24	24	60	Pa	pel																			
BT	14	13	11	16	13	13	14	25	28	21	23	21	26	21	Bal	ant	а																	
TD	16	15	13	8	11	11	12	12	15	17	12	13	16	11	15	Tai	ıda																	
BR	16	15	13	9	11	10	11	11	13	12	11	12	14	10	14	85	Bas	sari																
BK	14	15	12	8	10	9	11	13	15	11	10	11	16	11	17	69	65	Bee	lik															
KG	12	14	11	9	14	10	15	12	12	11	10	- 9	15	15	17	40	37	39	Koi	nya	gi													
BD	17	14	13	12	14	10	11	15	17	16	16	13	19	17	17	24	22	26	22	Bia	fad	a												
PD	12	14	13	12	13	12	11	16	17	18	19	14	14	15	14	24	22	27	22	52	Paj	ade	è											
KB	12	16	11	10	14	10	10	12	16	15	17	13	12	12	13	19	18	20	23	23	22	Kol	bian	ia										
BM	11	12	13	10	14	9	11	17	19	16	15	14	13	11	16	22	22	20	25	23	24	36	Baı	nhur	n									
NL	10	13	12	9	11	9	12	15	15	15	14	10	10	13	18	15	16	16	16	17	17	14	16	Nali	u									
BG	6	5	5	3	5	3	- 4	9	10	9	9	8	8	8	6	6	6	6	6	8	8	8	9	6	Bija	ago								
SA	9	-7	8	5	8	5	6	- 7	9	9	12	6	4	-5	9	-7	6	10	8	8	10	10	11	9	6	Su	a							
ΤN	- 7	6	3	-7	9	-7	-5	10	6	-7	-7	4	6	-7	6	8	-7	8	-7	9	9	6	9	6	-7	19	Te	mne	•					
BK	- 7	6	4	8	10	8	6	9	- 7	-5	6	6	5	6	5	9	9	10	8	8	8	6	10	5	5	19	79	Ba	ga I	{oba				
ΜM	- 5	-5	6	6	6	-5	-5	9	10	8	10	- 7	- 7	6	8	8	8	9	-7	4	6	4	- 7	8	4	14	24	21	Мn	nani				
SB	6	6	-5	-7	-7	-5	- 7	9	9	8	- 7	- 7	8	6	8	8	- 7	8	-5	6	- 7	-5	9	8	3	13	21	22	82	Shei	bre	0		
КM	6	4	6	6	6	4	6	6	- 7	6	6	6	- 4	3	6	6	5	- 7	-5	-5	6	- 4	-5	6	-4	14	20	19	68	73 M	irin	n		
KS	- 5	8	5	4	-5	3	3	9	9	9	8	8	- 7	4	6	-7	6	6	4	4	4	4	6	- 7	3	14	22	23	57	52 5	01	Kisi		
GL	8	5	6	7	7	6	6	5	6	-7	-5	4	6	-5	5	7	-7	-7	6	-7	8	-5	8	5	5	14	23	21	31	28 3	11	25 (Gola	
LB	11	8	6	5	7	7	8	8	9	8	10	11	4	4	8	9	7	9	7	8	9	7	7	7	4	13	14	16	13	12 1	1	10	14 Lii	nba

Besides these clusters, a few languages in the above table appear as isolates: their highest score with any other Atlantic language is under 20%. These are Nalu, Bijogo, Sua and Limba. Before turning to Bayot, we will briefly examine the situation of these four languages.

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2 Status of 'Atlantic Isolates'

At the time Sapir wrote his paper (1971), only a few Atlantic languages were documented. Apart from well-known languages such as Fula, Wolof and, to a lesser extent, Temne, the only grammatical descriptions of Atlantic languages were his own 'Grammar of Diola Fogny' (Sapir 1965) and Westermann's grammar of Gola (1921). All the remaining languages in the above table were only known by very short sketches and word lists, most of them collected and provided by W.A.A. Wilson in 1958. Wilson's data, including the word lists, have recently been published (Wilson 2007).

Bijogo (Bijago) is an Atlantic branch in itself, for the sake of its very low percentage of lexical resemblances with any other Atlantic language. It is nevertheless a very typical Niger-Congo language with a fully operational nounclass system, suffixed verbal extensions, CVC lexical roots. As examplified above, regular sound correspondances found between Bijogo and Joola indicate that Bijogo should probably be reclassified as a Bak language. A grammar (including a lexicon) is available since 2002 (Segerer 2002).

Nalu, despite a few resemblances with some neighbouring Mel languages, is lexicostatistically closer to the Northern branch of Atlantic. The amount of available descriptive material is nearly the same as it was in 1971: short word lists. From a very superficial personal investigation, I believe there are at least two major dialectal varieties. Nalu is spoken in Both Guinea and Guinea-Bissau but only in a handful of villages as it seems. This language is most probably endangered.

Sua, also an endangered language, is spoken near the city of Mansoa in Guinea-Bissau. That is why it is also known as Mansoanka, a Mandingo name. Like for Nalu, there is no more than a few word lists available, most of them unpublished. Dialectal variation may have been important, especially between a variety influenced by Mandingo and a variety influenced by Balanta. In other words, Sua is undergoing heavy external influence.

Limba is one of the very few Atlantic languages for which there exists a copious dictionary. This dictionary has been compiled by Mary Lane Clarke in 1922, and all subsequent references on the language have taken it as their primary source. It contains more than 4,500 words but unfortunately no grammatical information.

These 3 latter languages (Nalu, Sua, Limba) have in common that they are all understudied, especially in terms of grammatical description

2.1 Bayot: A Newcomer

There is another language showing very few lexical resemblances to others, namely Bayot. It is spoken in southern Senegal, in some villages between the city of Ziguinchor and the border with Guinea-Bissau. The Eramme language, spoken

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in a few villages in Northern Guinea-Bissau, is most probably a variety of Bayot. All the Bayot-speaking villages are enclosed in Joola-speaking areas.

The first piece of information about the Bayot language is probably Tastevin's wordlist (1936), which until recently was the longest available (268 items). As this source has not been used by Sapir in his 1971 survey (although the language itself is mentioned), Bayot remained quite unknown for two more decades. In turn, W.A.A. Wilson, in his chapter on Atlantic in J. Bendor-Samuel's *The Niger-Congo languages* (Wilson 1989), merely gives a mention of the language, putting it, like Sapir, in the Joola cluster of the Bak subgroup of the Northern Branch. Two years before however, A. Barry completed a PhD on the classification of the Joola languages (Barry 1987), where he gives word lists for 21 Joola varieties including 3 Bayot ones. Barry concludes, as did Sapir and Wilson, that Bayot is a kind of Joola, although the percentage of resemblances between Bayot and Joola varieties is never above 25% (Barry 1987:70). He groups the 3 Bayot varieties under the term *Southern Joola*.

From 1987 to 1989, an extensive survey on the Joola languages was conducted by a team of SIL linguists, and the results were published in 1993 (Carlton & Rand 1993). 31 villages were investigated, including 2 Bayot villages. Carlton & Rand's work includes lexicostatistical counts, in which Bayot shows only 12 to 18% of shared basic vocabulary with Joola languages (a little less than in Barry's count). In the light of these figures, and provided that Bayot is not closer to any other Atlantic language than it is to Joola, Bayot could reasonably be considered an Atlantic isolate, alongside with Nalu, Sua, or Limba.

Thus, all the sources on Bayot are purely lexical. All except one: a PhD thesis defended in 2009 in Paris (Diagne 2009) presents the first grammatical description of the language, allowing for comparison of various structural elements with the corresponding elements of Joola.

2.2 A Joola Language?

Despite its lexical distance from the core of Joola languages, Bayot has many features in common with Joola. First of all, its noun class system is very similar to that of Joola. The prefixes are nearly the same or, put in another way, nearly every Joola noun class prefix has an equivalent in Bayot, as shown in table 4:

(4)	The m	nain n	oun c	lass	prefix	tes o	of (co	mmo	on) Jo	ola a	and B	ayot			
JOOLA	a	ku	e	si	bV	u	fu	ku	ni	ka	mu	ma	ji	ba	ti
Bayot	a	ku	e	i	bV	0	f		na ?	ka	mu	ma	ji	ba	

Second, some phonological features are very similar too, as for instance ATRbased vowel harmony with two sets of 5 vowels each, a pattern which, if not rare, is by far not the most common one in West Africa.

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Third, it is easy to find regular sound correspondances between Bayot and the core Joola languages, as illustrated in tables 5, 6 and 7:

	*Joola	Kwaatay	Fogny	Kasa	Banjal	Bayot
to fish	*-buut	buutu	buut	but	bbut	bor
to die	*-ket	ket	cet	ket	∫et	ser
middle	*-tut	tut	tut	tut	tut	tur
to let	*-kat		kat	kat		kar
to hit	*-tek		tek	tek	tex	re?
five	*-tok	tok	tok	tok	tox	ro?

(5) *Joola t / Bayot r

(6) *Joola k / Bayot Ø

(1) 100						
	*Joola	Kwaatay	Fogny	Kasa	Banjal	Bayot
animal	*-nukur	nukukur	nukur	nukul	nuxur	no
to sit	*-lak		lak	lak		la
palm-wine	*-nuk	nuk	nuk	nuk	nux	no
day	*-nak	nak	nak	nak	nax	na
to see	*-juk	juk	juk	juk	jux	zo
five	*-tok	tok	tok	tok	tox	ro

(7) ***Joola - I** / Bayot - 0

	*Joola	Kwaatay	Fogny	Kasa	Banjal	Bayot
to crawl	*-fuul	hun	fúúl	hul	ffúl	fuo
breast	*-iil	in	il	il	il	io
eye	*-kil	kin	cíl	kil	∫í 1	sio
lip	*-bil	bin	bil	bil	bil	βio

This latter piece of evidence should definitely put Bayot in the same genetic unit as Joola. The nature of the correspondances shown above (in every series, Bayot clearly departs from Joola varieties) even allows to say that Bayot is likely to have separated first from proto-Joola, thus confirming the hypotheses deduced from lexicostatistics alone.

However, some puzzling features of Bayot, partially hidden by the paucity of available descriptive material before Diagne's work, might shed a different light on its position.

2.3 Not a Joola Language?

The first domain where Bayot 'unusual' features are found is phonology. The consonant inventory of Bayot is significantly different from that of Joola (the various Joola varieties display only a few minor differences with each other). Following Diagne, it includes a complete series of oral retroflex consonants: /t/, /d/, /t/. While the presence of a voiceless retroflex (/t/) is not uncommon in the region (see Bijogo, Manjaku), it is unattested in Joola. Moreover, no other Atlantic language shows more than one phonemic retroflex consonant.

The vowel inventory, said above to parallel that of Joola, is actually a little bit different. In addition to the 10 'classic' vowels (grouped in 2 sets following the Advanced Tongue Root feature), Diagne lists 5 nasal vowels, apparently of the -ATR type (but this point is not fully discussed, cf. Diagne 2009:36-38). Not only is this kind of inventory extremely unusual, but the presence of nasal vowels itself is exceptional for Atlantic.

Bayot also differs from Joola when it comes to morphology: while it is true that many noun class prefixes are the same in Joola and Bayot, one must add that Bayot has a few alternate forms that don't exist in Joola. Table 8 below is a modified version of table 4, with Bayot alternate forms:

(8) The noun class prefixes of Joola and Bayot

JOOLA	a	ku	e	si	bV	u	fu	ku	ni	ka	mu	ma	ji	ba	ti
Bayot	a	ku	e	i	bV	0	f		na ?	ka	mu	ma	ji	ba	
	ya		da	t			0								

Bayot also has an extra class v-, which is absent from all Joola varieties. Moreover, Bayot doesn't have any of the 1 to 3 locative classes that are attested throughout the Joola domain. It looks like the Bayot noun class system has undergone strong Joola influence, with only a few remnants from the original system. In fact, in all cases, the alternate forms are neither phonologically nor morphologically conditionned, and these alternate forms aren't attested in any of the Joola varieties. The presence of these alternate forms in Bayot yields a great number of original class pairings, the analysis of which falls beyond the scope of this short paper. Compare for instance the 25 pairings of Bayot (Diagne 2009:96) with the 11 pairings of Joola Banjal (Bassène 2007:32).

As for grammatical paradigms, let's have a look at the sytem of person marking. Table 9 presents an excerpt of the systems of person marking in Bayot and in 4 Joola varieties. All Joola varieties show three different, non-cognate forms for the 1st person singular. Bayot has only two near-identical variants, corresponding to the independant form found in Joola. Elsewhere in the system, only 2nd person singular seems to connect Bayot and Joola. All other forms are clearly not cognates. It is therefore very likely that the Bayot system of person

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		*Joola	Kwaatay	Fogny	Kasa	Banjal	Bayot
1sg	subj	*i	i	i	i	i	je
	obj	*om	am	om	om	om	nje
	indep	*inje	inje	inje	inje	inje	nje
2sg	indep	*aw	awe	aw	au	au	ab
1dual	"	???	wane		ola		ya
1pl inc	"	*olal?	úne	olal	olaal	olal	i
1pl exc	"	*uli	uni	uli	óli	óli	wa
2pl	"	*ji	ari	ji	ji	ji	ka

marking is being partially remodeled after the Joola one.

(9) Joola and Bayot personal pronouns

One can also compare the verb extensions of Joola and Bayot. Verb extensions are one of the diagnostic features of Niger-Congo, and are reputed to be especially widespread in a few branches of this phylum, including Atlantic (Williamson & Blench 2000). Whereas 'regular' Joola languages display from 8 to 11 distinct verb extensions, Bayot has only 3, all of which similar to the corresponding Joola forms. It seems very unlikely that Bayot, surrounded and heavily influenced by Joola, would have innovated by dropping all but three verb extensions. On the contrary, one might think that Bayot had no verb extensions at all and is progressively borrowing them from Joola.

Finally, let's have a closer look at the lexicon. For each sound correspondance mentionned above where Bayot displays an innovative segment (*t>r, *k>Ø, *-l>-o), it is possible to find series in which Bayot shows exactly the same segment as Joola:

	*Joola	Kwaatay	Fogny	Kasa	Banjal	Bayot
to be light	*-wiil	wiin		wiil	vvil	vul
to catch	*jok	jok		jok	jəx	zok 'choose'
heel	*tənj		tənj	tənj	ton	toĩ
to stick	*kət	kət	kət	kət	xət	kət

(10) Sound identities between Joola and Bayot

So far, there is no way to predict what will be the Bayot reflex of *Joola *k, *1, or *t. There seems to be at least two layers of lexical stems, one of which closer to Joola than the other. This can be explained by positing that the difference between these layers corresponds to borrowed vs inherited lexicon respectively. It could as well be a difference between old and recent borrowings,

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the old ones having undergone sound changes that were no more active when the new borrowings entered the language. Anyway, it seems clear that at least a part of the present Bayot lexicon has been borrowed from Joola, even if Bayot is to be considered Joola itself.

2.4 Discussion

We have seen that while there are good arguments (including regular sound correspondances) to include Bayot in the Joola cluster, some features suggest that this affiliation is probably not straightforward. From a purely synchronic point of view, Bayot is a Joola language in the sense that it is closer to Joola than to any other language. The question is: how comes that it is so divergent, when other Joola languages form a relatively homogenous cluster? If one assumes that Bayot is genetically close to Joola, there must have been a long period of isolation during which Bayot innovated in a number of ways (possibly through contact with another language, but this can't be demonstrated yet), then a long period of contact during which they borrowed many features from Joola, including some they had previously lost. Another possible story would be that Bayot speakers and Joola speakers once spoke very different languages, and Bayot progressively came to assimilate Joola linguistic features. The unique features of the Bayot language might be seen as remnants of proto-Bayot, as for instance the alternate noun-class markers or the unique personal pronouns (see above). Unfortunately, none of these scenarios can be given any historical support.

The adoption of this latter scenario has further consequences. If proto-Bayot is not Joola, then is it Bak (the genetic unit above Joola, that groups together Joola, Balanta and Manjaku, see table 1 above)? Does it belong to Northern Atlantic? To Atlantic? One can only say that Bayot is a Bak language insofar that it is a Joola language. In fact, no particular feature could be found, which would relate Bayot to Balanta or Manjaku but not to Joola. Regarding Northern Atlantic, and even Atlantic, no linguistic innovation has been put forward so far to characterize these groupings, as it has been stated at the beginning of this paper. That means that Bayot is Atlantic because it has noun classes and it is spoken on the coastal strip between Senegal and Sierra Leone

There is little doubt that proto-Bayot was a Niger-Congo language. Or is there? It certainly had noun classes even if one assumes heavy Joola influence, as shown by the actual alternate forms. But the few verbal extensions are all clearly from Joola origin. And from the very little stock of lexical roots that can be (cautiously) used as a diagnostic tool for Niger-Congo membership, those found in Bayot are all clearly borrowed from Joola. In other words, let aside noun class remnants, none of the linguistic features that can be traced to proto-Bayot can convincingly be said to originate from any well-established NC subgroup.

3 Conclusion

The Atlantic branch of the Niger-Congo phylum raises interesting challenges to language classification. While it displays a relative typological coherence (noun classes, rich morphology, verb extensions), lexicostatistics is of little use to reveal its internal structure. A few subgroups emerge, each of which might almost be given the status of an independant Niger-Congo branch: Wilson (1989:92) noted that Papel, a Bak language, scored better (15%) with Common Bantu than with Bijogo, yet also an Atlantic language. Thus, some of the languages that appear as 'Atlantic isolates' might as well be considered Niger-Congo isolates. On the other hand, we have shown that Bijogo, officially an Atlantic singleton, may be related to the Bak languages, although superficial lexical resemblances are very scarce.

The case of Bayot, a language long ignored by scholars, is different. It seems close to the Joola cluster, but in a way that suggests borrowing through contact instead of common genetic origin. In a synchronic description, Bayot can be called an atypic Joola language, but the hypothesis that proto-Bayot was an unrelated language cannot be ruled out. Furthermore, what can be traced to proto-Bayot shows no resemblance to any of the neighbouring languages, so that proto-Bayot should have been an isolate, or the only remaining member of a language group. So far, all the resemblances that have been found between Bayot and other languages involve a language of the Joola cluster. Further work will carefully examine the possible connections between Bayot and non-Joola languages of the same area such as Nyun, Tenda or Jaad.

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Guillaume Segerer

Guillaume Segerer LLACAN - CNRS - INALCO - Université Sorbonne Paris-Cité Paris, France

segerer@vjf.cnrs.fr

From Relativization to Nominalization and More: Evidence from the History of Okinawan

REIJIROU SHIBASAKI Okinawa International University

Introduction

The nominalization-relativization syncretism is characteristic of languages in Tibeto-Burman areas (e.g. Noonan 1997; DeLancey 1999), whilst the diachronic process of the phenomenon is now pursued in East and Southeast Asian languages as well (e.g. Yap and Wrona forthcoming). These preceding works propose two different directions of change. One is that nominalization has developed into relativization (e.g. Yap and Matthews 2008) albeit with a lack of syntactic explicitness in some cases by the want of historical documents. The other concerns the inverse direction from relativization to nominalization, which is proposed by researchers such as LaPolla (2003 with Huang). Although they are opposing against each other, each survey result remains and raises an intriguing possibility, which is worth reconsideration through the analysis of other languages. However, it should be pointed out that preceding research cannot give a full account of the directions with a paucity of crucial historical evidence. Genetti (2008) embarks on a reconstructing research into the diachronic process in which relativization and nominalization each give rise to the other based on five Tibeto-Burman languages; she provides a good syntactic analysis, but any synchronic study seems to have its own limits. Building on these preceding works, this study addresses the historical development of the Okinawan nominalizer si, which used to be si (see the next section), out of its earlier usage as the head of relative clause i.e. from relativization to nominalization.

1 Data

Since the languages spoken in Okinawa have a history of about four-hundred years, it is possible to compare some sizeable materials at different synchronic

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stages for a historical-comparative study. This study thus examines as primary data several historical materials written in the sixteenth/seventeenth through eighteenth centuries; some other materials in later centuries are also used, albeit on an as-needed basis, as supplementary data sources. The materials are shown in (1).

(1)	16/17C:	Omorosausi vols.1-22 (poems)
	Early 18C:	Gosamarutichiuchi (c. 1718) ¹
		Shuusinkaneiri (c. 1718)
		Mekarusi (c. 1718)
		Unnamunukurui (c. 1718)
		Timizinuyin (? 1733)
	Late 18C:	Hanauinuyin (after 1770)
	19/20C:	<i>Ryuuka</i> (traditional Okinawan verse songs)

According to Hokama (1995: 350) i.e. the unabridged dictionary of the Ancient Okinawan, *si* can trace back to the oldest document *Omorosausi*, which had been complied in three parts from the sixteenth to seventeenth centuries. *Omorosausi* consists of twenty-two volumes of *omoro* i.e. songs as dedications to the gods and goddesses, and 1554 songs in total are included in the twenty-two volumes of *sausi* i.e. book or brochure. The oldest song is said to have been the *omoro* in the thirteenth century, while the latest is identified as the *omoro* sung by Queen Shoonei in the early seventeenth century (Hokama 2000b: 455). I used the Hokama's (2000b) edition of *Omorosausi*, referring to Shimizu (2004) if need be.

The materials in the eighteenth century all belong to the genre of kumiodori i.e. a traditional Okinawan musical drama. Kumiodori dramas utilize stories and themes with popular appeal, which are performed with traditional Okinawan songs and dances using stylized movements. The first four works in (1) were all written by Tamagusuku Chookun (1684-1734), the originator of kumiodori. The other two kumiodori texts are considered to have been written, respectively, in the mid and the latter half of the eighteenth century. *Timizinuyin*, which is usually known as the modern pronunciation *Temizunoen*, was written by Heshikiya Choobin (1700-1734) around 1733 (Ohtani 1981: 14). *Hanauinuyin*, usually known as *Hanaurinoen*, was made up by Takamiyagusuku Peechin (dates unknown); the text is generally believed to have been written sometime within two decades after 1770 (*ibid*.). All these texts of kumiodori are edited and included in Ifa (1962).

The phonetic form $s\ddot{i}$, albeit written su in the cursive form of kana, had been used from the sixteenth/seventeenth century to the late nineteenth century, specif-

¹ I referred to Okinawa Prefectural Board of Education (2000: 70) for the dates of the first four Kumiodori dramas. Ohtani (1981: 13) states that there is no conclusive evidence for the dates of *Mekarusi* and *Unnamunukurui*. Note that *Gosamarutichiuchi* is also known as *Nidootichiuchi*.

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ically until around 1870 i.e. the very early period in the Meiji Era [1868-1912] (Hokama 2000a: 308-310). In the early Meiji Era, the phonetic value of alveolar fricative [s] in *su* [sī] remained to be used by members of the samurai class, while it has completed a phonetic change into the postalveolar fricative [\int] in Present Day Okinawan (Hokama 1995: 759); the vowel quality is also changed from [\overline{i}] to [\overline{i}]. Yet for convenience sake, I will use the *si* form consistently in this study for clarity.

In the following sections, I will only illustrate some crucial examples excerpted from these data sources because of space limitations.

2. Functional Changes of *si*

2.1 The Sixteenth/Seventeenth Century

In *Omorosausi*, there are six examples of *si*-headed clauses, and five of them can be translated as 'the one/person who does something...', while the other one is ambiguous in the interpretation. Since it might have served as a nominalizer (see below), I treat it as an example of nominalization. On the other hand, no example of the independent use of *si* was found in the texts. Let us take a look at some examples.² Notice that elements in focus are all underlined.

- (2) Omorosausi, vol. 3, 102 (17C)³ Ubudama ha life-generating.ball TOP inuru <u>si</u> du yukakïru bless si.person PT govern 'The person who (can) invoke(s) certain life-generating power from Ubudama (is the one/person who can) govern the world.'
- (3) *Omorosausi*, vol. 17, 1187 (17C) Chikwii ichigusiku famous Ikei.castle mira nu si ga hurubi. NEG si NOM perish see chikwii uni famous spiritually.advanced.person ncha masai... <u>si</u> ga see si NOM flourish

² For the transcription of *Omorosausi* I followed Shimizu (2004) unless otherwise noted.

³ The glossing conventions are as follows: COMP=complementizer; GEN=genitive; HON=honorific; LINK=clause-linker; NEG=negative; NOM=nominative; NOML=nominalizer; NP=noun phrase; PT=particle; REL=relativizer; ST=stance marker; TOP=topic; v=verb.

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'The one/person who does not see the famous Ikei Castle would perish, the one/person who sees spiritually advanced person would flourish...'

In (2) and (3), the meaning of *si* can be considered 'person', rendering the interpretation of 'the one/person who does something' as the head of the relative clause. While no independent use of *si* can be found in *Omorosausi*, there is still possibility that originally it was an independent nominal that indicates 'person'.

The following example may be ambiguous in the interpretation of *si*. Hokama's (2000b) edition of *Omorosausi* adds a footnote to this point that *si* serves as 'a person (that worships)', while Shimizu (2004) writes a note that *si* plays a role of nominalizer in this context. I interpret this particular case of *si* as an example of nominalization because unlike the other five examples, it exhibits increased polyfunctionality i.e. relativization and nominalization.

(4)	<i>Omorosausi</i> , vol. 7, 389 (17C)						
	Chikwii	ajisuija					
	celebrated	king					
	shuyuimui	chuwariba,					
	Shuri.castle	be.HON					
	kiyun	achan					
	today.too	tomorrow.too					
	umichooyu						
	face						
	wugamu <u>si</u>		ga	masai			
	worship si	.person/NOML	NOM	surpass			
	'Since the famous King stays in Shuri Castle, the one/person who has the						
	honor of meeting his face would flourish' or ', having the honor of						
	meeting his face would be good'						

2.2 The Early Eighteenth Century

In the early eighteenth century, *si* began to be multifunctional whilst retaining both relativization and nominalization strategies. First, consider the following examples of relativization and nominalization, respectively, in (5) and (6).

(5) Shuusinkaneiri (18C) vubukasa nyi Taru vu who PT midnight PT vadu kara ndi 'vu si va? ask.for si.person PT lodging COMP sav "Who is it that asks for lodging at this time of night?" (lit. "Who is the person that asks for...")

(6) *Mekarushi* (18C) matsi n tamamizi n pine.tree too waterfall too Pyu waga munu tu si ya self.GEN si.NOML PT thing COMP say Para muri va ni PT is PT impossible

'Saying that both pine trees and waterfalls are your own is unfair, isn't it?'

As to (5), Hokama (1976: 195) and Ifa (1962: 53) interpret the function of *si* as a nominalizer, providing the same note on this line. However, if we take it as a nominalizing function, the whole sentence turns out to be logically inconsistent, because 'the thing that asks for lodging' is logically impossible, whilst 'the person that asks for lodging' is semantically transparent. In (6), the functional role of *si* can be regarded as a nominalizer (see Hokama 1976: 231).

In addition to these functions, *si* came to have a new function at this stage, as follows.

(7)	Shuusinkaneir	<i>i</i> (18C)
	î gurisha	a <u>siga</u>
	say difficult	be si.thing.NOM'but'
	wan ya	Nakagusiku
	I PT	place.name
	Wakamatsi	du yayuru.
	person.name	PT be
	"I hate to ask	you, but I am Wakamatsu from Nakagusuku." (lit. "Thing
	that/what is di	fficult to say is I am Wakamatsu from Nakagusuku.")

(8) Mekarushi (18C)

kashiragi nu a siga
head.hair NOM be si.thing.NOM'but'
shija nu kami naran.
humans GEN hair be.not
"(The person i.e. Mekarushi) has a full head of hair, but (it) is not (like)
humans." (lit. ?"Thing that there is a full head of hair is not the one of humans")

In (7) and (8), the nominalizer si is accompanied by the nominative marker ga, and the whole unit serves as a concessive conjunction 'although' (Ifa 1962: 276). Once we take it into account that the Japanese nominative case marker ga underwent the similar functional extension from a nominative to a concessive conjunc-
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tion, this newly derived function would not be heterogeneous (see Genetti 1988 for similar issues in Newari, Tibeto-Burman languages). Kinjo (1974 [1944]) points out one construction $\int iga$ (si + concessive conjunction) 'although' in Present Day Okinawan, albeit limited to the regional speech spoken in Naha. Considering both functional similarity and phonological change, the earlier form of $\int iga$ i.e. *siga* may possibly have derived in the early eighteenth century.

2.3 The Late Eighteenth Century

In the latter half of the eighteenth century, the functional range of *si* had moved through the semantic bleaching of the original 'person' meaning. That is, the relativization strategy based on the lexical meaning 'the one/person who does something' faded out, while the nominalization strategy including the clause-combining function *siga* became dominant with progression of semantic bleaching. Here are examples of nominalization and concessive conjunction, respectively, in (9) and (10).

- (9) *Hanauinuyin* (after 1770) uchikurisha shusin sorrow.suffer do.si.NOML.PT usadami tin u nu heaven GEN fate **GEN** kunu 'mmari tu muti... this birth COMP think (I) think that lamenting and suffering (is due to) this life (of mine), a divine ordinance...
- (10) Hanauinuyin (after 1770)

yuufukuna	sudaci	hi	shichiwuta	<u>siga</u>
rich	upbringing		do.PST	si.thing.NOM'but'
dandan	fushiy	awashi	tsizichi,	
gradually	unhap	piness	continue	
Shuri	nu	simee	naran	
place.name	GEN	living	NEG.be	
'(The person)	was w	ell-bred	, but (now) is	not living in Shuri because of

adversities of life...'

2.4 Interim Summary

Table 1 summarizes the token frequency of the functions of si in the sixteenth through the late eighteenth centuries. The fourth function of si, i.e. stance-marking that is frequently used in later stages, has not yet appeared at these stages

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(see the next section; Shibasaki forthcoming). Figure 1 gives a graphic representation of the historical transition of *si* based on the proportional frequencies.

Function types	16/17C	Early18C	Late18C
<i>si</i> -relativization 'the one/person who'	5 (83 3%)	3 (15.8%)	0
<i>si</i> -nominalization 'thing that'	(16.7%)	9 (47.4%)	4 (36.4%)
si-marked clause linker 'although'	0	7 (36.8%)	7 (63.6%)
<i>si</i> -stance marker	0	0	0

Table 1: The Token Frequency of the Functions of si





There are four important findings from this survey result. Firstly, the *si*-headed relativization, which I translate as 'the one/person who does something,' declined in the early eighteenth century, subsequently disappearing in the late eighteenth century. Secondly, the clause-linking function 'although' newly emerged in the early eighteenth century. Thirdly, while the *si*-nominalization strategy was relatively infrequent in the sixteenth/seventeenth centuries, it became popular in the eighteenth century. Fourthly, the stance-marking strategy of *si*, which is dominant over the others in present-day Okinawan conversational discourse, had not yet developed at these stages. Of course, since these four findings are based only on the database in (1), especially those in the sixteenth/seventeenth and eighteenth centuries, I do not intend to generalize them beyond the realm of this case study. However, as discussed in the next section, the functional extension or functional transfer attested in the case of *si* is self-consistent or makes more sense to take it as a case of structural persistence, one of the robust tenets of grammaticalization (Hopper 1991). I will thus deal with the issue in the next section.

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3. Mechanisms of Functional Change

The erstwhile function of the *si*-headed relativization developed into its newer nominalizing function as shown in the above. This functional transfer or expansion is confirmed at the clause-edge, which is quite suggestive of further grammaticalization from a morphosyntactic perspective. For example, in the history of Japanese i.e. the only language with which Okinawan is genetically affiliated, some case-marking particles e.g. the nominative *ga* was developed into clause-combining particles. Furthermore, while other clause-combining particles such as *kara* 'because' and *reba* 'if' are used as part of subordinate clauses to introduce their main clauses, they often appear without main clauses, giving rise to clause-final particles at the right periphery (see papers in Ohori 1998 and Higashiizumi 2006). Taking the morphosyntactic position of *si* into account, the nominalizing function of *si* has the potential to further develop its function to such stance marking functions as seen in the history of Japanese particles (see Yap, Matthews & Horie 2004).

In this section, I will give a brief account of the mechanisms of the functional change of *si*, referring to both structural persistence and semantic bleaching. Yet before that, let us glance over how *si* had further expanded its function.

3.1 *Si* as a Stance Marker

Shinzato (2008: 13) states that "*si* never developed this sentence-final particle usage." If this is true, Okinawan has not yet proceeded enough to grammaticalize a nominalizer to a stance marker; otherwise, it might have followed a different pathway of change. Let us take a look at the following example.

(11) *Punnabusi* (19C?; Kadekaru 2003: 280)⁴ cizi fe nu nu tacu si prohibition GEN board GEN stand si.exclamatory kui sinubu madi nu nesami cizi va love remember even GEN prohibition PT be.not 'A prohibition order board is standing, (but it) would not forbid (us) to love' or 'A prohibition order board's standing would not (mean to) forbid (us) to love.'

In this example, si appears at the end of the first clause, rendering two types of

⁴ When this song was written is not yet clear. According to Kadekaru (2003: 280), the name of 2unnabushi was first found in the Anthology of Ryukyuuan Poems i.e. *Ryuukadaizenshuu* (1878) and that this song was one of those poems prevailing in the nineteenth century. I follow Kadekaru (2003), but see Hokama (1976: 111) for another possibility that this song dates back to the first half of the eighteenth century, although he mentions that the singer 2unnabushi's dates of birth and death are still unknown.

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interpretation as shown in the English translations. The first translation is based on the interpretation of si as a clause-final particle i.e. a stance marker. In other words, the clause followed by si turns out to be an independent clause. The second translation depends on the assumption that si serves to nominalize the preceding clause. That is, the si-clause is the subject of the whole sentence. In fact, these two interpretations are suggested in the annotated bibliography for this poem in Hokama (1976: 115, nt.2). Considering the fact that this stance-marking function became much more popular in the next century, it would be a reasonable inference that due to the morphosyntactic ambiguity, si began to be used at the clausefinal position in the nineteenth century, taking on a poetic or an exclamatory function.⁵

3.2 *Siga* as a Stance Marker

On the other hand, it is also pointed out in Section 2.2 that the *siga* 'although' lexicalization appeared in the early eighteenth century. Since the etymological meaning of *si* was 'person', it is no wonder that the semantically agent *si* frequently cooccurs with the nominative case marker *ga*. In fact, all the six examples of *si* in the head of relative clause in the sixteenth/seventeenth centuries were semantically agent, and five of the six appeared as *siga*. The other one is accompanied by the emphatic particle *du* i.e. *sidu* as in (2); however, even this *si* turns out to be agent in meaning. Notice that the nominative case marker *ga* cannot appear with the emphatic particle *du*.

In the eighteenth century, *siga* was very frequently used especially when *si* served as a clause-combining function. In the early eighteenth century, for example, all the seven uses of the *si*-marked clause linker 'although' in Table 1 were *siga*, while in the late eighteenth century, five of the seven *si*-marked clause linkers 'although' were *siga*. Therefore, it is reasonable to infer that the almost fixed expression *siga* linking particle may have functionally expanded into a stance marker in much the same way as *si* had developed it, as shown in the preceding section. Consider the example to follow.

⁵ The clause-final particle usage of *si* came to indicate something 'deprecatory' or 'dismissive' in later stages, especially in conversational discourse by the young Okinawan people (Shibasaki forthcoming).

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(12) Mutudanabusi (Early 20C?; Shimabukuro and Onaga 1968: 103)⁶ Sinnikuihuni tuke 'iariba nu *Picuru* dogout.canoe be.if NOM can.go ocean kiju va Pnzi 'ugasi Раса ja cusiga today PT meet tomorrow PT come.siga.ST go '(If my girlfriend lives within the) canoeing distance, (I can) go and meet (her) and come (back) tomorrow, but (it's impossible).'

The clause-final *siga* in (12) can be considered to serve as a stance marker. The *siga*-clause conveys the poet's desire to see his girlfriend, while the unuttered main clause would convey his giving up of his desire to see her in the real world. Ahagon (1983: 226) lists both clause-final and clause-linking uses under the heading of *siga*, and regards the function of *siga* in (12) as a clause-final exclamatory use i.e. stance marker. In the twentieth century on, the stance-marking use has become the major function of *si* as well as *siga* (see Kinjo 1974: 101-102).

3.3 Structural Persistence and Semantic Bleaching

What is characteristic of the functional expansion of si is the structural persistence by which si is situated at a certain syntactic position. Take a look at Figure 2, which represents the schematized morphosyntactic structures of the four functions of si. Note that 'periods' means the stages in which functions in focus are mainly attested in the database.

Function types	Structures	Meanings	Periods
si-relativization	[[clause1v] + si 'person'] NP	'the one who'	16/17C
si-nominalization	[[clause1v] + si 'thing'] NP	'thing who'	17-18C
si-marked clause linker	[[clause1v] + si 'thing'] NP + ga,	'although'	18C~
<i>si</i> -stance marker	[clause1v] + si [clause1v] + siga	<pre>'speaker's stance' 'speaker's stance'</pre>	19C~ 19C~

The verb form in the clause is attributive that modifies *si*, regardless of whether *si* is semantically 'person' or 'thing'; even after *si* changed into the clause-final stance marker, the verb form remains the same. In the earlier relativization and nominalization functions, *si*-marked clauses are embedded in the larger clauses, while the clause-linking function of the *si*-marked subordinate clause calls for the

⁶ Satoshi Nishioka states that the poem may have been sung by a man born in the Meiji Era [1868-1912] judging from the transcribed pronunciation.

following main clause. Both *si*-marked and *siga*-marked stance marking clauses requires no clauses to follow. However, the point is that the *si*-marked clauses have one syntactic structure in common i.e. [clause 1] + *si/siga*. What differentiates these functions from each other is the semantic content of *si*. In other words, the *si*-headed clause is used as a relative clause as long as *si* remains to indicate 'person', while the clause is used as a nominalized clause once *si* becomes semantically bleached. When the semantic content becomes empty, *si* comes to serve as a clause-final stance marker. Since the semantic bleaching proceeds in chronological order, it can be concluded that the functional transfer or expansion of *si* due to semantic bleaching and structural persistence. And this conclusion dovetails with Hopper's (1991) principle in (13).

(13) Principle of Persistence (Hopper 1991: 22) "when a form undergoes grammaticalization from a lexical to a grammatical function, so long as it is grammatically viable some traces of its original lexical meanings tend to adhere to it, and details of its lexical history may be reflected in constraints on its grammatical distribution."

4. Nominalization-Relativization Syncretism Revisited

Finally, I would like to rethink what-is-called nominalization-relativization syncretism addressed at the beginning of this study. Issues on the nominalization-relativization syncretism have been at the center of a linguistic controversy since Matisoff (1972). The two directions of change dead against each other have been proposed, for example, by Noonan (1997) and DeLancey (1999) on the one hand and by LaPolla (2003 with Huang) on the other. These two opposing ideas are nicely summarized in Genetti (2008). However, the languages surveyed in these preceding works are not always abundant in historical materials, but rather little or almost none, in comparison to languages relatively rich in historical documents such as Japanese and Okinawan. In this study, I thus examined the history of Okinawan, and found that the direction of change is from relativization to nominalization. Furthermore, this directional pathway is consistent with Principle of Persistence, a principle of grammaticalization in Hopper (1991). I will thus suggest that one linguistic phenomenon that is considered to be area-specific may be solved once we put it in a wider range of languages.

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Reijirou Shibasaki Okinawa International University Department of British and American Language and Culture 2-6-1 Ginowan Ginowan Okinawa 901-2701 Japan

reijiro@okiu.ac.jp abu_dida_loh@hotmail.co.jp

A Cross-linguistic Study of Sound Symbolism: The Images of Size

KAZUKO SHINOHARA¹, SHIGETO KAWAHARA² ¹Tokyo University of Agriculture and Technology; ²Rutgers University

Introduction

Although the sound-meaning relationship is often arbitrary (Saussure 1916), cases exist in which some sounds correspond to certain meanings. Such association between sounds and meanings is known as *sound symbolism*, and there has been a longstanding interest in the existence and the nature of sound symbolism.¹ This paper reports an experiment on size-related sound symbolism, which shows that certain sound symbolisms hold robustly across languages. In particular, we investigate how the images of size (small or large) are affected by three phonetic factors: the height of vowels, the backness of vowels, and voicing in obstruents. Our rating experiment of four languages—Chinese, English, Japanese, and Korean—shows that these three factors contribute to the images of size, with only a few exceptions. To explain the results, we offer phonetic grounding of these size-related sound symbolic patterns. We further raise the possibility that these phonetically grounded sound symbolic patterns are 'embodied' in the sense of Johnson (1987) and Lakoff and Johnson (1980, 1999).

1 Background

Sound symbolism refers to cases in which particular images are associated with certain sounds; for example, Sapir's (1929) seminal experimental work shows that English speakers tend to associate [a] with an image larger than that associated with [i]. Previous studies have argued that these sound symbolic patterns have phonetic bases (e.g. Eberhardt 1940; MacNeilage and Davis 2001; Ohala 1983b, 1994; Paget 1930; Sapir 1929); for example, [a] may be perceived as larger than [i] because [a] involves wider opening of the mouth than [i] (see section 5 for

¹ There is a large body of literature on sound symbolism, which is too large to list in this short paper. For a recent summary of bibliographies on sound symbolism, see Akita (2009).

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more discussion on the phonetic grounding of sound symbolism). Building on this tradition of research, our paper addresses the following three questions: (i) whether sound symbolic patterns hold robustly cross-linguistically, and if so (ii) how, and (iii) why.

Before we proceed, we clarify why studying sound symbolism is important for (cognitive) linguistic theories. First, sound symbolism possibly constitutes a counterargument against the thesis of arbitrariness, i.e. arbitrary relations between a signifiant and a signifié (Saussure 1916). Second, to the extent that sound symbolic connections between sound and meaning may have phonetic bases, sound symbolism may instantiate a case of iconicity (Haiman 1983, 1985a, b) between sound and meaning: phonetic factors affect—or shape—meanings. Third, again to the extent that sound symbolism has phonetic bases, it may also constitute an instance of embodiment (Johnson 1987, Lakoff and Johnson 1980, 1999), which is one of the central tenets of cognitive linguistics. In short, sound symbolic patterns are, as we will argue, semantic patterns grounded in phonetic gestures (or their acoustic consequences); in other words, sound symbolic patterns are cases in which speakers reflect their phonetic behaviors upon the meaning of certain sounds. For these reasons we take the study of sound symbolism to be an interesting topic of linguistic theories.

2 Research Questions

Many researchers have pointed out some existing relations between sounds and the image of size. For example, Sapir (1929) showed that given two nonce words [mil] and [mal] and two tables (small and large), English speakers tend to associate [mal], not [mil], with a large table: [a] evokes a larger image than [i] for English speakers. Building on this observation, this paper addresses three questions. The first issue is whether this size-related sound symbolism holds across languages, beyond English. Building on previous work, our current experiment shows that it does (see also Ultan 1978 for a cross-linguistic lexical study).

Second, this paper explores exactly which phonetic dimensions determine the image of size. Previous researchers have offered different answers to this question. Some previous studies suggested that it is vowel height that determines the images of size (Kawahara et al. 2005). Others found that back vowels are perceived as larger than front vowels: for example, Newman (1933) found that English speakers judge all back vowels to be larger than all front vowels. Ultan (1978) argued that both height and backness affect the images of size. Furthermore, in addition to vocalic differences, Newman (1933) found that English speakers consider voiced obstruents to be larger than voiceless obstruents. In short, it remains controversial as to which phonetic factors determine the images of size. The second aim of this project is to address this question. Our experiment shows that all of the three factors—vowel height, backness, and obstruent voic-

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ing-affect the image of size, albeit to different degrees in different languages.

The final issue concerns phonetic grounding of sound symbolism. Some scholars have suggested that size-related sound symbolism is grounded on the size of the oral cavity (e.g. Berlin 2006, Paget 1930, Sapir 1929). Building on these proposals, we attempt to clarify phonetic grounding of the size-related sound symbolic patterns. We further raise the possibility that the phonetically grounded sound symbolism instantiates a case of embodiment (Johnson 1987, Lakoff and Johnson 1980, 1999).

3 Method

The current study is a questionnaire-based rating experiment, in which the participants rated the size of various nonce words. To test whether sound symbolism holds cross-linguistically, we tested speakers of Chinese, English, Japanese, and Korean. The stimuli consisted of 40 disyllabic nonce words with VCVC form, in which the two vowels and the two consonants were identical (e.g. ibib). The consonants were four voiced obstruents [b, d, g, z] and four corresponding voiceless obstruents [p, t, k, s]. The vowels were [i, u, e, o, a], which are the five vowels that all the target languages have. These factors were fully crossed (2 voicing types * 4 types of obstruents * 5 vowels) as in Table 1. All of these words are nonce words in all the target languages.

Voiced	b	d	g	Z
i	ibib	idid	igig	iziz
u	ubub	udud	ugug	uzuz
е	ebeb	eded	egeg	ezez
0	obob	odod	ogog	ozoz
а	abab	adad	agag	azaz
Voiceless	р	t	k	S
i	ipip	itit	ikik	isis
u	upup	utut	ukuk	usus
е	ерер	etet	ekek	eses
0	орор	otot	okok	osos
а	арар	atat	akak	asas

(1) Table 1. List of stimuli.

The participants were 20 Chinese (Mandarin) speakers, 22 English speakers, 42 Japanese speakers, and 19 Korean speakers. In the experiment, participants were

presented with the stimuli on a written questionnaire² and asked to rate the size of each nonce word on a 1-4 scale (1=very small, 2=relatively small, 3=relatively large, 4=very large). They were instructed to imagine an exotic language in which the stimuli were spoken, and speculate on the meanings of these words, as in the instructions in (2). A sample question is shown in (3).

(2) Instructions:

Imagine an exotic language that you don't know. The language has a rich lexical inventory of adjectives that express a variety of "largeness" or "smallness". Now, a speaker of this language looks inside a box and finds a jewel. She verbally expresses how large or small it looks using one of these adjectives. Your task is to read each of the following words and guess its meaning — i.e., how large or small it is.

(3) Sample question:

ibib			
1	2	3	4
very small	relatively small	relatively large	very large

The stimuli were presented using Roman alphabet in a randomized order.

To assess the results statistically, a mixed linear model (Baayen 2008, Chapter 7) was used in which the main fixed factors were (i) vowel height, (ii) vowel backness, and (iii) voicing of obstruents. We also included additional fixed factors (place and continuancy) to distinguish different consonants and to soak up variability. For expository reasons, these two factors are not discussed in this paper. The model also included the speaker as a random factor. The degrees of freedom were assumed to be n-2 following the suggestion of Baayen (2008, p.248). After the general analysis, we carried out post-hoc analyses comparing three levels of height. To avoid the inflation of type I error, no multiple comparisons between each of the five vowels were conducted.

4 Results

Figure 1 shows the average ratings of all the five vowels in all four languages. Here and throughout, the error bars represent 95% confidence intervals. Although there is cross-linguistic variation, we observe some consistent patterns; for example, [i] is consistently rated as smaller than other vowels; [a] and [o] are generally rated as larger than other vowels.

² For Japanese participants, the first author pronounced these stimuli. We were particularly concerned about our Japanese participants assigning "Japanized reading" of alphabets on our stimuli. For a possible impact of reading on sound symbolism, see Kunihira (1971).



(4) Figure 1. Overall results. The error bars represent 95% confidence intervals.

Figure 2 shows the effects of height on the image of size. Within each language, the left bar shows high vowels, the middle bar shows mid vowels, the right bar shows low vowels. There is a general trend in which the lower the vowel, the larger the image. The effects of height in the general linear mixed model are as follows: Chinese, t(798)=9.48, p<.001; English, t(878)=1.74, p<.05; Japanese, t(1678)=.25, *n.s.*; Korean, t(758)=1.95, p<.05.

Post-hoc comparisons of each level of height reveal that, first of all, mid vowels evoked significantly larger images than high vowels in Chinese and Japanese but not in the other two languages (Chinese, t(638)=4.19, p<.001; English, t(702)=-.86, *n.s.*; Japanese, t(1342)=-5.00, p<.001; Korean, t(606)=1.25, *n.s.*). Second, low vowel evoked larger images than mid vowels in Chinese and English to a statistically significant degree (Chinese t(478)=6.32, p<.001; English, t(526)=5.34, p<.001). Japanese showed a significant reversal (t(1006)=5.04, p<.001); Korean showed no significant differences (t(454)=.6, *n.s.*).

Therefore, only one significant reversal to the height-size correlation is found in the behavior of Japanese speakers, who rated mid vowels to be larger than low vowels. This result contradicts our previous study (Kawahara et al. 2005), which found that Japanese speakers rate mid vowels to be smaller than low vowels. We do not have a good explanation of why we find this reversal in the current experiment.

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(5) Figure 2. The effect of vowel height on size ratings.

Figure 3 shows the effects of backness on the image of size. In all four languages, back vowels evoked significantly larger images than front vowels (Chinese, t(798)=9.05, p<.001; English, t(878)=13.37, p<.001; Japanese, t(1678)=7.89, p<.001; Korean, t(758)=8.56, p<.001).

(6) Figure 3. The effect of vowel backness on size ratings.



Figure 4 shows the effects of voicing of obstruents on the image of size. In Chinese, English, and Japanese, speakers rated voiced obstruents [b, d, g, z] to be larger than voiceless obstruents [p, t, k, s] (Chinese, t(798)=3.57, p<.001; English,

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t(878)=6.57, p<.001; Japanese, t(1678)=19.97, p<.001). Korean showed a non-significant reversal (t(758)=-1.61, *n.s.*).³

(7) Figure 4. The effect of obstruent voicing on size ratings.



In summary, we find the following three general patterns: (i) low > mid > high, (ii) back > front, and (iii) voiced > voiceless.

5 Discussion: Phonetic Grounding

All three of the factors we have examined—vowel height, vowel backness, and voicing in obstruents—affect the image of size in all the four languages (with some exceptions). The next question is why these patterns hold cross-linguistically. We now discuss phonetic bases for these factors affecting the image of size by offering articulatory and acoustic explanations for each of the three factors.

5.1 Vowel Height: An Articulatory Explanation

We start with vowel height. Figure 5 illustrates the articulation of vowels at three different heights, in which the lower the vowel, the wider the aperture. This

³ Young Ah Do (p.c.) suggested the following explanation for this exceptional behavior. In Korean, voiceless obstruents are realized as voiced in intervocalic position, and therefore Korean speakers may have perceived the voiceless stimuli (e.g. itit, ipip) as containing medial voiced consonants. Relatedly, Seunghun Lee (p.c.) shared his intuition that Korean speakers may be sensitive to size differences due to other laryngeal contrasts in such a way that aspirated consonants are larger than tense consonants, which are in turn larger than plain consonants.

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correlation may lead to the sensation of larger images in lower vowels.

(8) Figure 5. Articulatory configurations of vowels differing in height. The



differing in height. The thick vertical lines represent the degrees of aperture.⁴

5.2 Vowel Backness: An Articulatory Explanation

Back vowels evoke larger images, presumably because they have a larger sub-oral cavity in front of the tongue. Figure 6 compares the oral cavities in front vowels and back vowels.

(9) Figure 6. Articulatory configuration of front and back vowels.



As illustrated in Figure 6, the sub-oral cavity in front of the tongue is larger in back vowels. Furthermore, non-low back vowels [u, o] are usually rounded, which enlarges the sub-oral cavity (Stevens et al. 1986). Speakers also lower their larynx in pronouncing back vowels to lengthen the entire oral cavity (Diehl and Kluender 1989: p.126 and references cited there). These articulatory gestures result in larger sub-oral cavities in front of the tongue, which in turn, may yield larger images.

5.3 Vowel Features: An Acoustic Explanation

The explanations so far are articulatory, but we can offer acoustic-based explana-

⁴ Figures 5 and 6 are taken from http://www.ic.arizona.edu/~lsp/Phonetics/Vowels/.

tions based on the frequency code hypothesis (Ohala 1983b, 1994; see also Newman 1933; O'Boyle and Tarte 1980). This hypothesis builds on the correlation between the size of a resonator (or a resonating cavity) and its resulting frequency: lower frequencies imply large resonance cavities or resonators because the resonance frequency inversely correlates with its size.

We find that the second resonance frequency (F2) inversely correlates well with the judgments of size in our current experiment. Table 2 shows F2 values in Chinese (Howie 1976), English (Nishi et al. 2008), Japanese (Nishi et al. 2008), and Korean (Yang 1996).⁵ In Figure 1, the judged size of five vowels (roughly) follows the order of [i] < [e] < [a] < [u] < [o], and the F2 values (from high to low) follow the reserve order: [i] > [e] > [a] > [u] > [o] (with a reversal between the last two in Chinese).

	i	e	а	u	0
Chinese	2640	2200	1480	620	1080
English	1805.5	1622.5	1210.5	1175.0	921.0
Japanese	2076.5	1777.5	1158.0	1120.0	790.5
Korean	2516.5	2172.5	1583.0	1001.0	987.0

(10) Table 2. F2 values of five vowels in four languages (Hz).

In general, then, F2 is a good predictor of the size of the images. One systematic exception is [a] in Chinese and Korean, which were judged to be the largest. It may be possible that [a] is considered to be large because [a] generally has a low F0 (Whalen and Levitt 1995) (for the discussion of F1, see subsection 5.6).

5.4 Voicing in Consonants: An Articulatory Explanation

We now turn to the effect of voiced obstruents, which are associated with large images. This association may have its roots in the articulation of voiced obstruents. Speakers expand their oral cavities when they pronounce voiced obstruents (Ohala 1983a), as illustrated in Figure 7. We can consider the entire oral cavity as consisting of two smaller spaces separated by the glottis: the oral cavity and the sub-glottal cavity. We call the air pressure in the oral cavity Po (for "intraoral air pressure") and the air pressure in the sub-glottal cavity Ps (for "subglottal air pressure") (Figure 7).

⁵ The values for English, Japanese, and Korean are averaged over male and female speakers, while the Chinese data is based on one male speaker. To obtain data from comparable phonetic contexts, the values in Chinese are taken from those in the following context: in the 4th tone (high-falling) syllable near the midpoint of the vowel; non-low back vowels had [w]-onset, front vowels had [y]-onset, and [a] had no onsets.

(11) Figure 7. The oral cavity consisting of two sub-cavities separated by the glottis.⁶



Po must be lower than Ps in order for the air to flow across the glottis. However, Po rises when the airway is significantly obstructed, which makes the condition Po < Ps difficult to meet. In order to keep Po sufficiently low, speakers execute several articulatory maneuvers to expand their oral cavity, such as larynx lowering, velum raising, and cheek expansion (Ohala 1983a). This articulatory expansion of the oral cavity may lead to the sensation of large images.

5.5 Voicing in Consonants: An Acoustic Explanation

An acoustic explanation is also possible for the association between voiced obstruents and large images. Recall that a lower frequency implies larger objects (Ohala 1983b, 1994). Cross-linguistically, vowels have lower F0 next to voiced obstruents than next to voiceless obstruents (see Kingston and Diehl 1994 among others). Due to the lowering of F0, voiced obstruents may evoke larger images, because low F0 implies larger resonators.

5.6 Summary: Articulatory or Acoustic?

In summary, then, our results make either articulatory or acoustic sense. A question naturally arises at this point which type of explanation—articulatory or acoustic—better explains the sound symbolic patterns in natural languages. One challenge to the acoustic view is that we would have to postulate that speakers ignore F1, because low vowels have higher F1, yet evoke larger images. Another challenge may come from Eberhardt's (1940) finding that deaf children are sensitive to symbolic relations, although they showed behaviors slightly different from normal hearing children. She concludes that "while characteristic vowel

⁶ The picture is taken from http://www.chass.utoronto.ca/~danhall/phonetics/. The illustration is ours.

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frequency seemed to be the most important general factor involved in the choices of both deaf and normal subjects kinaesthetic data apparently played a relatively greater part in some cases with the deaf" (p. 36). At least deaf children seem to be sensitive to their articulatory gestures in the context of sound symbolism.

John Ohala (p.c.) pointed out however that the articulatory view alone cannot explain why high tones are sometimes associated with small images (e.g. in African languages: Ohala 1983a). He also points out that the articulatory view predicts that nasals may be associated with larger images because nasals include the nasal cavity in addition to the oral cavity. With these issues in mind, we would like to leave this question open at this point, and wait for future experimentation.

One line of research that could bear on this issue would consist of experiments using non-speech stimuli, which has been used to bear on the articulation/acoustic debate in other domains of phonetic theories—especially on the debate about the objects of speech perception (see Diehl et al. 2004 for a review). One such non-speech experiment on sound symbolism was conducted by O'Boyle and Tarte (1980), who did not find a significant correlation between frequencies of pure tones and the figures that they represent. They moreover cite (apparently unpublished) results (Tarte 1976) which found that speakers associated low tones with small figures significantly more often than with large objects—a correlation opposite of the one that the frequency code hypothesis predicts. More work using non-speech stimuli thus seems necessary.

Another line of approach may be to present to listeners non-native sounds, whose articulations cannot be guessed by the listeners.⁷ If the sound symbolic patterns have articulatory bases, then listeners would not be able to associate the non-native sounds with particular images. If sound symbolism patterns have psychoacoustic bases, then the listeners should have no trouble associating them to an image.

5.7 A Final Issue: Inferences from the Lexicon?

One final issue that we would like to raise here—without offering a definite answer—is whether our results can be explained based on inferences from existing lexical items. Stochastic patterns in the lexicon are known to affect our linguistic judgments (e.g. Hay et al. 2004). Appling this explanation to sound symbolism, for example, in English the word *large* has a low vowel; English also has a diminutive suffix -*y* to represent small objects. From these lexical items, English speakers could have associated large images with low vowels and small images with a high front vowel [i]⁸ (see also Ultan 1978 for an extensive cross-linguistic lexical study). However, such analogical lexicon-based explana-

⁷ We would need to use those sounds that do not perceptually assimilate to native sounds.

⁸ Alternatively, sound symbolism may diachronically affect the coinage of lexical words, skewing the lexicon in the direction that conforms to sound-symbolic patterns.

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tions face a non-negligible number of exceptions; e.g., *small* has a low vowel, *big* has a high front vowel, and *huge* has a high vowel.

Another systematic argument against this lexicon-based explanation comes from Korean. Korean has two sets of sound symbolic vowel categories, the bright category (e.g. [a, o]) and dark category (e.g. [u, i]) (Garrigues 1995: 367-371). Among other sound symbolic meanings, the bright category can denote "lightness, smallness and quickness" (Garrigues 1995: 368, citing Kim 1977: 69). Here non-high, back vowels correspond to the small images. It is unlikely therefore that the Korean participants in our experiment produced the results above based on inferences from existing items in their lexicon.

Although this Korean example is telling, it is beyond the scope of this short paper to make a definitive conclusion about a systematic lexicon-based explanation of sound symbolism. The question would ultimately boil down to: are the lexicons of the four languages we studied (and beyond) stochastically skewed enough to explain the sound symbolic patterns we observe? We would thus like to leave the testing of this question for future research.

6 Summary and Conclusion

Cross-linguistically, vowel height, backness, and voicing of obstruents all affect the perception of size. All of these patterns make phonetic sense (articulatory and/or acoustic). Speakers can project their articulatory gestures (or their acoustic consequences) to the sensation of image.

Patterns of sound symbolism can be a counterargument against the thesis of arbitrariness (Saussure 1916). Speakers have some non-arbitrary intuition about connections between sounds and meanings/images. They may have embodied motivations and may instantiate iconicity (e.g. Haiman 1983, 1985a, b) between sound and meaning. The study of sound symbolism thus can be an interesting topic in cognitive linguistics.

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Kazuko Shinohara Tokyo University of Agriculture and Technology 2-24-16 Nakacho, Koganei Tokyo 184-8588, JAPAN

k-shino@cc.tuat.ac.jp

Shigeto Kawahara Keio University 2-15-45 Mita, Minato-ku Tokyo, JAPAN

kawahara@icl.keio.ac.jp

Testing for Frequency and Structural Effects in an English Stress Shift

MORGAN SONDEREGGER University of Chicago

Introduction

In many cases of language change, there is exceptionality: only some forms have changed, or different forms are changing at different rates. For any given case of change where exceptions exist, there are often several types of plausible conditioning factors for the behavior of different forms, such as phonetic environment, social factors, or token frequency. Of interest is the relative contribution of proposed factors on a form's likelihood of changing (or rate of change).

This paper considers one such case, the English diatonic stress shift (DSS). We examine the role of frequency and phonological structure as conditioning factors for which of a set of noun/verb pairs have undergone the DSS between 1700 and the present. Previous work by Phillips (1984) has shown a role of frequency: on average, words which have undergone the DSS have lower frequency than those which have not. Using a new dataset, we show via multiple logistic regression that there is a significant effect of frequency in the direction shown by Phillips, as well as effects of phonological structure; for example, a closed initial syllable makes change more likely. There is also a strong *interaction* between the effects of frequency and structure; in particular, structure modulates the strength and direction of the frequency effect. Our use of multiple regression follows its widespread use in sociolinguistics (e.g., Labov 1994) for quantifying the relative effects of different conditioning factors in cases of language change.

The paper is structured as follows. Section 1 gives background on the DSS. Section 2 describes possible conditioning factors related to frequency and phonological structure, and Section 3 considers each factor's effect in isolation. Sections 4–5 dis-

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cuss regression models for the joint effect of frequency and structure, and Section 6 sums up.

1 Background

1.1 N/V pairs

Of interest here are English disyllabic, homographic noun/verb pairs, referred to as *N/V pairs* throughout. We use the notation {Nstress,Vstress} to denote an N/V pair's stress, with $1=\dot{\sigma}\sigma$, $2=\sigma\dot{\sigma}$.¹ Of the four logically possible stress patterns, all current N/V pairs for which N and V have categorical stress follow one of 3 patterns: {1,1} (*fracture*: N $\dot{\sigma}\sigma$, V $\dot{\sigma}\sigma$), {1,2} (*convict*: N $\dot{\sigma}\sigma$, V $\sigma\dot{\sigma}$), {2,2} (*cement*: N $\sigma\dot{\sigma}$, V $\sigma\dot{\sigma}$). The fourth possible form, {2,1}, is unattested both synchronically and diachronically (Sherman 1975; Sonderegger and Niyogi 2013). There is also variation in the pronunciation of a few N/V pairs (e.g., *research, perfume*).

Change in N/V pair stress was first studied systematically by Sherman (1975), and subsequently by Phillips (1984) and Sonderegger and Niyogi (2013). In dictionary data from 1570 to the present, four types of clear-cut change can be observed between the three stress patterns, at the level of individual pairs: $\{2,2\} \rightarrow \{1,2\}$, $\{1,1\} \rightarrow \{1,2\}, \{1,2\} \rightarrow \{1,1\}$, and $\{1,2\} \rightarrow \{2,2\}$.

1.2 The diatonic stress shift

By far the most common type of change observed is $\{2,2\} \rightarrow \{1,2\}$, from the *oxy-tone* pattern to the *diatone* pattern. We restrict ourselves to this change, the *diatonic stress shift* (DSS).² Only two diatones are recorded before 1570 (Minkova 1997:160), suggesting the DSS began in the 16th century. The DSS has been categorized as lexical diffusion (Sherman 1975; Phillips 1984, 2006) or analogical change (Kiparsky 1995), and indeed the relationship between the two is controversial (see Phillips 2006, vs. Kiparsky 1995; Janda and Joseph 2003). All that is important for our purposes is the basic fact that the DSS is lexically gradual.

Most N/V pairs currently stressed as $\{1,2\}$, and hence most pairs which have undergone the DSS, begin with a prefix, such as *pre* or *re* (Fudge 1984:32). Setting aside why this is the case, we can infer that the set of prefixed words contains most words which *could* shift stress, an important point for the dataset considered below (Sec. 3.1).

Two types of motivation for the DSS (i.e., why it occurs at all) have been proposed; as this paper is concerned instead with which words it has affected, we only

¹ By "stress," we always mean primary stress.

² The other changes are too uncommon to study potential conditioning factors: the next most common change, $\{1,1\} \rightarrow \{1,2\}$, only affects 3 words in the sources used here.

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describe these briefly.³ There is a strong tendency in English for nouns to have earlier stress than verbs (e.g., Ross 1973); one explanation for the DSS is that speakers regularize $\{1,1\}$ N/V pairs to follow the dominant pattern of stress in the lexicon (Phillips 2006:37–9). A different account is that the DSS is driven by the interaction between stress perception and prosodic context (Kelly 1989; references therein).

2 Frequency and structural conditioning

We now describe two types of possible conditioning factors for how likely an individual N/V pair is to undergo the DSS: word frequency and phonological structure.

2.1 Frequency conditioning

The most detailed proposal for a conditioning effect comes from Phillips (1984), who argues that lower frequency words are more likely to undergo the DSS. Phillips uses two lists of words from Sherman (1975):

- 1. Changed: Words currently stressed as {1,2}, and known to have undergone the DSS. (44 N/V pairs)
- 2. Unchanged: Words currently stressed as {2,2}, designated by Sherman as "likely to change" to {1,2} in the future. (124 N/V pairs)

All words begin with one of 9 prefixes: *a*, *con/m*, *de*, *dis*, *es*, *ex*, *pre*, *re*, *sur*. Phillips considers the (combined N+V) frequency for each pair, from the *American Heritage Word Frequency Book* (Carroll et al. 1971), and finds that within each prefix class (words sharing the same prefix), the average frequency of changed words is lower than that of unchanged words; the data is shown in Fig. 1.

We note that the observed differences in means are not statistically significant; that is, they could simply be due to chance.⁴ However, the frequency differences are consistently in the predicted direction, suggesting that there may be other factors obscuring an underlying significant effect. One possible issue is the small size of some prefix classes (e.g., 4 words for *pre*), which can make a significant difference in means impossible. For the dataset considered below, we show a statistical technique to deal with small prefix classes, and consider the role of phonological structure as well as frequency; one finding is a significant frequency effect in the direction discussed by Phillips.

³ Of course, the DSS's motivation and which words it has affected could be related, a possibility not considered here.

⁴ Using Mann-Whitney tests (two-sided) of whether the difference in frequencies of changed vs. unchanged pairs is different from 0 in individual prefix classes ($p \ge 0.19$ for each prefix), or across all words (p = 0.5). Because the Mann-Whitney test is sensitive only to the relative order of values, the *p* values are the same if frequencies are first log-transformed.

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Figure 1: Frequency data from Phillips (1984). Left: frequencies for individual words. Right: means across all words of each type ($\{1,2\}, \{2,2\}$), within each prefix class.

2.2 Structural conditioning

We now discuss two types of possible structural conditioning factors for the DSS: syllable weight and final segment identity. σ_1 and σ_2 are used to denote the first and second syllables of an N/V pair.

Besides the general cross-linguistic correspondence between heavier syllables and stress, there is theoretical and experimental evidence for the importance of syllable weight to primary stress assignment in English. To a first approximation, English syllables are heavy if they contain a long vowel (diphthong or tense monophthong) or a coda, and light otherwise; only heavy syllables can bear stress (e.g., Giegerich 1992). For disyllabic nouns (the class of words which change in the DSS), primary stress is predicted to be final if σ_2 contains a long vowel, and initial otherwise (e.g., Chomsky and Halle 1968; Hayes 1982). In disyllabic nonsense words, Guion et al. (2003) find that syllables with long vowels are more likely to be assigned stress, but the presence of a σ_2 coda does not consistently attract stress; however, Baker and Smith (1976:21) show that a σ_1 coda increases the likelihood that stress is assigned to σ_1 (also in nonsense words). A more direct motivation for considering the role of syllable weight in the DSS comes from an observation by Poldauf (1984), that present-day N/V pairs pronounced $\{1,2\}$ often have a σ_1 coda. In general, we might hypothesize that both heavier σ_1 and lighter σ_2 make change to $\{1,2\}$ more likely.

Although both codas and vowel length contribute to syllable weight, below we will consider only codas as predictors of whether a word has undergone the DSS.⁵

⁵ Because σ_1 vowel length can change if stress shifts, it is unclear how it should be coded. We tried using σ_2 vowel length as a predictor, based on the verb pronunciation. There was no significant difference in this predictor for changed vs. unchanged words, and it did not prove useful in the

A different type of structural conditioning is suggested by an observation by Minkova (1997:161): many N/V pairs which at some point have followed the $\{1,2\}$ pattern end in /t/ or /d/. Minkova specifically means Romance loans, which includes many N/V pairs affected by the DSS; the observation fits into a larger account of the role of Romance loans in changing the Middle English stress system.⁶ Based on Minkova's finding, we predict that words ending in final /t/ or /d/ will be more likely to shift stress to $\{1,2\}$.

We have described two types of factors which may influence whether a word has undergone the DSS: word frequency and phonological structure. We now turn to the dataset used to test whether these factors do have any effect.

3 Data

As data, we wish to consider a set \mathcal{W} of words stressed $\{2,2\}$ at some time t_1 , and still in use at a later time t_2 , when each word is stressed $\{1,2\}$ or $\{2,2\}$. \mathcal{W} should be a representative sample of all words which could undergo the DSS between t_1 and t_2 .

3.1 Dataset

In our dataset, t_1 =1700 and t_2 is the present day. These dates were chosen to maximize the timespan considered, and hence the number of words which have undergone the DSS, given that (Boyer 1700) is the first dictionary listing stress for a significant fraction of all N/V pairs (according to the data given by Sherman 1975). To find all words which were pronounced {2,2} in 1700, we would have to manually check an entire dictionary. To avoid doing so, we make use of the fact that the DSS seems to be largely restricted to prefixed words (Sec. 1.2); the set of prefixed words thus contains most words which *could* have changed, making it a good choice for W.

We considered words beginning with one of 17 prefixes.⁷ Following previous work (Phillips 1984, 2006), "prefix" is used loosely here, to mean something between initial syllable and morphological prefix. Some prefixes are theoretically questionable; for example, *re* has at least two different senses. The important point is that most words which have undergone the DSS fall into groups of words with

regression models discussed below.

⁶ Briefly, an N/V pair ending in /t/ or /d/ will be trisyllabic $\sigma \delta \sigma$ in the past tense form; this influences the speaker to assume the N/V pair belongs to a lexical stratum with a highly-ranked constraint (in the Optimality Theory sense) against final stress, which in turn makes the optimal stress of the N form $\delta \sigma$.

⁷ The prefixes, and number of words for each, are: *re* (42), *a* (20), *dis* (17), *de* (16), *com/con* (9), *e* (8), *ex* (5), *sur* (4), *in/im* (3), *mis* (2), *sup* (2), *pro* (2), *per* (1), *pre* (1). *e* refers to words where the initial vowel is orthographically followed by a consonant other than 'x' (e.g., *escape, elect*).

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similar initial segments, and the behavior of words in the same group may not be independent.

We found all N/V pairs (a) beginning with one of the 17 prefixes, (b) listed as $\{2,2\}$ in Boyer (1700), a French–English dictionary, and (c) pronounced as $\{1,2\}$ or $\{2,2\}$ today, using CELEX (Baayen et al. 1996) and the OED as sources. There are 132 such words in this set, denoted *L*, of which 23 have changed: the 1700 pronunciation is $\{2,2\}$ and the present-day pronunciation is $\{1,2\}$.

3.2 Inputs

We are interested in the effect of 4 *input variables* (or *inputs*) on whether a word changed, corresponding to the conditioning factors considered above:

- LogFreq: The log of the total (N+V) lemma frequencies, from the British National Corpus (Leech et al. 2001).⁹
- Coda1, Coda2: The number of coda consonants of σ_1 and σ_2 , according to the CELEX syllabification.¹⁰ (Range: 0–1 for σ_1 , 0–3 for σ_2 .)
- Coda2.td: 1 if Coda2 is /t/ or /d/, 0 otherwise.

As exploratory data analysis, we first consider the effect of each input in isolation.

Frequency Considering the frequency of all words in *L* (across prefix classes), the result is the same as for Phillips' data: the mean of LogFreq is lower for changed words than for unchanged words, but the difference is not significant (Mann-Whitney, p = 0.11). We would also like to test whether there is a frequency effect within prefix classes. However, many prefix classes have few (<5) words (Footnote 7), and the notion of a difference between changed and unchanged words does not make sense for such small sets. We thus cannot test within individual prefix classes without throwing out much of the data (from small prefix classes).

A solution is offered by mixed-effects logistic regression, via the concept of "partial pooling," both described below (Sec. 4.3). For the moment, we note that in a simple mixed-effects model of the effect of LogFreq on whether a word changed,

⁸ For the N and V forms of each pair, if CELEX listed a pronunciation it was used; otherwise the OED pronunciation was used. To maximize the number of "changed" words in *L*, 2 words (*perfume, surname*) with variation in the V form (between $\dot{\sigma\sigma}$ and $\sigma\dot{\sigma}$) were counted as {1,2}. Space constraints prevent us from describing *L* in detail; the dataset can be found on the author's web page (currently, people.cs.uchicago.edu/~morgan).

⁹ Six words had frequency 0, either because the N and V lemmas were not present in the BNC or because frequencies are in integer counts per million, rounded down; many low-frequency words are thus rounded to 0. To avoid taking log of 0, 0.25 was added to all N+V frequencies.

¹⁰Syllabic liquids were not counted as codas.

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Figure 2: Empirical proportion of words which have changed, as a function of Coda1, Coda2, and Coda2.td.

controlling for prefix class, there is a significant effect of frequency in the predicted direction ($\beta = -0.28$, z = -2.0, p < 0.05): that is, lower frequency promotes change.¹¹

Structure Fig. 2 shows the proportion of words which have changed, plotted as a function of the 3 structural variables. In each case, the empirical means trend in the predicted direction—words with higher Coda1, lower Coda2, or higher Coda.td are more likely to change—but none of these trends are significant (p > 0.2).¹² For convenience, we refer to these three directions of the structural inputs as *hypothesized change-promoting structure*, with the caveat that for Coda2 it is actually the absence of structure that predicts change.

4 Regression models

Considered in isolation, the effects of individual input variables on whether a word changes are largely insignificant. However, they all trend in the expected directions, suggesting that more robust effects may be seen if all inputs are included in a single model. Including frequency and structural variables in the same model also allows us to check for interactions between the two.

4.1 Logistic regression

We model the effect of frequency and structure on whether a word changes using logistic regression (LR); which we briefly review to establish terminology. LR predicts the probability of a binary outcome (the *response*) given values of the *predictor variables*.¹³ Here, the response is changed: 0 for unchanged words, and 1

 $^{^{11}\}mbox{The model includes a fixed effect of $LogFreq$, with a random effect of $Prefix$ on the intercept.}$

¹²Coda1: $\chi^2(1) = 1.55$, p = 0.21. Coda2: Spearman rank correlation $\rho = -0.11$, p = 0.21. Coda.td: $\chi^2(1) = 0.01$, p = 0.92.

¹³We follow Gelman and Hill (2007:37) in referring to the variables observed for each point—here, frequency and structure variables—as "inputs," and the variables used in modeling as "predictors." The distinction is that both interactions and main effects of the inputs are predictors.

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for changed words. The data are (\vec{x}_i, y_i) pairs, where each \vec{x}_i is a vector of predictors and $y_i \in \{0, 1\}$ is the response, for an individual data point. The log-odds of y = 1are modeled as a linear function of \vec{x} :

$$\log \frac{P(y=1|\vec{x})}{P(y=0|\vec{x})} = a + \vec{x} \cdot \vec{\beta}$$
(1)

where *a* is the intercept and $\vec{\beta}$ is a vector of coefficients.

We are interested in modeling the effects of 4 input variables on changed, as well as interactions between frequency and structural inputs, and controlling for prefix class, resulting in at least 8 degrees of freedom. Because we only have 132 data points, we cannot build a single model which considers all these factors at once without serious danger of overfitting.¹⁴ We instead consider two models, each using a different strategy to reduce the number of degrees of freedom; together, they give a good picture of what is conditioning the DSS.

4.2 Model 1: Across prefix classes

We first model the effect of all 4 inputs on changed, including possible interactions between frequency and structure, but disregarding prefix class.

The model was fitted using R, with all inputs centered to reduce collinearity.¹⁵ We began with a model including all interactions between LogFreq and the structural variables (Coda1, Coda2, Coda2.td). The interaction term between Coda2 and LogFreq was removed because its contribution to model likelihood was not significant ($\chi^2(1) = 0.94$, p = 0.33).

The strategy used to address overfitting in Model 1 was *penalization* of model coefficients, following Baayen (2008:224–7). Penalization shrinks coefficients towards zero, and decreases coefficient significances. The resulting penalized model is summarized in Table 1.¹⁶

The main effects for structural inputs are all in the predicted directions, and either significant (p < 0.05: Coda1, Coda2) or approaching significance (p < 0.1: Coda2.td): on average, words with each type of hypothesized change-promoting structure were indeed more likely to change. The main effect of frequency is not significant: on average, there is no frequency effect when structure is controlled for.

¹⁴As a rule of thumb, overfitting is a concern for binomial data when the number of points with the minority outcome is smaller than 10–15 times the number of predictors (Harrell 2001:61); this is clearly the case for our data.

¹⁵LogFreq and Coda2 were centered; Coda1 and Coda2.td were sum coded. Collinearity is of particular concern because the structural inputs (e.g., Coda2 and Coda2.td) are not independent. After centering, there was minimal collinearity (condition index=1.89).

¹⁶The penalty was 1.25. The penalized model validates fairly well, giving confidence that we have not overfit the data. Repeatedly taking bootstrap samples and refitting the model, all coefficients (except the main effect of LogFreq) are different from 0 with significances p < 0.06 (see Baayen 2008: 307–8). The model has Nagelkerke pseudo- $R^2 = 0.22$.

Predictor	Coef.	S.E.	Z.	p
Intercept	-0.73	0.55	-1.3	< 0.001
LogFreq	-0.16	0.13	-1.2	0.22
Codal	1.06	0.53	2.0	0.047
Coda2	-0.98	0.48	-2.0	0.041
Coda2.td	0.96	0.55	1.8	0.078
LogFreq:Coda1	1.01	0.35	2.9	0.0041
LogFreq:Coda2.td	0.56	0.29	1.9	0.056

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Table 1: Coefficients, standard errors, Wald *z*-scores, and significances for Model 1.

However, there is also an interesting interaction between frequency and structure. The presence of either a σ_1 coda or a final t/d significantly changes the effect of frequency. When neither is present, the slope of LogFreq is negative (increasing frequency makes change less likely); when either is present, the slope of LogFreq increases, possibly becoming positive. We discuss this effect further below (Sec. 4.4).

4.3 Model 2: Controlling for prefix class

No main effect of frequency was found in Model 1. However, we found in exploratory data analysis (Sec. 3.2) that a significant frequency effect only emerged when prefix class was controlled for. In Model 2, we again consider the effects of both frequency and structure, but controlling for prefix class.

Mixed models and partial pooling The simplest way to control for prefix class would be to add a Prefix predictor to Model 1, with one level per prefix. However, several prefix classes have few (< 5) observations, and it is problematic to have levels of a categorical predictor with so few observations.

An elegant solution to this sort of situation, where the data come in groups of very different sizes, is offered by mixed-effects logistic regression, via what Gelman and Hill (2007:252–9) call "partial pooling."¹⁷ In Model 2, in addition to *fixed effects* of frequency and structure, we will include a *random effect* of Prefix on the intercept. This means we assume that the intercept (*a* in Eqn. 1)—the intrinsic likelihood of change, in log-odds—differs by prefix class, and the intercepts for different prefix classes are normally distributed. Roughly speaking, the intercepts for small classes are inferred based on the proportion of changed words in large classes.¹⁸

¹⁷Baayen (2008) discusses mixed-effects logistic regression for linguistic data.

¹⁸The intercepts are fitted by starting with the empirical proportions (% changed words) for each

Predictor	Coef.	S.E.	z	р
Intercept	-1.83	0.65	-2.83	0.005
LogFreq	-0.35	0.16	2.53	0.012
Structure	1.77	0.70	-2.11	0.035
LogFreq:Structure	2.4	0.74	3.18	0.0015

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Table 2: Fixed effect coefficients, standard errors, Wald *z*-scores, and significances for Model 2.

Model 2 Ideally, we would fit a mixed-effects logistic regression using the terms of Model 1 as fixed effects, and simply adding a random effect of Prefix; however, this model has too many degrees of freedom relative to the number of data points.¹⁹

We address overfitting in Model 2 by "data reduction" (Harrell 2001), and reduce the degrees of freedom by defining a single composite predictor for structure:

$$Structure = Coda1 - \frac{1}{3}Coda2 + Coda2.td$$

Structure increases for any change in a structural input in the direction predicted to promote change to $\{1,2\}$. (Coda2 is divided by 3 because it takes on values between 0 and 3 in the data, while Coda1 and Coda2.td are 0 or 1.)

The model was fitted in R using lmer, from the lme4 package for mixed-effects models (Bates and Maechler 2009), with a logistic link. Fixed effects were included for LogFreq, Structure, and their interaction, and a random effect of Prefix on the intercept. LogFreq and Structure were centered, and there was little collinearity after centering (condition index = 1.31).

The estimated variance for the random effect term is $s^2 = 3.0$. This term's contribution to model likelihood was nearly significant ($\chi^2(1) = 3.8$, p = 0.052), giving some support to the assumption that different prefix classes have different intrinsic probabilities of change.

The estimated fixed effects are summarized in Table 2.²⁰ The effect of structure and its interaction with frequency are qualitatively the same as in Model 1: the probability of change increases with the amount of hypothesized change-promoting structure, as does the slope of LogFreq. An important difference from Model 1 is the significant main effect of frequency: on average, change becomes less likely as frequency increases. This comes from controlling for prefix class, not from using

prefix class, and adjusting them to follow a normal distribution; the key fact is that the smaller the prefix class, the more its intercept can be adjusted.

¹⁹Bearing out this intuition, the resulting model does not validate well: some fitted coefficients are not significantly different from 0 using bootstrap samples. (See Footnote 16.)

²⁰The model has Nagelkerke $R^2 = 0.26$, calculated relative to a model with only an intercept term (and no random effects).

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	Frequency quartile				Structure quartile			е	
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
<i>ρstructure</i>	-0.21	0.35	0.39	0.21	ρ_{freq}	-0.40	-0.31	0.051	0.72
р	0.22	0.044	0.026	0.25	p	0.004	0.07	0.77	0.008

Table 3: Left: Spearman rank correlations between Structure and changed for words in each frequency quartile. Right: Correlations between LogFreq and changed for words in each Structure quartile. Bold values are significant (p < 0.05).

a composite predictor for structure: the main effect of frequency is marginal (p = 0.10) if Model 2 is fitted without the random effect term.²¹

4.4 **Regression models: interpretation**

Models 1 and 2 give significant insight into the roles of frequency and structure in conditioning the DSS.

Structure In both models, there were significant main effects for structural inputs in the hypothesized directions. To our knowledge, this is the first demonstration that stress shift in N/V pairs is conditioned by phonological structure.

Model 1 is useful for understanding the relative role of different structural variables. More σ_1 coda consonants, fewer σ_2 coda consonants, and the presence of final t/d all increased the likelihood of change. It would be nice to know the relative importance of the three structural inputs to how likely a word is to change; this comparison is complicated by the presence of interaction terms. One approach is to compare the *average predictive difference per unit* (APDU) of each input: the average difference in probability predicted by the model, across all data points, when a given input is varied by one unit, with other inputs held at their observed values.²² The APDU of Coda1 is 0.24, compared to 0.17 for Coda2.td and -0.13 for Coda2. By this measure, whether a word has a σ_1 coda is somewhat more important in determining its probability of changing than the length of its σ_2 coda, or whether it ends in /t/ or /d/.

Model 2 is useful for a broader understanding of the role of structure. Because we centered LogFreq, the main effect of Structure is to be interpreted with frequency held at its mean value: on average, more hypothesized changepromoting structure makes change more likely. But because of the large interac-

²¹Model 2 validates well: all coefficients are different from 0 in bootstrapped samples with p < 0.05. (See Footnote 16.)

²²See Gelman and Hill (2007:§5.7, §21.4). For Coda1 and Coda2.td we used Eqn. 5.9; for Coda2 we divided Eqn. 5.9 by 3 (the range of Coda2).

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tion with frequency, the effect of structure is predicted to diminish (slope nearer to 0) as frequency is decreased. This prediction is reflected somewhat in the data (Table 3), in that the correlation between Structure and changed is lower for words in the lowest frequency quartile ($\rho = -0.21$) than for words in other quartiles ($0.21 \le \rho \le 0.39$). However, ρ for the highest and lowest quartiles is not significantly different from zero, making any conclusion about the effect of frequency on the slope for Structure tentative. The interaction is more important for the effect of Structure on the slope for frequency, discussed shortly.

Frequency In both models, the main effect of frequency was in the direction predicted by Phillips (lower frequency makes change more likely), but it was only significant when prefix class was controlled for (Model 2). This agrees with Phillips' view (1984, 2006) that it is within prefix classes that lower frequency promotes change, rather than across all words.

However, the role of frequency is affected by structure. In Model 2, the negative main effect of frequency means that on average (Structure held at its mean), the slope of frequency is negative. But due to the interaction with Structure, this slope is predicted to diminish (become null), then reverse (become positive) as Structure is increased. This pattern is seen in the empirical data (Table 3): the correlation between frequency and changed is significantly negative for words in Structure quartile 1 (Q1), significantly positive for words in Structure Q4, and increases steadily from Q1 to Q4. While lower frequency does promotes change on average, the size of this effect diminishes as the amount of change-promoting structure increases, and reverses given enough change-promoting structure.

5 Discussion

The observed interaction between frequency and structure is intriguing in light of a central hypothesis in the literature on frequency and lexical diffusion, that changes can be classified by whether it lower or higher frequency that promotes change, and that which frequency effect is seen reflects the underlying mechanism of change: low frequency-first changes involve "lexical analysis" and tend to be analogical changes, while high frequency-first changes involve only the surface phonetic realization of words (less lexical analysis) and tend to be "physiologically motivated" (Phillips 1998, 2006:56). This classification does not, however, make predictions for changes with multiple motivations, or where the effect of frequency is modulated by other conditioning factors.

The DSS shows *both* types of frequency effect, perhaps reflecting two underlying sources of change. We do not have a compelling explanation for the observed interaction between frequency and structure, in particular how structure influences the effect of frequency. A heuristic account is that different mechanisms are at play
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for words with different amounts of change-promoting structure. Words with less structure are being treated "analogically": lower frequency words are more likely to have their pronunciation modeled on similar words (i.e., disyllabic nouns). Words with more structure are being treated "phonetically": for high-frequency words, there is a higher probability of stress placement being influenced by syllable weight and final segment identity, in the same vein as the correlation between word frequency and the degree of vowel reduction (see references in Bell et al. 2009). Why structure would condition frequency effects in this way is not clear.

Aspects of the frequency/structure interaction are compatible with recent studies of change in progress. Both types of frequency effect within a single change have also been observed by Clark and Trousdale (2009), in the context of consonant fronting in a variety of Scottish English. An interaction between frequency and other factors (though not a reversal in the direction of the frequency effect) was found by De Schryver et al. (2008) for Dutch fricative devoicing. Along with the DSS, these cases suggest that the two-way typology of frequency effects requires refinement to account for the more general case of frequency effects in changes with several motivations.

6 Conclusion

This paper has examined the contributions of frequency and phonological structure to conditioning the DSS, using multiple logistic regression models. Both frequency and structural factors are important for predicting whether an N/V pair has undergone the DSS, and there is a substantial interaction between the effects of frequency and structure. In Models 1 and 2, we found a significant effect of structure on the likelihood that an N/V pair has undergone the DSS. In Model 2, we controlled for the effect of prefix class, and observed a significant frequency effect. There were no significant effects of structure or frequency in simple observed proportions (i.e., the mean frequency of changed vs. unchanged words), showing that understanding the interaction between frequency and structure is important for understanding the relative contribution of each, and illustrating the utility of regression models incorporating both.

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Morgan Sonderegger University of Chicago Department of Computer Science 1100 East 58th Street Chicago, IL 60637

morgan@cs.uchicago.edu

Neighborhood Density in Phonological Alternations

SVERRE STAUSLAND JOHNSEN Harvard University

Introduction

Neighborhood density (ND) is a measure of how similar a word is to other words in the lexicon. In response to the growing evidence of the significance of ND for word identification and word production, linguists have started asking what role ND could play in phonological alternations, without reaching a consensus.

This paper assesses the role of ND in a phonological alternation in Norwegian, by asking whether the alternation is best predicted by ND or by the phonological structure of the alternators. The results reveal how these factors are strongly correlated and equally good predictors of alternations.

A question previously not addressed in the literature is what role ND could play for *novel* words in phonological alternations. An experiment conducted with nonce forms shows that ND cannot predict speakers' production, whereas the phonological structure of the alternators can. Based on this discrepancy between existing and novel words, I conclude that although the observed effect of ND in word identification can affect how words are phonologically represented over time, it plays no role in the mapping from representation to surface realization.¹

1 Norwegian retroflexion

Norwegian distinguishes an alveolar laminal /s/ from a postalveolar apical 'retroflex' /s/ in virtually all positions (see Kristoffersen 2000:22f. and Simonsen &

¹ This paper has benefited from comments and suggestions by Adam Albright, Michael Becker, and the audiences at the MIT Phonology Circle and the 2009 LSA Meeting. I am grateful to the people who volunteered to participate in the experiments, and to Vegard Johnsen for helping me recruit them. I am especially grateful to Kjetil Aasen for volunteering to tag the tokens analyzed in this paper. The raw data from the experiments reported in this paper can be found on the author's website.

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Moen 2004:610ff. for the articulation):²

(1)	/set/ 'see'	/sɛː/ 'happen'	word-initial prevocalic
(2)	/suæ:t/ 'very'	/svæ:t/ 'huge'	word-initial preconsonantal
(3)	/təsk/ 'fool'	/təşk/ 'cod'	postvocalic preconsonantal
(4)	/farsi/ 'Farsi'	/kirs/ 'kirsch'	postconsonantal
(5)	/ma:s/ 'nagging'	/maːs/ 'Mars'	word-final postvocalic
(6)	/laŋs/ 'along'	/re'vans/ 'revenge'	word-final postconsonantal

The contrast is rare in some contexts (such as (2), (4), and (6)) where the contrast exists thanks to incorporated loanwords from other languages or idiosyncratic native developments, but it is nevertheless invariably present for such words.

When a word beginning in /s/ is directly preceded by a morpheme ending in the apical alveolar tap /r/ (see Kristoffersen 2000:24 and Moen et al. 2003:1756 for its articulation), the tap regularly deletes (Kristoffersen 2000:315), and /s/ surfaces as a retroflex [s]. The retroflexion of /s/ to [s] occurs both with words in prevocalic /s/ (7-8) and preconsonantal /s/ (9-11):

(7)	/səmər-suːr/	>	[səməşuːr] 'summer sun'
(8)	/somər-sy:n/	>	[soməşy:n] 'summer vision'
(9)	/səmər-spil/	>	[soməspi]] 'summer games'
(10)	/somər-stæ:v/	>	[soməstœ:v] 'summer dust'
(11)	/səmər-sku:/	>	[sɔməsku:] 'summer shoes'

Despite earlier descriptions of the retroflex rule as being obligatory (Eliasson 1986:282, Kristoffersen 2000:316f., Torp 2007:70), the final step of the process described above (/s/ > [s]) is in fact variably applied. According to intuition (which is verified in the following sections), retroflexion is more commonly applied to words in preconsonantal /s/ than to prevocalic /s/. For the examples above, retroflexion is strongly dispreferred in (7), where [soməsu:r] is the favored realization, but strongly preferred for (11). No words, however, are obligatorily exempted from or obligatorily included in the retroflex rule.

2 **Predicting Alternations**

A challenge for phonologists when dealing with optional processes with much variation is to pin down the predictive factors for when the process does or does not apply, and to understand why those factors affect the process in the way they do. A recent proposal by Ussishkin & Wedel (2009) highlights the possibility that

² Throughout this paper, 'Norwegian' will be used as a convenient short term for 'Urban East Norwegian' (see Kristoffersen 2000:8).

this could in part be determined by the relationship between words in the lexicon. They draw attention to the fact that for many phonological alternations, there is a negative correlation between the likelihood of a word to alternate and how many similar words there are in the language – the word's *neighborhood density* (ND). Since participants in experiments do worse in recognizing words that have undergone phonological alternations (Tsapkini et al. 1999, Järvikivi et al. 2009:227ff.) or that reside in dense neighborhoods (Luce & Pisoni 1998:20, 24f., Dirks et al. 2001:6ff.), Ussishkin & Wedel point out that words that both have a dense neighborhood and also participate in an alternation are at a double disadvantage for lexical access. As a way to make lexical access more effective, they suggest that phonological alternations are suppressed in dense neighborhoods (2009:280ff.).

Centering the discussion on the variation in final devoicing in Turkish, Pycha et al. (2007) and Becker & Nevins (2009) evaluate Ussishkin & Wedel's claim by doing statistical analyses on the Turkish lexicon, concluding that no such significant correlation can be found, and that ND in general plays no role in phonological alternations. The Turkish alternation is in their view best described by referral to the word size, measured in morae or syllables.

The role of ND can similarly be assessed for the variable application of retroflexion in Norwegian. By gathering data on applied retroflexion for words with prevocalic /s/ (simple onset) and preconsonantal /s/ (complex onset), a statistical analysis can be performed to evaluate whether the retroflexion of a word is best predicted by referring to its ND or to its onset structure.

3 Experiment 1

To evaluate the role of ND and onset structure (Onset) for Norwegian retroflexion, a production experiment was designed with words beginning with simple and complex onsets. Since the two commonest word initial /s/-onsets in Norwegian are simple /s-/ and /st-/, /st-/ was chosen as the complex onset. Five nouns in simple /s-/ and five nouns in /st-/ were selected for production, all taken from the 15 most frequent monosyllabic nouns in /s-/ in the LBK corpus.³ All ten items had a /-V(V)C/ rhyme.

The ND for these ten words were found by automatically generating a list of all possible neighbors of their retroflex variants, since these are the forms that suffer from the 'double disadvantage' identified by Ussishkin & Wedel (2009), further filtered through hand-crafted phonotactic surface constraints. Following the methodological principle outlined in Pycha et al. (2007:370, 377), a neighbor was defined as any phonological word in this list present in the author's native

³ Leksikografisk bokmålskorpus, with ca. 40 million tagged tokens. http://www.hf.uio.no/tekstlab/ English/corpora.html

lexicon.

In the experiment, these ten nouns formed nominal compounds of the kind in (7-11) with a nonce first element *bemmer*-, ending in the retroflex trigger /c/, and which was assigned no semantic content. The items were appropriately illustrated to ensure that the participants treated them as the intended high-frequency nouns.

Ten native speakers of Norwegian with a median and mean age of 30 participated in the experiment. All items were presented in randomized order for each participant, with multiple instances of each item embedded in a frame story, interspersed among filler items. A pilot study revealed that speakers often hyperarticulate tokens for some time at the beginning of an experiment, at which register retroflexion is almost always absent. Since such speech is of no interest in this study, each participant's production up until the first instance of applied retroflexion was treated as a warm-up to the experiment, and the items contained in the warm-up were then repeated at the end of the experiment.

The participants' production was recorded, and each item was tagged as retroflex or non-retroflex independently by the author and by a phonetically trained linguist who is a native speaker of Norwegian, and who was kept unaware of the purpose and design of the experiment. Only items that were tagged identically by both were included in the final analysis.

0.29% of the items were excluded due to erroneous and disfluent production, and a subsequent 0.41% were excluded due to disagreement between the two taggers. In the end, the data set contained 2406 trials. Overall, 60.89% of the tokens underwent retroflexion, and every item in the experiment exhibited variation. The item with least retroflexion was /sutt/ 'sun', with 29%, and the item with most retroflexion was /stof/ 'material' with 86%.

3.1 Results

Figure (12) shows the relation between ND and retroflexion, and figure (13) shows the relation between Onset and retroflexion. Both figures confirm the expected tendencies of correlations in that there is less retroflexion for words in dense neighborhoods and for words in a simple /s-/ onset.



The results were analyzed with generalized linear mixed effects models (Jaeger 2008:442ff.) using maximum likelihood fitting in R (Bates & Maechler 2010, R development core team 2010).⁴ The binomially distributed dependent variable is the presence or absence of retroflexion. Among the independent variables, subjects and words were treated as random effects (Baayen et al. 2008). Fixed effects were ND, Onset, the log lemma frequency of the word in the LBK corpus, and various factors related to the experimental setting that are of no interest in this study. The significance of the fixed effects was estimated with likelihood ratio tests.⁵

When ND was not included in the analysis, Onset was a highly significant factor ($\chi^2(1) = 12.35$, p < .001), and similarly when Onset was not included in the analysis, ND was highly significant ($\chi^2(1) = 11.71$, p < .001). Log frequency proved insignificant ($\chi^2(1) = .54$, p = .46). Onset and ND are, however, tightly correlated with each other, r(2404) = -.96, p < .001, since words in a simple /s-/ consistently have more neighbors than words with a complex /sC-/ onset. In figure (12) above, the circles with a ND > 10 represent the five words in a simple /s-/, whereas the circles with a ND < 5 represent the five words in /st-/. When the residuals of ND are added to a model with Onset included, no significant improvement is made ($\chi^2(1) = .21$, p = .65). The same holds when the residuals of Onset are added to a model with ND included ($\chi^2(1) = .85$, p = .36). This means that ND and Onset explain the same data equally well, and neither is able to

⁴ The models were fit with maximum likelihood fitting in order to allow likelihood ratio tests of the fixed effects (cf. Pinheiro & Bates 2000:76).

⁵ Applying likelihood ratio tests to fixed effects in these mixed models has its limitations (Pinheiro & Bates 2000:87ff.), and should ideally be replaced by probability estimates using Markov chain Monte Carlo sampling (Baayen et al. 2008:396ff.). Since it is currently unclear how such sampling should be performed in generalized linear mixed models, likelihood ratio tests are nevertheless our best approximation of probability estimates of fixed effects (Bates 2008).

explain any data the other one does not also explain.⁶

3.2 Discussion

The results from experiment 1 are inconclusive with respect to the effect of ND in the retroflex alternation in Norwegian, since the analysis is not able to tease apart the role played by ND and the role played by Onset. When it comes to the question of why ND or Onset would have the observed effect on the retroflexion rate in the first place, Ussishkin & Wedel (2009:280ff.) make the suggestion that the grammar suppresses alternations in dense neighborhoods in order to achieve more efficient lexical access. Building on the same observations as Ussishkin & Wedel do, however, it is possible to obtain the same correlation between ND and phonological alternations without assuming that the grammar optimizes in a teleological fashion under functional pressure.

First, it is observed that adult speakers change their phonology to better reflect the ambient language. Longitudinal studies have shown how their phonology changes in line with phonological changes in the speech community (Harrington et al. 2000, Sankoff & Blondeau 2007:570ff.). Experimental studies agree, revealing how speakers immediately change their production to better match recently experienced stimuli (Goldinger 1998:257ff., Nielsen 2008:31f.), an effect that persists well beyond the experimental setting (Goldinger 2000:157).

Second, phonology has been shown to be word-specific. For example, the realization of a certain phoneme might depend on the word it belongs to. A particularly well studied case is vowel reduction in English, where it has been found that words in dense neighborhoods are pronounced with less reduction in their vowels than words in sparse neighborhoods (Wright 2003:81f., Stephenson 2004:367, Munson & Solomon 2004:1055). Behavioral experiments support this finding, as it has been shown that participants unconsciously mimic the phonetic properties of recently perceived words significantly more than words they did not recently hear, even though they share the relevant phonemes (Nielsen 2008:40f.).

Taken together, all these studies reveal how there is a close connection between speakers' production of words and their experience with those words in the input, even on a detailed level on an individual word basis.

As addressed in section 2, participants have greater difficulties recognizing words that have undergone a phonological change, and words that are in dense neighborhoods. A crucial part of these observations is that participants are also less accurate under these conditions, more often failing to recognize the words

⁶ Enriching the models with fixed effects for vowel features (height, backness, rounding, length) did not alter any significant effects (or lacks thereof) reported in this section. Others measurements of ND were explored as well, such as a) the summed log frequency of the neighbors, b) neighbors sharing the same syntactic category as the target word. They differed little from the measurement used for ND above, and they did not improve the significance of ND in the analysis.

altogether (Vitevitch & Luce 1999:386f., Dirks et al. 2001:6ff., Vitevitch 2002:415). Relating these facts to Norwegian retroflexion, this means that speakers run a higher risk of not successfully recognizing a retroflex token of a word in a dense neighborhood than they do with a retroflex token in a sparse neighborhood (cf. Pierrehumbert 2002:117, Wedel 2006:264). As a result, the perceived distribution of retroflex tokens for /s/-words in dense neighborhoods will be slightly different compared with /s/-words in sparse neighborhoods, as there will be more solid evidence that retroflexion applies to the latter words than to the former words. In Goldinger (1998:257ff., 2000:156f.), participants unconsciously mimicked phonetic properties of words they heard several repetitions of significantly more than they did for words they heard fewer repetitions of. If speakers of Norwegian encounter retroflex tokens of /s/-words in sparse neighborhoods more often than in dense neighborhoods due to occasional failures in recognizing retroflex tokens in the latter category, then speakers could be reflecting this directly by producing more retroflex tokens in sparse neighborhoods than in dense neighborhoods, as illustrated in figure (12) above.

Moving on to the correlation between Onset and retroflexion, it is suggested in Stausland Johnsen (2009) that this link could be a result of the perceptual properties of the different /s/-onsets. Steriade (2001:222, 2009:164) claims that the likelihood of a phonological alternation is inversely related to the phonetic distance between the alternators, and Stausland Johnsen (2009) supports this view by finding that native Norwegians have greater difficulties distinguishing between [stV] and [stV] than between [sV] and [sV]. In other words, the phonetic distance between [sV] and its retroflex counterpart [sV] is greater than between [stV] and its retroflex counterpart [stV]. Since [sV] at the same time alternates less often with [sV] than [stV] does with [stV], as seen in figure (13), this supports the claim by Steriade that the phonetic distance between alternants stands in an inverse relation with their likelihood to alternate.

Experimental studies by Marslen-Wilson et al. (1996:1386f.) and Skoruppa et al. (to appear) show that when a derived form differs from its base in the initial consonant, the greater the phonetic distance between the forms is, the worse participants are at relating them to each other. Building on these observations, the link between phonetic distance in the onset and retroflexion rate can be explained in the same fashion as with ND above: Due to the greater phonetic distance between a base in /sV-/ and its retroflex variant [sV-], the retroflex [sV-] tokens run a greater risk of not being recognized as related to their base forms than would be the case for /stV-/ words. Consequently, speakers would perceive more retroflex [stV-] tokens in relation to their base forms in /stV-/ than they would perceive retroflex [sV-] tokens in relation to base forms in /sV-/. Following the close connection between speakers' perceived input and own production as outlined above, they would replicate this skewed distribution in their own output.

With regard to the original connection between ND and retroflexion on the

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one hand, and between Onset and retroflexion on the other, as envisioned in this section, the occasional failures in recognizing retroflex tokens would probably only lead to a very small change in speakers' input. The significant difference observed in figure (12) and (13) would under this view represent the *accumulated* effect of this change, as the effect should be additive for each learner.

4 **Predicting Alternations for Novel Words**

When looking at the surface realization of words, it is not always clear which aspects of it are due to active and productive phonological operations in the mapping from representation to output, and which are due to lexicalized properties of the word which is realized. A standard procedure to tease these apart is to let speakers produce novel forms, as these by definition cannot have lexicalized properties.

A question that has not been addressed so far in the literature is what role ND is expected to play for the realization of novel words in alternations. Yet different accounts for the observed ND effects make different predictions for what the interaction between ND and novel words should be. According to Ussishkin & Wedel (2009), the grammar suppresses alternations for words in dense neighborhoods in order to facilitate lexical access. This entails that when the grammar is ready to ship a word off to production, it estimates the ND of that word, and decides based on the outcome whether or not to apply a phonological operation to it. The same should therefore hold for novel words, as the grammar should be equally capable of making the same ND estimation for new words. According to the view advocated in section 3.2 above, however, the ND effect in alternations is the result of linguistic experience. Since speakers by definition have had no experience with novel words, this view predicts that no ND effect should be found for novel words. In order to test these opposing hypotheses, an experiment with nonce forms was designed.

5 Experiment 2

To evaluate the role of ND and Onset for retroflexion in novel words, an experiment along the same lines of experiment 1 was designed, only this time exclusively with nonce nouns. Nine nonce monosyllabic nouns were selected for production, three in /sV/, three in /stV/, and three in /skV/, with the vowels /ʉ:/, /u:/, and /a:/.⁷ These nine nonce nouns formed nominal compounds with the first element *sommer* 'summer', ending in the retroflex trigger /r/. The procedure and participants were the same as in experiment 1.

⁷ The form /sku:/ was replaced with /sko:/, using the other available back round vowel in Norwegian, since /sku:/ is a real Norwegian noun.

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0.5% of the items were excluded due to erroneous and disfluent production, and a subsequent 1.13% were excluded due to disagreement between the two taggers. In the end, the data set contained 3340 trials. Overall, 54.07% of the tokens underwent retroflexion, and every item in the experiment exhibited variation. The item with least retroflexion was /su:/ with 35%, and the item with most retroflexion was /sko:/ with 72%.

5.1 Results

Figure (14) shows the relation between ND and retroflexion, and figure (15) the relation between Onset and retroflexion. For comparison, figure (14) contains the plots and regression lines from both experiment 1 and 2. The filled circles and the solid line represent the data from experiment 2.



The results were analyzed with linear mixed effects models as for experiment 1. Fixed effects were ND, Onset, Vowel, and various factors related to the experimental setting. When Onset was not included in the analysis, ND was a highly significant factor ($\chi^2(1) = 14.49$, p < .001), and similarly when ND was not included in the analysis, Onset was highly significant ($\chi^2(1) = 20.57$, p < .001).⁸ When the residuals of ND were added to a model with Onset included, no significant improvement was made ($\chi^2(1) = 2.53$, p = .11). When the residuals of Onset were added to a model with ND included, however, a significant improvement was seen ($\chi^2(1) = 8.6$, p < .01). This means that Onset explains the same data as ND does, but Onset also explains more, in the end leaving ND with no predictive power.

⁸/sk/ and /st/ did not behave differently in this experiment ($\chi^2(1) = 2.63$, p = .11), so they were collapsed as 'sC'.

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5.2 Discussion

The results from experiment 2 support the view of ND given in section 3.2, according to which ND might affect phonological alternations through the accumulated effect of having missed phonologically altered tokens in dense neighborhoods. Since novel words have not been experienced by speakers before, ND should have no impact on their alternations. The same prediction should follow from the exemplar models in Pierrehumbert (2002:114ff.) and Wedel (2006:254). In these models, producing an existing word involves sampling from a cloud of stored memories of perceived tokens of that word. Since ND affects how tokens are perceived, then ND will influence how tokens are produced. Given that novel words have not been perceived before, ND effects are predicted not to be found. This prediction is partly confirmed by Stephenson (2004), who in an explicit comparison of ND effects in existing and novel words found significantly less vowel dispersion for novel words, which she concludes is supportive of an exemplar model (2004:368). The lack of ND effects in experiment 2 serves as additional support for such models.

The results do not support the model put forward in Ussishkin & Wedel (2009), where the grammar suppresses alternations for words in dense neighborhoods. Since the ND of a word bears no relation to the history of the word, their model should hold for existing and novel words alike. Whereas the results from experiment 1 admit the possibility of a link between ND and phonological alternations for existing words, the results from experiment 2 deny the same link for novel words. The lack of this link is also an expected result based on what has been observed elsewhere for the perception of novel words. If the speaker's grammar suppresses alternations in dense neighborhoods in order to facilitate lexical access, it would do so in order to facilitate lexical access for the listener. When a listener encounters a novel word, his task is to identify it as a novel word and learn it. Although a dense neighborhood inhibits quick and accurate recognition of existing words (see section 2 and 3.2), it has the opposite effect for novel words; it *facilitates* their learning (Storkel et al. 2006:1180). If functional pressure for efficient lexical access guides the inhibition of phonological alternations, then the grammar should in reality suppress such alternations in dense neighborhoods for existing words, but suppress them in sparse neighborhoods for novel words. Since there is no significant correlation in this direction in experiment 2 either, we are led to the conclusion that ND plays no active role in the mapping from representation to production.

This leaves the question of why Onset is a significant predictor of alternation for novel words. If there is a causal link between the perceptual properties of the onsets and their likelihood to alternate, as suggested in section 3.2, then this, too, is a word-specific property connected with words with a history, something novel word do not have. It has been known since Berko (1958:160ff.), however, that speakers are prone to generalize properties of individual words to phonological categories, which is seen precisely in speakers' treatment of novel words (see e.g. Finley & Badecker 2009). That the category distinction between simple and complex word onsets is something speakers generalize over can be seen from processes in real languages. A well-known example comes from traditional Finnish, which inherited from its proto-language only words beginning with a vowel or a simple onset. Despite the abundance of word-internal consonant clusters in Finnish, the lack of initial clusters, which up until this point was simply a fact about existing words, was generalized to novel words as they were borrowed from other languages, as seen in borrowings such as *koulu* 'school' and *ressi* 'stress' (Suomi et al. 2008:55f.).

Note, however, that the same generalization from words to categories could have taken place if ND were the more dominant force behind the skewed distribution of retroflexion for existing words. Since there is such a strong correlation between ND and Onset, words in simple /s-/ and /sC-/ would under either scenario exhibit the same skewed distribution. The fact that this behavior is generalized to new words does not tell us what the dominant underlying cause for the pattern in real words is. Although the results from experiment 2 allow us to reject ND as a relevant factor for alternations in novel words, it does not extend to the results for experiment 1. We can therefore not refute the possibility that ND plays a significant role for phonological alternations in existing words.

6 Conclusion

This paper has investigated the connection between neighborhood density (ND) and retroflex alternation in Norwegian. According to Ussishkin & Wedel (2009), phonological alternations are suppressed in dense neighborhoods, but such a connection cannot be established for the retroflex alternation. In experiment 1, where the retroflexion rate for real words was tested, the retroflexion is predicted just as well by the onset structure of the word as by the ND of the word. In experiment 2, on the other hand, where the retroflexion rate for novel words was tested, the onset structure of the word is a significant predictor of retroflexion, whereas ND is not.

Based on studies showing how ND affects the recognition of words, and studies showing how speakers' phonological production is directly influenced by what they have perceived, this paper offers an account for why ND can affect phonological alternations for existing words, but not for new words: If speakers more often fail to recognize alternated tokens in dense neighborhoods, then such alternated tokens will appear less frequently in speakers' own production, due to the direct connection between perceived input and produced output. Since new words have never been perceived before, ND cannot have caused an asymmetry in their recognition, and it should therefore not correlate with the produced output.

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In conclusion, ND might affect the phonological representation of an existing word, but it does not play a role in the mapping from representation to surface realization.

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Sverre Stausland Johnsen Department of Linguistics Boylston Hall 3rd floor Harvard University Cambridge, MA 02138

johnsen@fas.harvard.edu

Person Indexicals in Uyghur Indexical Shifting

YASUTADA SUDO Massachusetts Institute of Technology

1 Introduction

Every natural language known so far has indexicals — expressions whose meanings are dependent on the context of utterance (e.g. I, you, here, now, etc. in English). An intriguing semantic property of indexicals was pointed out by Kaplan (1989): their referents are fixed regardless of the syntactic environments they are in. Especially, they are insensitive to modals unlike definite descriptions. For example, in the examples below, the word I obligatorily refers to the speaker, even though it is in modal contexts.

- (1) a. John thinks that **I** am a linguist
 - b. If **I** were a biologist, **I** wouldn't be a linguist

This fact led Kaplan (1989) to conjecture that indexicals always refer to the actual context of utterance, and moreover that there is no operator in natural language that manipulate contexts. He called such (supposedly non-existent) context-shifting operators *monsters*. The logic here is that if a context-shifting operator did exist, indexicals under its scope would be interpreted relative to non-actual contexts. In this paper, we call such phenomena *indexical shifting*.

Contrary to Kaplan's (1989) conjecture, however, Schlenker (1999, 2003) pointed out that there are languages with indexical shifting. Specifically, in Amharic attitude reports, indexicals may be interpreted relative to the reported context, rather than the current context of utterance, as shown by the examples below.

- (2) *Amharic*
 - a. John [jiəgna ləmin n-ññ] yil-all?
 John [hero why COP.PRES-1S] says-3sm
 'Why does John say that {I am, he is} a hero?' (Anand 2006:82)

b. [min amt'-a] ind-al-p-ññ al-spmma-hu-mm
[what bring.IMPER-2m] COMP-say.PF-3m-1sO NEG-hear.PF-1s-NEG
'I didn't hear what he told me to bring.' (Leslau 1995:779)

In addition, recent studies show that Amharic is not the only language with indexical shifting. Specifically, Navajo (Speas 1999), Zazaki, Slave (Anand and Nevins 2004; Anand 2006), Catalan Sign Language (Quer 2005), Nez Perce (Deal 2008) and Matses (Ludwig et al. to appear)) are reported to allow indexical shifting in attitude contexts. Based on these languages, it is now considered that monsters in fact do exist in natural language, contrary to Kaplan's (1989) surmise (Schlenker 1999, 2003; Anand and Nevins 2004; Anand 2006 among others).¹

One of the goals of the present paper is to provide novel data of indexical shifting from yet another language, (Modern) Uyghur.² Focusing on the interpretation of 1st and 2nd person singular indexicals, we observe two peculiar features of Uyghur indexical shifting: (i) that 1st person indexicals are obligatorily *de se*, while 2nd person indexicals are not obligatorily *de se* in the sense explained below; and (ii) that shifted 2nd person pronouns are not allowed under certain attitude verbs, while shifted 1st person pronouns are always licensed. We propose a formal semantic account of both phenomena.

This paper is organized as follows. In Section 2, the basic facts about Uyghur indexical shifting are introduced. The semantic properties of shifted indexicals are discussed in Section 3, a formal semantic account of which is proposed in the subsequent section. We look at the behavior of person indexicals under various kinds of attitude verbs in Section 5, which we claim follows from the lexical semantics of the attitude verbs and can be given a straightforward account in our theory presented in Section 4. In Section 6, we review a previous account of similar facts in Slave due to Anand and Nevins (2004) and Anand (2006), and claim that our analysis is conceptually better.

2 Uyghur Indexical Shifting

Just as in the other languages mentioned in Section 1, indexical shifting in Uyghur is confined to complement clauses to attitude verbs, but Uyghur is special in that it has two kinds of complement clauses that differ in whether indexical shifting takes place. More specifically, some attitude verbs only take nominalized complement clauses, others only take finite complement clauses, and still others are compatible with both types. For example, the verb de- 'say, tell' can take either.

¹ See von Stechow (2002) and Ogihara (2006) for monster-free theories.

² Uyghur is an eastern Turkic language spoken by 8-10 million speakers mainly in the Xinjiang Autonomous Region of China. It possesses the usual Turkic features including SOV word order, scrambling, radical pro-drop, highly agglutinative verbal morphology, allomorphy involving vowel harmony, and case suffixes on nouns (see Hahn 1991 and De Jong 2007 for descriptive grammars).

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- (3) a. Nominalized Complement Clause
 Ahmet [profesor-ning kit-ken-lik-i-ni] di-di
 Ahmet [professor-GEN leave-REL-NMLZ-3-ACC] say-PAST.3
 'Ahmet said that the professor left'
 - b. *Finite Complement Clause*Ahmet [profesor ket-ti] di-di
 Ahmet [professor.NOM leave-PAST.3] say-PAST.3
 'Ahmet said that the professor left'

Interestingly enough, indexical shifting is basically obligatory in finite complement clauses to attitude verbs (see Shklovsky and Sudo to appear for some complications), but never observed in nominalized complement clauses, as illustrated by the following examples.

- (4) a. Nominalized Complement Clause Ahmet [mening kit-ken-lik-im-ni] di-di Ahmet [1SG.GEN leave-REL-NMLZ-1SG-ACC] say-PAST.3 OK (non-shifted) 'Ahmet said that I_{speaker} left' * (shifted) 'Ahmet_i said that he_i left'
 - b. Finite Complement Clause
 Ahmet [men ket-tim] di-di
 Ahmet [1SG leave-PAST.1SG] say-PAST.3
 * (non-shifted) 'Ahmet said that I_{speaker} left'
 OK (shifted) 'Ahmet_i said that he_i left'

These sentences are not synonymous. In (4a), *mening* 'my' refers to the speaker of the entire sentence, just like in English, while in (4b), *men* 'I' obligatorily refers to the attitude holder Ahmet, rather than the speaker.

At this point, one might wonder whether the embedded clause in (4b) is an instance of direct quotation. However, there are several pieces of evidence showing that finite complement clauses need not be quotational.³. For example, the finite complement in (5) contains a wh-phrase taking the matrix scope, which guarantees that the embedded clause is not a quotation, because wh-quantification into quotations is generally impossible. Nonetheless, the first person indexicals obligatorily refer to the attitude holder Tursun.

(5) Tursun [men kim-ni kör-dim] di-di?
Tursun [1SG who-ACC see-PAST.1SG] say-NEG-PAST.3
'Who did Tursun; say he; saw?'

³ Due to space limitations, we present just one argument here and refer the interested reader to Shklovsky and Sudo (to appear).

We observed in this section that Uyghur morphosyntactically distinguishes shifting and non-shifting complement clauses to attitude verbs, unlike in the languages known so far. For the rest of this paper, we exclusively look at 1st and 2nd person indexicals in shifting environments, but it should be noted here that certain temporal indexicals also shift in the same way, while locative indexicals and demonstratives never do in Uyghur.

3 (Non-)Obligatory *De Se* Readings of Shifted Indexicals

This section discusses the semantic properties of shifted indexicals in Uyghur. In particular, we observe that shifted 1st person indexicals are obligatorily *de se*, while shifted 2nd person indexicals need not be 2nd person *de se* (or *de te*).

By *de se* interpretations of pronouns, we mean the following. In the *de se* construal, a pronoun refers to the individual that the attitude holder identifies as himself, not just that we, as a third party, identify as him (Lewis 1979). That this is a linguistically relevant distinction is shown by the contrast between 3rd person pronouns and PRO in obligatory control constructions in English. That is, English 3rd person pronouns are generally ambiguous between *de se* and non-*de se* readings, while PRO is obligatorily *de se* (Chierchia 1989).

- (6) CONTEXT: John is so drunk that he has forgotten that he is a candidate in the election. He watches someone on TV and finds that that person is a terrific candidate, who should definitely be elected. Unbeknownst to John, the candidate he is watching on TV is John himself.
 - a. John_{*i*} hopes that he_i will be elected
 - b. $\#John_i$ hopes **PRO**_i to be elected (Schlenker 2003:61)

There is a comparable reading for pronouns denoting the hearer, which is called 2nd person *de se* or *de te*. That is, *de te* pronouns denote the individual that the attitude holder identifies as the person she is/was talking to. Again PRO in English object control is sensitive to this distinction.

- (7) CONTEXT: John is hosting a party. He hears that a certain waiter named Bill is being a nuisance. John tells the nearest waiter, "Bill has to go." Unbeknownst to him, he's talking to Bill.
 - a. John told $Bill_i$ that he_i had to leave
 - b. #John told $\text{Bill}_i \mathbf{PRO}_i$ to leave (Anand 2006:16)

With this in mind, we now observe that Uyghur shifted 1st person pronouns are obligatorily *de se*, just as PRO in English. The logic is the same as above: the given context only supports the non-*de se* readings of the pronouns and an infelicity indicates that the pronoun can only be read *de se*. Here, the contrast is illustrated

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by shifted 1st person pronoun *men* and a 3rd person pronoun (a 3rd person reflexive or *pro*) in a nominalized complement clause which is not a shifting environment.

- (8) CONTEXT: Ahmet took an exam, and later saw the top 10 scorers with the respective ID numbers. He forgot his own ID number, so didn't know who was who. Pointing to the No.1 scorer, he remarked "This guy is very smart!" But it turned out that he was talking about himself. Ahmet üzi ik-ken-lik-i-ni bil-mey, Ahmet himself COP-REL-NML-3sg-ACC know-NEG, 'Ahmet did not know that it was him, but'
 - a. # Ahmet [men bek aqriliq] di-di
 Ahmet [1sg very smart] say-PAST.3
 'Ahmet_i said that he_i is very smart'
 - b. Ahmet [(üz-i-ning) bek aqriliq ik-ken-lik-i-ni] di-di
 Ahmet [(self-3-GEN) very smart COP-REL-NML-3sg-ACC] say-PAST.3
 'Ahmet_i said that he_i is very smart'

On the other hand shifted, 2nd person pronouns are not obligatorily de te.

- (9) CONTEXT: Muhemmet is hosting a party. He hears that a certain waiter named John is being a nuisance. Muhemmet tells the nearest waiter, "John should go home." Unbeknownst to him, he's talking to John.
 - a. Muhemmet John-gha [*pro* öy-ge kit-sh-ing kirek] di-di
 Muhemmet John-DAT [*pro* home-DAT leave-GER-2sg should] say-PAST.3
 'Muhemmet told John_i that he_i should go home'
 - b. Muhemmet John-gha [u-ning öy-ge kit-sh-i kirek ik-ken-lik-i-ni Muhemmet John-DAT [3sg-GEN house-to leave-GER-3 should COP-REL-NML-3-ACC] di-di
 -] say-past.3

'Muhemmet told John_i that he_i should go home'

It is even possible to be explicit about Muhemmet's epistemic state as in the following example, which is felicitous in the same context as above.

 (10) Muhemmet John-ni tunu-imay, uninggha [sen öy-ge kit-sh-ing Muhemmet John-ACC recognize-NEG, he.DAT [2sg house-DAT leave-GER-2sg kirek] di-di should] say-PAST.3

'Muhemmet did not recognize John_i, and told him_i that he_i should go home'

This behavior of Uyghur 2nd person pronouns in shifted contexts is different from other languages with indexical shifting such as Amharic and Zazaki, in which both shifted 1st and 2nd person pronouns are obligatory *de se* or *de te*, as Anand (2006) discusses. We will come back to this in Section 6.

4 Analysis of Indexical Shifting

In this section, we present a formal semantic analysis of indexical shifting. We adopt Anand's (2006) analysis to a large extent, although there are some differences.

Firstly, we model a (possible) context of utterance as an additional index c to which the interpretation function $[\cdot]$ is relativized. As we are only interested in indexical shifting of person indexicals, we assume that contexts are triples consisting of two individuals and a world ($c = \langle a_c, h_c, w_c \rangle$). By assumption, indexicals make reference to the context index.

(11) a. [[I]]_g^c = a_c
b. [[you]]_g^c = h_c
c. [[we]]_g^c = the salient group of individuals that includes a_c

Also, we postulate possible evaluation indices *i* in the object language (cf. Ty2 of Gallin 1975; see also Percus 2000; Keshet 2008), whose denotations are assumed to be of the same semantic type as context indices (cf. von Stechow and Zimmermann 2005; Anand 2006; *pace* Kaplan 1989).

In general, modals are quantifies over indices. For examples, the universal deontic modal *must* is of type $\langle st, st \rangle$ and given the following meaning.

(12) For any $\llbracket \phi \rrbracket_g^c$ of type $\langle s, t \rangle$, $\llbracket \text{must } \phi \rrbracket_g^c = \lambda i$. for any $\langle a_i, h_i, w_j \rangle$ such that the relevant rules are obeyed in w_j , $\llbracket \phi \rrbracket_g^c (\langle a_i, h_i, w_j \rangle) = 1$

It should be remarked here that modals never manipulate the context index, which ensures indexicals' insensitivity to modality discussed in Section 1.

In order to account for indexical shifting, we claim that there is a 'monstrous' lexical item \mathcal{M} in Uyghur that manipulates the context index. Notice that this operator should not be attitude verbs, because indexical shifting never takes place in nominalized complements clauses although the same attitude verbs are employed as in finite complement constructions (*pace* Schlenker 1999, 2003). Instead we assume that \mathcal{M} is a covert operator that only and always appears in finite complements and never in nominalized complements (see Shklovsky and Sudo to appear for its syntax). \mathcal{M} performs the following operation.

(13) For any $\llbracket \phi \rrbracket_g^c$ of type t, $\llbracket \mathcal{M}_i \phi \rrbracket_g^c = \llbracket \phi \rrbracket_g^{g(i)}$

Just as other lexical items in the current system, \mathcal{M} is assumed to take an object language index as its first argument as indicated by the subscript. Also for compositional purposes, we take (13) to be a new compositional operation triggered by this particular lexical item (cf. 'Monstrous Functional Application' of von Stechow and Zimmermann 2005; Anand 2006).

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The last ingredient necessary for indexical shifting is the meaning of attitude verbs. Following the standard Hintikka semantics for attitude verbs, we assume that they are modals. Recall, however, that in the present system, modals quantify over triples consisting of two individuals and a possible world, rather than just possible worlds. We claim that unlike non-attitude modals, attitude verbs change the individual coordinates to new ones, namely, *de se* and *de te* individuals respectively. For example, the meaning of *tell* looks like the following.

- (14) For any $\llbracket \phi \rrbracket_g^c$ of type $\langle s, t \rangle$, $\llbracket \text{tell } \phi \rrbracket_g^c = \lambda y.\lambda x.\lambda i. \quad \forall j \in \text{SAY}_{x,y,i} \ \llbracket \phi \rrbracket_g^c(j) = 1$ where $j \in \text{SAY}_{x,y,i}$ iff $(j = \langle a_j, h_j, w_j \rangle)$
 - a. w_j is compatible with what x tells y in w_i ;
 - b. a_i is the individual in w_i that x identifies in w_i as himself;
 - c. h_j is the individual in w_j that x identifies in w_i as the person x is talking to

The above ingredients are sufficient to achieve indexical shifting. More concretely, the monster \mathcal{M} changes the context index to the one that is quantified over by the attitude verb, and therefore, any indexical under the scope of the monster gets interpreted relative to the new index and may refer to an individual other than the current speaker or hearer.

(15)

$$\begin{bmatrix} \lambda_{j} & d\ddot{a} \\ \mathcal{M}_{j} & \phi & (say) \end{bmatrix}_{g}^{c} = \lambda_{y} \cdot \lambda_{x} \cdot \lambda_{i} \quad \forall j \in SAY_{x,y,i} \begin{bmatrix} \mathcal{M}_{j} & \phi \end{bmatrix}_{g[j \mapsto j]}^{c} = 1$$
$$= \lambda_{y} \cdot \lambda_{x} \cdot \lambda_{i} \quad \forall j \in SAY_{x,y,i} \begin{bmatrix} \phi \end{bmatrix}_{g[j \mapsto j]}^{j} = 1$$

There are two auxiliary assumptions that should be made explicit here. The matrix clause is always of type $\langle s,t \rangle$ and is evaluated against the current context of utterance. Also, \mathcal{M} must take the index of the closest abstraction (j in the above case), just like adverbs and predicates (cf. Percus 2000; Keshet 2008), and can never be *de re*.

Now we are ready to explain the difference between shifted 1st and 2nd person indexicals. Recall that in Uyghur the former are obligatorily *de se*, while the latter are not. The following simple semantics for 1st person indexicals as a projection function, which we proposed for English in (11), yields the obligatory *de se* reading, because the first individual coordinate of a shifted context index is required to be the *de se* individual by the semantics of the attitude verb.

(16)
$$\llbracket \operatorname{men} \rrbracket_g^c = a_c$$

On the other hand, shifted 2nd person indexicals in Uyghur require a further treatment, because they are not obligatorily *de te* and therefore cannot denote the

de te individual coordinate of a shifted context index. To this end, we claim that they are disguised definite descriptions containing a 1st person indexical. Being definite descriptions, they take an index as their first argument.

(17) $[\![\operatorname{sen}]\!]_{g}^{c} = \lambda i$. the individual in w_{i} that a_{c} is/was talking to in w_{i}

It is assumed here that this definite description can be read *de re*, just like other normal definite descriptions, in which case *sen* takes the matrix index. This is illustrated by the following schematic example.

(18) λi John told Mary [that $\lambda j \mathcal{M}_j \dots [sen_i] \dots$]

Thus *sen* 'you' in (18) is interpreted as the individual in w_i that a_c was talking to in w_i , and there is no requirement that John be able to identify the same individual as the person he was talking to. It is also allowed for the index *sen* takes to be j, in which case it receives a *de te* reading.⁴

5 Restrictions on Shifted 2nd Person Pronouns

In this section, we turn to another difference between 1st and 2nd person indexicals in Uyghur indexical shifting. That is, certain attitude verbs shift only 1st person indexicals and shifted 2nd person indexicals under them are infelicitous. Furthermore, we claim that these two classes of attitude verbs are not determined arbitrarily, but are semantic natural classes. Specifically, under verbs of communication whose subject is the language user and the other argument is the hearer, both 1st and 2nd person indexicals undergo indexical shifting.

- (19) **de-** (say, tell)
 - a. Ahmet [*pro* kim-ni jaxshi kör-imen] di-di?
 Ahmet [*pro* who-ACC well see-IMPERF.1sg] say-PAST.3
 'Who did Ahmet say that he likes?'
 - b. Ahmet Aygül-ge [*pro* kim-ni jaxshi kör-isen] di-di? Ahmet Aygül-DAT [*pro* who-ACC well see-IMPERF.2sg] say-PAST.3
 'Who did Ahmet told Aygül that she likes?'

(20) **sözle-** (speak, talk)

a. Ahmet [*pro* kim-ni jaxshi kör-imen dep] sözli-di?
Ahmet [*pro* who-ACC well see-IMPERF.1sg C] speak-PAST.3
'Who did Ahmet say that he likes?'

⁴ Strictly speaking, for *sen* to receive the correct interpretation in this construal, the world coordinate of the index *sen* combines with should be a world compatible with what John believes, rather than a world compatible with what John told Mary. This is a general problem of this type of account of *de re/de dicto* (cf. Geurts 1999).

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- b. Ahmet Aygül-ge [*pro* kim-ni jaxshi kör-**isen** dep]sözli-di? Ahmet Aygül-DAT [*pro* who-ACC well see-IMPERF.2sg C] speak-PAST.3 'Who did Ahmet told Aygül that she likes?'
- (21) maxtan- (brag)
 - a. Ahmet Aygül-ge [*pro* kim-ni kör-**dim** dep] maxtan-di?
 Ahmet Aygül-DAT [*pro* who-ACC saw C] brag-PAST.3
 'Who did Ahmet brag to Aygül that he met?'
 - b. Ahmet Aygül-ge [men sen-din igiz dep] maxtan-di Ahmet Aygül-DAT [1sg 2sg-from tall C] brag-PAST.3
 'Ahmet bragged that he is taller than Aygül'
- (22) qayil qil- (persuade, convince)
 - a. Ahmet Aygül-ni [*pro* kim-ni kör-imen dep] qayil
 Ahmet Aygül-ACC [*pro* who-ACC see-IMPERF.1sg C] convince qil-di?
 do-PAST.3

'Who did Ahmet convince Aygül that he should meet?'

b. Ahmet Aygül-ni [*pro* kim-ni kör-isen dep] qayil
 Ahmet Aygül-ACC [*pro* who-ACC see-IMPERF.2sg C] convince qil-di?
 do-PAST.3

'Who did Ahmet convince Aygül that she should meet?'

- (23) **aghrin-** (complain)
 - a. Ahmet Aygül-ge [*pro* kim-ni kör-**dim** dep] aghrin-di?
 Ahmet Aygül-DAT [*pro* who-ACC see-PAST.1sg C] complain-PAST.3
 'Who did Ahmet complain to Aygül that he met?'
 - b. Ahmet Aygül-ge [*pro* kim-ni kör-**ding** dep] aghrin-di?
 Ahmet Aygül-DAT [*pro* who-ACC see-PAST.2sg C] complain-PAST.3
 'Who did Ahmet complain to Aygül that she met?'
- (24) wede qal- (promise)
 - a. Ahmet Aygül-ge [*pro* kim-ni söy-imen dep] wede qil-di?
 Ahmet Aygül-DAT [*pro* who-ACC kiss-IMPERF.1sg C] promise do-PAST.3
 'Who did Ahmet promise Aygül to kiss?'
 - b. Ahmet Aygül-ge [*pro* qaysi imtihan-din öt-**isen** dep] Ahmet Aygül-DAT [*pro* which test-from pass-IMPERF.2sg C] wede qil-di? promise do-PAST.3

'Which test did Ahmet promise Aygül that she would pass'

Unlike verbs of communication, verbs of believing shift only 1st person indexicals and 2nd person indexicals under these verbs are infelicitous. Notice that with those verbs, finite complement clauses simply cannot contain a shifted 2nd person indexical and there is no alternative acceptable interpretation.

- (25) **bil-** (believe, know)
 - a. Ahmet [*pro* kim-ni jaxshi kör-imen dep] bil-du?
 Ahmet [*pro* who-ACC well see-IMPERF.1sg C] believe-IMPERF.3
 'Who does Ahmet believe that he likes?'
 - b. *Ahmet [*pro* kim-ni jaxshi kör-**isen** dep] bil-du? Ahmet [*pro* who-ACC well see-IMPERF.2sg C] believe-IMPERF.3

(26) **oyla-** (think)

- a. Ahmet [*pro* kim-ni jaxshi kör-imen dep] oyla-du?
 Ahmet [*pro* who-ACC well see-IMPERF.1sg C] think-IMPERF.3
 'Who does Ahmet think he likes?'
- b. *Ahmet [*pro* kim-ni jaxshi kör-**isen** dep] oyla-du? Ahmet [*pro* who-ACC well see-IMPERF.2sg C] think-IMPERF.3

(27) **ansir-** (worry)

- a. Ahmet [*pro* qaysi imitihan-din ötül-ma-imen dep]ainsir-di?
 Ahmet [*pro* which test-from pass-NEG-IMPERF.1sg C] worry-PAST.3
 'Which test does Ahmet worry that he didn't pass?'
- b. *Ahmet [*pro* qaysi imitihan-din ötül-ma-**isen** dep]ainsir-di? Ahmet [*pro* which test-from pass-NEG-IMPERF.2sg C] worry-PAST.3
- (28) **ümid qil-** (hope)
 - a. Ahmet [*pro* kim-ni kör-imen dep] ümid qil-du?
 Ahmet [*pro* who-ACC see-IMPERF.1sg C] hope do-IMPERF.3
 'Who does Ahmet want to meet?'
 - b. *Ahmet [*pro* kim-ni kör-**isen** dep] ümid qil-du? Ahmet [*pro* who-ACC see-IMPERF.2sg C] hope do-IMPERF.3
- (29) **xejal qil-** (dream about)
 - a. Ahmet [*pro* qaysi imtihan-din öt-**tim** dep] xejal qil-di? Ahmet [*pro* which test-from pass-PAST.1sg C] dream do-PAST.3 'Which test did Ahmet dream about passing?'
 - b. *Ahmet [*pro* qaysi imtihan-din öt-**ting** dep] xejal qil-di? Ahmet [*pro* which test-from pass-PAST.2sg C] dream do-PAST.3

Interestingly, verbs of hearing also shift only 1st person indexicals.

(30) **angla-** (hear)

- a. Ahmet Aygül-din [*pro* qaysi imtihan-din öt-tim dep]angla-di?
 Ahmet Aygül-from [*pro* which test-from pass-PAST.1sg C] hear-PAST.3
 'Which test did Ahmet hear from Aygül that he passed?'
- b. *Ahmet Aygül-din [*pro* qaysi imtihan-din öt-**ting** dep]angla-di? Ahmet Aygül-from [*pro* which test-from pass-PAST.2sg C]hear-PAST.3
- (31) **oqu-**(read)
 - a. Ahmet [*pro* qaysi imtihan-din öt-tim dep] oqu-di?
 Ahmet [*pro* which test-from pass-PAST.1sg C] read-PAST.3
 'Which test did Ahmet hear from Aygül that he passed?'
 - b. *Ahmet [*pro* qaysi imtihan-din öt-**ting** dep] oqu-di? Ahmet [*pro* which test-from pass-PAST.2sg C] read-PAST.3

We claim that the above restrictions on shifted 2nd person pronouns follow from the meanings of attitude verbs. Recall that our meaning for *tell* in (14) quantifies over indices whose first and second coordinates are *de se* and *de te* individuals respectively. We assume the same semantics for other verbs of communication, except that they impose different restriction on the possible world coordinate. As explained in the previous section, this semantics together with the definite description analysis of Uyghur 2nd person indexicals predicts obligatory indexical shifting.

Our semantics also explains the infelicity of shifted 2nd person indexicals under verbs of believing without further ado. That is, in the *de re* construal, a 2nd person indexical denotes the individual in the actual world w_i that the *de se* individual a_j is talking to in w_i . However, verbs of believing describe events or states involving just the agent/experiencer without a person who he or she is talking to. Thus there is no individual satisfying the description, and a presupposition failure ensues. The *de dicto* reading similarly gives rise to a presupposition failure. Likewise, in events describe by verbs of hearing, the *de se* individual is talking to nobody, and shifted 2nd person indexicals under those verbs are predicted to be infelicitous as well.

6 Anand & Nevins on Slave

In this last section, we address one issue of cross-linguistic variation among languages with indexical shifting. It has been observed that languages with indexical shifting differ in whether multiple attitude verbs allow indexical shifting,⁵ and in Amharic, Zazaki, and Matses, unlike in Uyghur, only the verb *say* triggers indexical shifting.⁶ At this moment, we only know of one language, Slave, that allows for

⁵ Another cross-linguistic variation among languages with indexical shifting is optionality of indexical shifting: Indexical shifting is optional in Amharic and Zazaki, while it is obligatory in Matses, and as we saw in the present paper, in Uyghur finite complement clauses. Slave is complicated in that it is obligatory only under certain verbs. We have nothing insightful to say about this.

⁶ In Navajo, there seems to be an inter-speaker variation (Anand 2006:75).

multiple verbs to license indexical shifting. In the rest of this section, we compare Slave and Uyghur and discuss their differences. The Slave data presented in this section are taken from Anand and Nevins (2004) and Anand (2006), who in turn took them from Rice (1986).

Slave imposes restrictions on shifted 1st and 2nd person indexicals that are very similar to Uyghur we observed in the previous section. Specifically, both 1st and 2nd person indexicals shift under *édedi* (tell, ask), while only 1st person indexicals do under *hadi* (utter; intransitive), *yenjwę* (want, think), and *hudeli* (want, think).

- (32) a. [segha ráwǫdɨ] sédɨdi yɨlé
 [1sg-for 2sg-will-buy] 2sg-tell-1sg PAST
 'You told me to buy it for you'
 - b. Simon [rásereyineht'u] hadi
 Simon [2sg-hit-1sg] 3sg-say
 'Simon said that you hit {him, *me}'
 - c. sú [leshuyie k'eguhw'e] yerineweQ [spoon 1sg-will-lick] 2sg-want'Do you want to lick the spoon?'
 - d. denexare [woję] yeniwe sister [2sg-will-sing] 3sg-want
 'Sister wants you to sing'
 - e. John [beya ráwozíe] hudeli
 John [1sg-son 3sg-will-hunt] 3sg-want-4sg
 'John wants his/my son to go hunting'

Anand and Nevins (2004) and Anand (2006) account for the Slave fact by postulating three kinds of monsters in (33), assuming different attitude verbs select for different monsters. In their analysis, context indices are richer than ours, and the difference between the first two monsters are not directly relevant for our purposes. Also notice that in their semantics the object language does not contain indices, and hence the interpretation function is relativized to two indices c and i.

(33) a.
$$\llbracket OP_{\forall} \phi \rrbracket_{g}^{c,i} = \llbracket \phi \rrbracket_{g}^{i,i}$$

b. $\llbracket OP_{per} \phi \rrbracket_{g}^{c,i} = \llbracket \phi \rrbracket_{g}^{\langle a_{i},h_{i},l_{c},t_{c},w_{c},\ldots\rangle,i}$
c. $\llbracket OP_{auth} \phi \rrbracket_{g}^{c,i} = \llbracket \phi \rrbracket_{g}^{\langle a_{i},h_{c},l_{c},t_{c},w_{c},\ldots\rangle,i}$

They maintain that verbs that only shift 1st person indexicals select for the third monster, which only shifts the first individual coordinate of the context index, leaving the other coordinates intact.

Although this account can basically describe the data, however, it has a conceptual weakness, on which Anand (2006:110) himself remarks as follows.

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"[I]t seems rather natural that 'tell' would shift 2nd person while 'want' would not; indeed, what would such a shift mean, given that it is unclear how the ADDR coordinate would even be filled in such cases."

Also, in their analysis, it is in principle possible to define a monster that only shifts the second individual coordinate, but such a shifting pattern has not been found.

Under our analysis, by contrast, only verbs involving an attitude holder and her addressee are predicted to shift both 1st and 2nd person indexicals. Also, it is expected that no verbs shift only 2nd person indexicals because no attitude verbs lack an attitude holder. Thus, our analysis is more constrained than Anand and Nevins' and better on conceptual grounds.

Lastly, we discuss an intriguing difference between Uyghur and Slave, namely, in Slave, 2nd person indexicals under verbs that do not shift them are still felicitous, and interpreted as the hearer of the current context of utterance as shown in (32b), unlike in Uyghur where they are infelicitous. This can be given a straightforward explanation in our analysis by postulating a variation in the interpretation of 2nd person indexicals. Recall that we proposed that Uyghur 2nd person indexicals are in fact disguised definite descriptions containing a 1st person indexical. We conjecture that Slave 2nd person indexicals are not definite descriptions but directly denote the second individual coordinate h_c of the context index c. Furthermore, we propose attitude verbs such as *think* and *want* just inherit the second individual coordinate from the higher index (cf. the meaning of non-attitude modals in (12)).

(34) For any ϕ of type $\langle s, t \rangle$,

 $\llbracket \texttt{think } \phi \rrbracket_g^c = \lambda x. \lambda i. \ \forall j \in \text{DOX}_{x,i} \ \llbracket \phi \rrbracket_g^c(j) = 1$ where $j \in \text{DOX}_{x,i}$ iff

a. w_i is compatible with what x believes in w_i ;

- b. a_i is the individual in w_i that x identifies in w_i as himself;
- c. $h_j = h_i$
- (35) For any ϕ of type $\langle s, t \rangle$ $\llbracket \text{hear } \phi \rrbracket_g^c = \lambda x. \lambda y. \lambda i \ \forall j \in \text{HEAR}_{x,y,i} \ \llbracket \phi \rrbracket_g^c(j) = 1$ where $j \in \text{HEAR}_{x,y,i}$ iff
 - a. w_i is compatible with what x hears from y in w_i ;
 - b. a_i is the individual in w_i that x identifies in w_i as himself;
 - c. $h_j = h_i$

This analysis explains why 2nd person indexicals in Slave under those verbs can still refer to the actual hearer.

It should be pointed out here that this semantic variation in 2nd person indexicals is independently necessary to account for the difference between Uyghur and languages such as Slave and Zazaki in which shifted 2nd person indexicals are obligatorily *de te* (Anand 2006). It is predicted therefore that shifted 2nd person index-

icals in Slave are obligatorily *de te* unlike in Uyghur, but the lack of data prevents us from testing this prediction at this moment. This is left for future research.

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Yasutada Sudo

Massachusetts Institute of Technology Department of Linguistics and Philosophy 77 Massachusetts Avenue, 32-D808

Cambridge, MA 02139

ysudo@mit.edu

Metathesis and Reanalysis in Ket

EDWARD VAJDA Western Washington University

Introduction

This article identifies cases where metathesis and reanalysis have left idiosyncratic changes in the morphology of Ket, a critically endangered language of Central Siberia. Section 1 discusses basic typological features that reflect the language's distinctive genetic origin or developed from contact with typologically different morphologies. Section 2 examines five minor aspects of Ket word structure that seem anomalous in light of the known history of Yeniseian to show how each arose through metathesis or reanalysis. These features cannot be explained by simple descent or language contact, and failure to understand their true nature hinders a straightforward characterization of Ket typology. Section 3 explains how all five of these seemingly unconnected changes were triggered by a single rule of metathesis that operated on combinations of labial and non-labial consonants. Certain morphemes strongly affected by the metathesis later underwent semantic reanalysis.

The analysis reflects ongoing work compiling *The Etymological Dictionary of the Yeniseian Languages* (Vajda and Werner, in preparation). With fewer than 100 speakers, Ket is the last surviving member of the Yeniseian family and genetically isolated in North Asia. Internal comparative data from three of Ket's vanished southern relatives, Yugh, Kott, and Assan, along with external comparison with the distantly related Na-Dene family of North America (Vajda 2010), also appear in the article.

1 Genetically Inherited and Contact-Induced Features in Ket

Modern Ket in many ways presents a stark typological contrast to the suffixing agglutinative Ugric, Samoyedic, Turkic, Tungusic, and Mongolic languages spoken by the neighboring peoples of Inner Eurasia. Areally unique features of the phonology and morphology include phonemic tones, possessive proclitics, and

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a strongly prefixing verb. As Ket hunting groups took women as marriage partners from neighboring tribes over the centuries, influence from the surrounding suffixing morphologies modified certain inherited Yeniseian structural properties, though little borrowing of lexical material seems to have occurred (Vajda 2009). Ket provides an interesting case study of how areal pressure can alter native features to yield a uniquely blended typological profile. Morphology developed under areal influence involves mainly an elaboration of inflectional suffixes. Language contact most obviously affected noun inflection, but it also influenced the development of predicate agreement suffixes as well as a radical leftward shift of the semantic head position in finite verb morphology.

1.1 Ket Phonemic Prosody

Ket monosyllabic words contain four phonemic prosodemes consisting of an amalgam of melodic and non-melodic features. The tonal notation in (1-4) follows that used in Vajda (2004) and adopted by Georg (2007).

- (1) High tone (high tone on half-long vowel, raised mid-vowel articulation) $q\bar{o} j$ $s\bar{u} l$ 'aunt, uncle' 'blood'
- (2) Laryngealized tone (pitch abruptly cut short by laryngeal stricture)
 qɔ'j su'l
 'wish' 'Siberian white salmon'
- (3) Rising-falling tone (rising-falling pitch on a geminate vowel) $q\dot{2}\dot{2}j$ $s\dot{u}\dot{u}l$ 'neighboring' 'sled'
- (4) Falling tone (abruptly falling pitch on a short vowel) $q \partial j$ $s \partial l$ 'bear' 'hook'

Words of two or more syllables generally have regular non-melodic accent on their initial syllable. Tone was inherited from Common Yeniseian rather than borrowed, as none of the surrounding languages have phonemic tones. Vajda (2010) shows how distinctive pitch developed from erosion of consonant articulations in the syllable coda or, in the case of rising-falling tone, from elision of an intervocalic consonant.

The prosodic domain of tone in Ket is the phonological word, and tonal prosody helps distinguish clitic from affix boundaries. As a rule, suffixes merge prosodically with their host, affecting its tone, while clitics do not (Vajda 2008).
1.2 Preposed Possessive Markers

To express possession, Ket uses pronominal markers separated from the following possessum noun by a clitic boundary.

(5)	b-sū·l	d-sùl	da-qō'j	k-qɔ'j	na-súùl	
	'my blood'	'her hook'	'his aunt'	'your (sg.)	wish' 'our/your/their sle	ď

Anlaut consonant clusters occur only across a proclitic boundary.

Cognate possessive prefixes were present in the extinct Yeniseian languages (Werner 2005). Inherited from Proto-Yeniseian, they contrast typologically with the possessive suffixes typical of the surrounding families.

Possessive clitics take the following possessum noun as their host as in (5) only when no word precedes them in the same phonological phrase. Otherwise, they attach to the preceding word. In (6) the monosyllabic nouns $k\epsilon't$ 'man, person', hu'n 'daughter', and $d\epsilon'\eta$ 'men, people' have attracted the possessive marker as suffix, losing their inherent laryngealized tone:

(6)	kɛd-da qō j	hun-d sùl	dɛŋ-na súùl	
	'man's aunt'	'daughter's hook'	'people's sled'	

The tendency for pronominal possessive markers to attach to the preceding word probably arose through contact, given the general areal pattern of suffixes and root-initial words. The alternate explanation that these markers were originally suffixes on the possessor noun is not supportable, since they are not morphologically dependent on the presence of such a noun and readily encliticize to any available preceding word, even sentential adverbs. By contrast, possessive markers must be followed in context by the possessum noun, though separated from it by an equally obligatory clitic boundary. Apparently, these markers were originally simple prefixes that became special clitics to render the noun a root-initial phonological word in keeping with the root-initial morphologies of the surrounding languages.

In the next section, the same type of areal pressure will be shown to have influenced the finite verb morphology, where the rightmost agreement markers are also special clitics that frequently attach to the preceding word. This likewise creates root-initial structures out of finite verb forms, in typological accordance with the suffixing verbs found elsewhere in Inner Eurasia.

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1.3 Polysynthetic Verb Structure

A third Yeniseian feature that is strikingly unique in northern interior Eurasia is the family's traditionally prefixing verb morphology. All verbs displaying Ket and Kott cognates attesting to their membership in the oldest layer of the vocabulary are strongly prefixing. A general model of Ket finite verb structure appears in (7), with the three lexical slots marked in bold type.

subject agr. - incorporate - agr. - thematic consonant(s) - 3p agr. - tense/mood - 1/2 agr. - root - animate-pl.subject agr.

As will become clear from the discussion below, this model ignores cases where metathesis has altered the original linear arrangement of morphemes.

Slots marked "agr." are used to express subject or object agreement. Based on which agreement slots are filled in each given stem, the Ket verbal lexicon can be divided into three productive transitive patterns and six intransitive patterns, with a residue of unproductive agreement marker configurations (Vajda 2009). The root is often preceded by several prefixes but only one suffix (animate-class plural subject agreement). A typical example appears in (8), where lexical morphemes are shown in bold type in keeping with the model introduced in (7):

(8) *d-sla-bo-kd-o-b-il-taŋ-in* (< **d-sla-bo-kdb-ol-taŋ-in*)
 3sbj-outside-1obj-thematic.consonants-past.tense-DRAG-pl.sbj
 'They dragged me outside.'

Agreement and tense/mood affixes are interdigitated between the lexical morpheme (shown in bold type), making a linear representation of the verb stem difficult to achieve without recourse to a position-class formula of some sort. Ket verb forms also present other challenges for interlinear morpheme glossing. The function of thematic consonants such as -k-, -d- and -b- is often opaque, though these morphemes are lexical elements present in all forms of the given verb except where truncated by phonological rules. More will be said about thematic -b- in 2.1 below, where it is shown to have metathesized ahead of the tense/mood vowel, complicating the original linear placement of thematic consonants before tense/mood markers. The expression of past tense in forms containing -b- thus consists of linearly disconnected affixes, in this case -o- and -il. Note that the morpheme glosses in (8) reflect the "pre-metathesis" order of elements shown by the asterisked form.

As Vajda (2009) has argued, the suffixing languages spoken around Ket – South Siberian Turkic, Samoyedic Selkup, Enets and Nenets, Tungusic Evenki, and Ugric Khanty – produced an interesting effect on Ket verb morphology. While preserving the original template, Ket innovated new patterns of verb stem

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creation in which the leftmost lexical slot – originally used to incorporate nouns, adjectives, or adverbs that semantically modified the verb root – contains an infinitive expressing the verb's primary lexical meaning. In such stems the original root slot contains a morpheme expressing aspect or transitivity. An example appears in (9):

(9) d-bag-bo-k-ol-bet-in
 3sbj-FIND-1obj-thematic.consonant-past.tense-iterative-pl.sbj
 'They used to find me (many times).'

Here the semantic head, expressed by the incorporated infinitive bAg 'to find', stands near the beginning rather than the end of the verb form, as it did in (8). The morpheme *-bet* in root position originally meant 'do' or 'make', but here expresses iterativity rather than a concrete lexical meaning. A clitic boundary separates the subject marker *d*- from the rest of the verb, so that bAg 'to find' occupies phonological-initial position. See Reshetnikov and Starostin (1995:25) for the earliest identification of these markers as special clitics, and Vajda (2004:74) for the rules governing their phonetic realization.

The originally prefixing Ket verb has thus gradually manipulated the semantic possibilities of its inherited template to evolve a strongly suffixing structure, without rearranging or deleting any of the existing morpheme positions. All productive patterns of verb formation in Modern Ket require a lexical root in the incorporate slot. During fieldwork my native informants typically tried to deduce an unfamiliar verb's meaning by examining the incorporate rather than the morpheme in the original root position. Verbs without a recognizable lexical root in their initial syllable, such as example (8), belong to unproductive patterns, analogous to strong verbs in Germanic languages.

These innovations have converted all of the slots following the incorporate into *de-facto* suffixes, so that Modern Ket verb forms mimic the suffixing agglutinative verbs of neighboring languages. Vajda (2009) calls this process "typological accommodation" since it did not involve any borrowing of grammatical material or radical change in the verb's inherited polysynthetic structure.

1.4 Person Agreement Suffixes

Unlike Ket, the Kott finite verb innovated a series of subject person/number agreement suffixes. These new suffixes duplicates the meaning of the original subject person/number prefixes:

(10) *i-te:n-u* 2sg.sbj-LIE.DOWN-**2sg.sbj.** 'you (singular) lie down'

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In forms with plural subjects, they also duplicate the meaning of the older plural suffix *-an* inherited from Common Yeniseian, so that plurality is marked redundantly three times:

(11) on-te:n-aŋ-an-toŋ
 1pl.sbj.-LIE.DOWN-perfective/stative.-pl.sbj.-1pl.sbj.
 'we lie down'

Multi-site person/number agreement developed as the Kott verb reoriented itself toward suffixation under areal influence. After the new verb-final person/number agreement series became productive, however, the original Common Yeniseian subject prefix and plural suffix seen in (11) were dropped in most verbs. The morpheme $-a\eta$ - glossed 'perfective/stative' will be discussed in section 2.2 below.

Although Ket never innovated person agreement suffixes in its verb morphology, it did inherit from Common Yeniseian a series of predicate agreement suffixes that attach to adjectives and certain adverbs to mark subject person and number in locational or existential clauses lacking a finite verb of any kind. Three examples appear in (12):

(12)	sokŋ -am	sokŋ -du	sokŋ -aŋ
	thick-3sg.inan.	thick-3sg.masc.	thick-3anim.pl.
	'it is thick'	'he is thick'	'they are thick'

Cognate predicate agreement suffixes were documented for the extinct Yeniseian languages, as well (Werner 2005). It is probable that these suffixes developed under areal influence, as modifiers assumed predicate head position in the absence of a conjugated verb form. This trait, already present in Common Yeniseian, was extended in Kott (but not Ket or Yugh) to the finite verb morphology.

1.5 Nominal Case Suffixes

Another feature that Yeniseian probably evolved through contact is its system of grammatical case suffixes. Ket cases semantically mirror those of neighboring languages and seem to have developed from an earlier system of postpositions (Vajda 2008). Some case suffixes require an augment identical to the possessive markers described in section 1.3.

 (13) Ket ablative case of the noun *qu's* 'tent', with possessive augment -*di-qus-di-ŋal* TENT-3p.inan.poss-abl.

Other case suffixes attach to the bare stem with no possessive augment.

(14) Ket locative case of the noun qu's 'tent' qus-ka TENT-loc.

It remains unclear why some Ket case markers require a possessive augment while others do not; see Vajda (2008) for more discussion.

While pronominal possessive markers are inherited from Proto-Yeniseian, the system of nominal case suffixes seems to have evolved at least partly after the breakup of Common Yeniseian. Some case suffixes differ in shape across the daughter languages, reflecting a more recent development: compare the Kott ablative suffix *-čaŋ* with Ket *-ŋal*.

2 Morphological Traits Arising from Metathesis or Reanalysis

The previous section discussed salient features of Ket typology that reflect the family's distinct genetic inheritance (phonemic tone, possessive prefixes, prefixing polysynthetic verb) or which arose through contact (case suffixes, agreement suffixes on predicate adjectives, semantic reorientation of the finite verb template from prefixing to suffixing). The origin of certain minor, yet typologically striking idiosyncrasies in Ket morphology cannot be explained as simple inheritance or as byproducts of language contact. Earlier studies such as Vajda (2004) failed to account for them correctly. This section describes five odd morphological features that developed due to metathesis followed by reanalysis. These processes obscure the original, more regular patterns of word formation. Only when such effects are understood can a straightforward picture of Ket historical morphology emerge.

2.1 The Mystery of Ket "Non-Agreement" -b-

Many Ket verbs contain an affix *-b-* that regularly expresses agreement with an inanimate-class subject or object. This prefix stands between the thematic consonants and the verb root, occupying a position ahead of the tense/mood vowel but before the tense/mood consonant.

(15) Ket forms with inan.-class -b- after the tense/mood vowel
 a-b-qo da-k-o-b-in-tet present-inan.sbj.-die
 3fem.sbj.-them.cons.-past-inan.obj.-past-hit
 'it dies away'
 'she hit it'

A comparison with the Kott forms in (16) suggests that the Ket inanimateclass marker *-b*- has metathesized ahead of the tense/mood vowel:

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(16) Kott verb forms, with inan.-class -b- before the tense/mood vowel
 b-a-pi
 b-a-t^hij-aη
 inan.-present-RIPEN
 iri ripens'
 ishe hit it'

Kott preserved the pre-metathesis order of prefixes, with third-person agreement markers preceding the tense/mood markers, retaining the original linear order inherited from Common Yeniseian.

In all of these Ket and Kott verb forms, -b- conveys agreement with an inanimate-class subject or object. However, some Ket verbs contain what appears to be the same affix that does not agree with any argument in the verb phrase but remains unchanged in all indicative forms, regardless of the subject or object.

This section will argue all cases of "non-agreement" -b- arose through metathesis of a labial consonant originally occupying a different, but adjacent slot. Its origin has nothing in common with the homonymous inanimate-class agreement -b-.

In some of these cases, "non-agreement" -*b*- arose when verb-root anlaut *b*-metathesized with the preceding perfective past-tense marker -*n*-:

- (17) dabatomnet < *da-ba-t-on-bet
 3fem.sbj-1obj-thematic.cons-past-UNDERSTAND
 'she understood him'
- (18) daatpines < *da-a-t-in-bes 3fem.sbj-3masc.obj-thematic.cons-past-DRAW 'she drew him'

Root anlaut *b*- remains in its original location in the present-tense forms *da-ba-ta-bet* 'she understands me' and *da-a-t-i-bes* 'she draws him', where there is no preceding nasal to trigger the metathesis.

In the remaining cases, non-agreement -b- represents a thematic consonant (probably the Proto-Yeniseian area prefix *p-) that metathesized ahead of the following tense/mood marker in stems containing another thematic consonant.

(19) da-don-ba-t-a-b-tet < *da-don-ba-t-p-a-tədⁱ
 3fem.sbj-KNIFE-1obj-them.cons-area-present-HIT.ENDWISE
 'she stabs me repeatedly'

Note that thematic p-voices to b as a byproduct of this metathesis, for reasons that remain unclear.

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Thematic *t*- in (19) seems to express iterative meaning. When thematic **p*-was stem's only thematic consonant, as in (20), it did not metathesize or voice to -*b*-, but instead yielded Ket -*h*- and Yugh -*f*-, the regular reflexes of Proto-Yeniseian **p*:

(20) Ket da-don-ba-h-a-tet (Yugh da-don-ba-f-a-tetⁱ) < *da-don-ba-p-a-tədⁱ
'she stabs me once'
3fem.sbj-KNIFE-1obj-area-present-HIT.ENDWISE

Accounting for labial metathesis is crucial for a correct description of the meaning, underlying shape, and original linear position of Ket verb morphemes. It is not correct to connect "non-agreement" -*b*- etymologically with the homony-mous inanimate-class agreement morpheme, as did Vajda (2003, 2004), who suggested it had innovated the non-agreement functions "applicative", "intensive", or "involuntary causative" in small numbers of verbs. In reality, Ket has no such categories derived from inanimate-class -*b*-.

Native speakers occasionally reanalyze "non-agreement" -*b*- as the inanimateclass marker. My work with Ket informants turns up sporadic examples where a 3^{rd} person animate-class object marker replaces "non-agreement" -*b*-, even though the given forms contain the correct object markers in another location. For example, observe the canonical forms *d*-*o*-*g*-*d*-*a*-*b*-*taŋ* 'he drags him around' and *d*-*u*-*g*-*d*-*a*-*b*-*taŋ* 'he drags her around', where -*b*- is the area prefix and -*o*- and -*u*are the correct 3^{rd} person masculine and feminine-class object markers. These forms are sporadically replaced by *d*-*o*-*g*-*d*-*aj*-*taŋ* and *d*-*u*-*g*-*d*-*ij*-*taŋ*. In the noncanonical forms, the redundant masculine-class marker -*aj*- and feminine-class -*ij*have replaced thematic -*b*-, which has obviously been falsely identified as an agreement marker.

Understanding how metathesis altered the surface position of inanimate-class -*b*- and its lexical look-alikes simplifies the linear description of Ket verb morphology. Establishing the true identities of the various affix shapes -*b*- in Ket and identifying their original locations as either entirely before or entirely after the two tense/mood markers, permits the eight-slot Ket verb model given in (7). This "pre-metathesis" linear model can replace the ten-slot template in Vajda (2004:45) or the nine-slot model in Reshetnikov and Starostin (1995:100). It also obviates the need to assign "non-agreement" -*b*- to a different position class than the other thematic consonants.

2.2 The Perfective/Stative Suffix

A redundant plural suffix *-ŋ* seems to appear after a couple dozen basic verb roots in forms in forms conjugated with plural subjects. In some of these, plural agreement seems to be expressed redundantly up to four times, as in the Kott form in

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(11) or twice, as in the Ket verb *d-in-aŋ-doq-ŋ* 'they flew' (cf. the singular form *d-in-doq* 'he flew'). This element actually turns out to be an ancient aspectual suffix that originally appeared in verbs denoting a change of state. Due to homonymy with the plural suffix, it was reanalyzed as a plural marker and deleted from most singular forms, though it occasionally remains fused to the root in both singular and plural forms, as in *h-a-b-daqy* 'it adheres', *du-h-a-daqy* 'they get stuck' (*daq* 'stick', 'adhere'); or *o-k-t-a-b-a-tujuy* 'he hangs suspended', *oy-k-t-a-b-a-tujuy* 'they hang suspended' (*to'j* 'high up'). Verbs with this suffix belong to a semantic category Vajda (2003, 2004) called "stative-resultative" and Werner (1997) "passive-resultative". The Na-Dene cognate of this suffix was called the "perfective/stative" by Leer (2000) and the term is equally apt for Yeniseian. In both families it appears in verbs that express conditions arising from a prior action, as opposed to static states such as 'be long', or 'be red'. For more on the perfective/stative, see Vajda (2010:40-42, 49) or Leer (2000).

The Kott form in (21) illustrates the historical layering of agreement morphology in the verb complex. The underlined positions 2 through -1 were inherited into Proto-Yeniseian, as shown by external comparison with Na-Dene (Vajda 2010:36-60). The plural subject agreement position -2 must have been added by Common Yeniseian times, as it is present in Ket and Yugh as well as Kott. The Kott subject person/number agreement series in -3 is not found in Ket or Yugh and must have arisen under later Turkic influence:

(21) $\frac{al^2 - o\eta^1 - te:n^0 - a\eta^{-1} - an^{-2} - to\eta^{-3}}{past^2 - 1sbj.pl.^1 - LIE.DOWN^0 - perfective/stative^{-1} - sbj.pl.^{-2} - 1sbj.pl.^{-3}$ 'we lay down' (past tense)

Reanalysis of the moribund perfective/stative suffix, which originally functioned to convey a resultant state, has created what appears to be a redundant series of plural suffixes fused to roots in some Ket and Kott verbs; see Krejnovich (1968:53-57) for more Ket examples of such forms. It is not correct, however, to posit two plural agreement suffix slots as an original Yeniseian feature.

2.3 Plural Agreement Suffixes on Adjectives

Ket is a head-marking prefixing language influenced by head-marking suffixing languages. There is no reason to expect inflections on attributive modifiers to have arisen through contact. Inflections in Ket normally appear on the finite verb or head noun, while modifiers are uninflected. However, about two dozen adjectives contain what appear to be plural agreement suffixes when modifying a plural noun:

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(22)	qa' ke't	'big person'	>	qàŋ dɛ'ŋ 'big people'
	ugd ki's	'long foot'	>	ugden kisen 'long feet'
	hə'l ōʻks	'short tree'	>	holan a'q 'short trees'

Evidence from Yugh shows that the apparent plural suffix $-\eta$ was originally an adjective derivational suffix that generally elided except where preserved through reanalysis as a plural marker in association with plural nouns due to its homonymy with the common noun plural suffix $-\eta$; both suffixes often contain epenthetic vowels, as seen in *hol-aŋ* and *ugd-eŋ*. Some adjectives retain the nasal suffix in all contexts, further demonstrating it was originally part of the stem and not an agreement marker. Two examples are Ket *sokŋ* 'thick', *udokŋ* 'lazy', which modify either singular or plural nouns. Other adjectives show free variation between forms with or without this suffix. Once example is Yugh *surbes* ~ *surbe:* $\hbar s \sim surbesin$ 'red' < * $s\bar{u}r$ 'blood' + *wes 'resemble' + * η 'adj. suffix'. The Ket cognate *sulem* 'red', which shows a more radical reduction, occurs with either singular or plural nouns – *sulem* t_A 's 'red stone', *sulem* t_A ' η 'red stones' – showing the nasal was originally part of the stem.

Recognizing this semantic reanalysis of the adjective derivational suffix $*-\eta$ makes it unnecessary to posit adjective number agreement as an original feature of Yeniseian – a highly idiosyncratic trait in a strongly head-marking language like Ket.

2.4 Vestigial Infinitive Suffix

Vajda (2010:60-63) provided evidence that Yeniseian once contained a productive infinitive suffix. This morpheme was identical to, and probably cognate with, the adjective suffix described in 2.3. It underwent the same pattern of reduction, as in $b\lambda g$ 'to find', though it sometimes remained, as in *bagdey* 'to pull', *qorey* 'to kill', and *ensoky* 'to forget' (cf. *en* 'thought', *suk* 'back', 'pushed back'). There are also occasional pairs where the suffixed form refers to multiple action.

(24) Ket $b \hat{e} r$ 'to make', 'to do' ~ $b \hat{e} r \hat{e} \eta$ 'to make, do (frequently)' Ket $t \hat{h} \hat{l}$, Yugh $t \hat{a} \hat{r}$ 'to freeze' ~ Ket $t \hat{h} \hat{l} \hat{q}$, Yugh $t \hat{a} \hat{r} \hat{\eta}$ 'to freeze (often)'

It is likely that here too we have an instance of reanalysis through false analogy with the plural suffix $-\eta$ found extensively in the nominal system.

2.5 Ablaut Noun Plurals

Yeniseian noun plural formation follows a typical North Asian suffixing pattern, e.g., \bar{e} 's 'god', *esaŋ* 'gods'. But there are also occasional forms where plurality is expressed by tonal shift or other stem-internal changes. One example is Ket $s\bar{e}$'s

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'river', *sàs* 'rivers' and its Yugh cognate $s\bar{e}s$ 'river', *sà:ħs* 'rivers'; note that pharyngealization (\hbar) always accompanies falling tone in Yugh and was probably originally present in Old Ket, as well.

Early loanwords also offer examples of a final nasal eliding and falling tone (along with Yugh pharyngealization). Old Mongolian *qusan 'birch tree' probably approximates the original form that became Arin kus, Yugh \dot{u} : $\hbar s$, and Ket $\dot{u}s$ 'birch tree'. Here the rounded vowel /u/, possibly labializing the following /s/, triggered metathesis with the following nasal.

Tonal patterns in irregular noun plurals resemble those of reduced infinitive and adjective stems, where attrition of a nasal suffix often left falling tone. The singular adjectives and plural nouns in (25) suggest that falling tone was caused by reduction of a nasal suffix:

(25) Ket $h \partial \kappa s \bar{e} s$, Yugh $f \partial h \chi s \bar{e} s >$ Ket $hoq \eta s \partial s$, Yugh $foq \eta s \partial h s$ 'deep river' 'deep rivers'

Reduction of the new rhymes that arose following metathesis sometimes left a different tone, as in the earlier cited $qa' \sim qag$ 'big' and $hs'l \sim hslag$ 'short'. The rules governing these reductions involve more than the metathesis itself and are beyond the scope of the present article. What is important here is identifying why suffixes metathesized in the first place.

If ablaut noun plurals arose from metathesis of a plural suffix followed by its reduction to pharyngealization and falling tone (or occasionally to another tone), it is unnecessary to posit root ablaut as a basic pattern in Yeniseian. Once metathesis is accounted for, Ket nominal inflection turns out to resemble the suffixing systems found elsewhere in Siberia.

3 The Link Between Metathesis and Reanalysis

Having described various cases of metathesis and subsequent coda reduction, as well as several instances of semantic reanalysis, it is possible to show how all of these changes developed on the basis of a single phonological rule that affected linear combinations of labial + non-labial or non-labial + labial elements. Reanalysis later followed where metathesis and reduction were so frequent as to leave only sparse remnants of what had formerly been a productive morpheme.

The reason noun plural suffixes were only occasionally replaced by root ablaut, while reduction of perfective/stative, adjective and infinitive suffixes was extremely common, becomes clear from the sound shape of these suffixes in Proto-Yeniseian. The perfective/stative, adjective and infinitive suffixes originally consisted of the labialized velar nasal $*-y^{w}$. This sound metathesized with any preceding non-labial, so that these suffixes reduced more often than they remained intact. Plural suffixes consisted of non-labial *-y or *-n and metathesized only in the much smaller number of stems that ended in a labial. When Proto-Yeniseian $*\eta^w$ delabialized to η in Proto-Ket-Yugh, the perfective/stative, adjective and infinitive suffixes that had originally avoided metathesis after another labial became homonymous with the plural suffix $-\eta$. They also became subject to the rule of metathesis they had earlier escaped, since now they were non-labial segments following a labial.

Labial metathesis occasionally produces free variants in Modern Ket, an example being the onomatopoetic *qopqun* and *qoqpun*, both meaning 'cuckoo bird'. If the new round of metathesis affecting the newly delabialized survivals of the perfective/stative, adjective and infinitive suffixes operated similarly, it would have produced pairs like Yugh *surbè:hs* ~ *surbesiy* 'red' that become susceptible to semantic redistribution based on false analogy with the common plural suffix - *y*. In most of these, as in Ket *-doq* ~ *-doqy* 'fly' and $h \partial_{\mathcal{B}} \sim hoqy$ 'deep', the variant with *-y* became associated with plurality and the suffixless form with singular meaning. In some cases, mostly after velars or uvulars as in *soky* 'thick', *-daqy* 'adhere', and *ensoky* 'to forget', the suffix remained regardless of whether the stem was associated with singular or plural meaning. In other cases, mostly after another nasal, attrition seems to have removed the suffix entirely, as in Ket *sī* 'n 'old' and *k* 'n 'light'. The phonological details of these processes remain to be worked out.

The existence of a Proto-Yeniseian series of labialized velars, crucial to this explanation, finds support from both internal and external comparative evidence (Vajda 2010:84-87). While * η normally survived unchanged, as in genuine plural suffixes, labialized * η^w elided in Kott and the closely related language Assan except where changed to another nasal by an earlier phonological process. For example, Kott * η^w became *m* before *p* in the compound *ujempul* 'mosquito' < *ujem* 'long' + *pul* 'leg', whereas the simple adjective was recorded suffixless as *ui* 'long' (cf. Ket *ugd* ~ *ugdeŋ* 'long', where η is the reanalyzed adjective suffix). It delabialized to η adjacent to *n*, as in (11) and (21), where the perfective/stative survived as *-aŋ* after *te:n* 'lie down'. The sparsely documented Assan shows an example where the infinitive suffix * $-\eta^w$ dissimilated to *n* after η : *tann* 'to see', though the Kott cognate $t^ha\eta$ was recorded without the suffix. External comparison with the Na-Dene perfective/stative shows a correspondence of Yeniseian * η^w to Na-Dene * η^y , whereas Yeniseian **n* and * η correspond instead to Na-Dene **n* and **n* (Vajda 2010:75-77).

Ket, Yugh and Kott noun plural suffixes regularly appear as $-\eta$ (mostly with inanimate-class nouns) or -n (mostly with animate-class nouns), showing they reflect original $*\eta$ and *n, since labialized $*\eta^w$ would have mostly disappeared. Being non-labialized, plural suffixes underwent metathesis only after roots ending in a labial, a relatively infrequent occurrence. Being uncommon, ablaut plurals may have been subject to analogical leveling from the more frequent suffixed plurals. This might explain plurals such as Ket *am-aŋ* 'mothers' or *ob-aŋ* 'fa-

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thers', where the plural suffix follows a labial coda, though the use of velar-nasal $-a\eta$ after such nouns (in place of the expected animate-class plural suffix -n) might have another explanation.

Some ablaut plurals seem to have arisen from non-labial roots. Ket *sàs* 'rivers' and Yugh *sà:ħs* 'rivers' derive from the root noun "*sēs* 'river', which contains no labial element. The expected plural would be "*seseŋ*. In such cases is the original root-final consonant may have been a labialized velar (the earlier coda of "*sē̄s* 'river' was probably " x^w). This sound would have metathesized with the plural suffix, yielding an ablaut plural. Comparison with Na-Dene supports this, if Proto-Athabaskan "*de'š* 'river, sandbar' derived from earlier "*de x*^w; cf. Vajda (2010:68) on the possible cognate status of these words. However, as mentioned earlier, a full account of Yeniseian irregular noun plurals involves rules in addition to metathesis and requires a separate study.

If the scenario presented here is correct, it would explain why metathesis occurred in some cases yet bypassed other, seemingly identical environments. It also explains why some suffixes became moribund and underwent reanalysis, while others remained productive in their original meaning. Considered with the evidence for labialized velar phonemes in Proto-Yeniseian, it becomes clear why reanalysis affected the perfective/stative, adjective, and infinitive suffixes so strongly, but left the seemingly homonymous noun plural suffix largely untouched. The reanalyzed suffixes were simply those that had lost their productivity through widespread attrition from an earlier application of the metathesis rule.

4 Conclusion

Correctly identifying the idiosyncratic effects of metathesis and reanalysis clarifies the origin of odd features of Ket morphology such as sporadic plural agreement in adjectival modifiers or redundant plural agreement suffixes in a subset of verbs. Identifying a series of labialized velars in Proto-Yeniseian and tracing their interaction with a rule of labial metathesis that still operates sporadically in Modern Ket, provides a cogent explanation for a variety of seemingly unrelated quirks in Yeniseian nominal and verbal morphology. It also demonstrates that Ket, while morphologically distinct from other North Asian languages, is not quite as typologically bizarre as previously characterized.

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Edward Vajda Western Washington University Modern and Classical Languages, MS9097 Bellingham, WA 98225

edward.vajda@wwu.edu

An Empirical Investigation of Typicality and Uniqueness Effects on Article Choice in Attributive-Possession NPs*

GREGORY WARD, CHRISTOPHER AHERN, TOM HAYDEN Northwestern University

Introduction

Previous analyses of the use of English definite descriptions have generally taken one of two approaches, loosely characterizable as familiarity and uniqueness. That is, felicitous use of the definite article has been argued to require that the referent of the NP be either known to the hearer within the current context of utterance (e.g. Heim 1983, Prince 1992) or uniquely identifiable to the hearer (e.g. Gundel et al. 1993, Birner & Ward 1994, inter alia). What is common to all previous analyses is that the explanatory principle is presented as categorical; i.e. a referent is familiar or not, unique or not. There is generally no provision for gradience within the theory. In what follows we will investigate how familiarity- and uniqueness-based accounts of definiteness fare in accounting for the class of EMBEDDED DEFINITES known as ATTRIBUTIVE-POSSESSION constructions (McKercher 2001) and how the gradient notion of typicality impacts article choice in these constructions.

Attributive-possession NPs (henceforth APNPs), which consist of embedded NPs headed by *with* (e.g. *the man with <u>the cane</u>)*, can be used to refer to one of the figures in (1):

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(1) a. The guy with the cane is my roommate.b. The guy with a cane is my roommate.

The felicity of both the definite and indefinite suggests that the general felicity conditions for the use of definite descriptions do not apply to APNPs. First, under a uniqueness-based approach, the presence of two equally salient canes should render the definite in (1a) infelicitous. Second, under a familiarity-based account, if the man's cane, being clearly visible, is taken to be (weakly) familiar, then the indefinite in (1b) should be infelicitous. Moreover, if it is taken not to be (weakly) familiar, then the definite in (1a) should be infelicitous. However, neither is the case. Thus, neither uniqueness nor (weak) familiarity alone appears to be driving article choice for APNPs. In what follows we will explore the role that other factors play in accounting for the article we find used with this type of NP in an experimental setting.

1 Previous Studies

Attempts to provide a unified account of the felicity conditions for the English definite article have proven to be elusive. For example, proponents of 'familiarity' as the explanatory condition for the definite article encounter difficulties in explaining how some first-mention definites representing familiar entities are felicitous while others are not. Consider (2):

(2) I'm taking an Italian conversation class this semester. On the first day of class, <u>the instructor told #the student</u> that <u>the textbook</u> is available on-line.

Here, none of the underlined definites has a referent that has been explicitly evoked in the preceding discourse. However, as is well known, what licenses the use of the felicitous definites in (2) is the inferable bridging relation that holds between a class and things associated with a class, e.g. instructors, students, textbooks, etc. (Clark 1975, *inter alia*). However, the same bridging inference which licenses the felicitous use of *the instructor* in (1) would also presumably license the infelicitous use of *the student* in the same context. That is, the student

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referenced in (2) is presumably as familiar as the instructor via a bridging relation, yet only the latter is felicitous with a first-mention definite, suggesting that familiarity is at most a necessary condition for the use of the definite article.

However, familiarity does not seem to constitute a sufficient condition either. Even in situations in which there is no plausible bridging relation, i.e. no plausible grounds for accommodation, definite descriptions can nonetheless be used to refer to completely unfamiliar entities, as in (3a):

- (3) a. When I got in my car this morning, I was totally grossed out by <u>the half-eaten burrito that I had left on the front seat from the night before</u>.
 - b. #When I got in my car this morning, I was totally grossed out by <u>the</u> <u>half-eaten burrito</u>.

As noted by Birner & Ward (1994), Barker (2005), Abbott (2008), *inter alia*, such NPs are felicitous even if the speaker assumes that their referents are completely unfamiliar to the hearer. On the basis of such data, we can conclude that familiarity by itself is neither a necessary nor sufficient condition for the use of the definite article.

Accounts based entirely on uniqueness fare better with respect to the examples discussed above. The felicity of *the instructor* and *the textbook*, as well as the infelicity of *the student*, in (2) can be explained by the fact that classes typically contain a single instructor and textbook, but typically contain more than a single student. Similarly, the minimal description contained in the NP in (3b) is insufficient to identify the intended referent upon first mention; what is needed is a uniquely identifying description (Gundel *et al.* 1993, Ward & Birner 1995), such as is provided by the relative clause in (3a). That is not to say that uniqueness-based accounts are not without their problems as well. As is well known, so-called 'weak' definite NPs may be used to refer to contextually non-unique entities under certain specifiable conditions, as illustrated in (4):

- (4) a. [Instructor to students in a classroom with three equally salient windows] Could somebody please open <u>the window</u>?
 - b. When I was six, I had to spend a night in <u>the hospital</u> and I was terrified.

In (4a), the context includes multiple salient windows, yet the definite is nonetheless felicitous. In (4b), the hospital in which the speaker spent a night need not be unique (much less familiar) in the context of utterance; the event in question could have occurred in New York City, where there are literally dozens of hospitals. Birner & Ward (1994) conclude that uniqueness is at most a sufficient condition on the use of the definite article.

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More recently, it has been proposed that there exists a systematic class of exceptions to the uniqueness condition/presupposition for definite NPs, namely the class of WEAK DEFINITES, and that they constitute a semantically distinct type of expression (Poesio 1994, Barker 2005, Carlson & Sussman 2005, Carlson et al. 2006, Schwarz 2009, inter alia). As a class, weak definites (as compared to 'strong' definites) share the following properties: they allow the 'sloppy' reading in VP ellipsis (John went to the hospital and Bill did, too can involve different hospitals), take narrow scope (Every passenger was taken to the hospital), occur only with a restricted class of nouns (John went to the doctor vs. #the surgeon), resist modification (John was taken to #the award-winning hospital), exhibit enriched meanings (John went to the doctor (for medical purposes and not, e.g., to subpoena her), and don't occur in subject position except with a generic reading (The hospital overcharged its patients disallows a weak reading). Instead, as Carlson et al. (2006) argue, such NPs are semantically related to bare singular NPs (e.g. in class, at work, in prison), as discussed by Stvan (1998), and are more akin to indefinite expressions than definite ones.

Finally, it has been observed that certain embedded definites (as in (1a, b) above), seem to lack a uniqueness presupposition (Haddock 1987, Meier 2003, Champollion & Sauerland 2009). Haddock (1987) proposes to account for the felicitous use of embedded definites to refer to seemingly non-unique entities by means of a computational model of incremental interpretation, whereby *the cane* in (1a) is interpreted locally (with respect to the unique man who has a cane) rather than globally (with respect to the larger discourse context in which an additional cane exists). That is, for Haddock, the interpretation of *the man with the cane* would begin with *the man* combining with *with* to produce the set of men who are 'with' something. After the preposition is encountered incrementally, then the interpretation of *the cane* is restricted to the (singleton) set of canes that have men with them, thus preserving a uniqueness-based analysis for the embedded definite.

In this paper, we investigate the use of APNPs in an experimental setting. We hypothesize that uniqueness is not the only factor that influences the use of the definite article with such NPs. Indeed, the results of our empirical study confirm that the typicality of the object NP is another significant factor in accounting for the use of the definite and indefinite articles in this construction.

2 Hypothesis

Following previous work on the felicity conditions for the definite article in English, we assume that, at least for NPs on the so-called 'strong' interpretation, uniqueness provides at most a sufficient condition for felicity. Of particular interest are cases in which the discourse context provides no uniquely identifiable referent, yet use of the definite for that referent is nonetheless possible. One such case is the attributive-possession construction, illustrated in (1) and repeated below for convenience:

(5) [to companion] The man with <u>the/a cane</u> is my roommate. [=(1)]

The NPs of this construction are of theoretical interest because they appear to permit the use of the definite in the case of non-unique referents as well as the use of the indefinite for unique referents. From this it follows that factors other than uniqueness must play a role in accounting for the distribution of the definite and indefinite article in this construction. Specifically, we propose that the perceived typicality of the referent of APNPs plays a significant role in determining article use and that the typicality of that referent corresponds to the object/property-denoting distinction of Partee 1987. That is, we predict that typical instances of a referent will more likely be interpreted as property-denoting, favoring the indefinite and, correspondingly, atypical instances will be more likely taken as object-denoting, favoring the definite.

3 Experiment

3.1 Design

To test this hypothesis, we conducted an experiment with two phases. The first phase was designed to elicit spontaneous responses from participants containing APNPs. The second phase elicited individuals' typicality rankings for different objects used in the first phase of the experiment.

3.2 Phase 1

Participants were brought into a quiet laboratory setting and seated in either a sound booth or at a workstation containing a computer monitor, keyboard, and mouse. They were presented with a series of images on their computer screen, each containing four silhouetted human or animal figures in a row, spaced evenly apart. After a brief pause (2.5 seconds) one of the figures on the screen would begin to flash. Participants were asked to describe the flashing figure in such a way that another participant (their "teammate") would be able to identify the flashing figure from the same set of four figures on his/her computer screen at a later time. Participants had as much time as they needed to complete the experiment. Responses were recorded electronically and labeled for article use. An example of an image used in the experiment is shown above in (1), where the figure of the man with a cane would begin to flash. Since the objects in each image were assumed to be weakly familiar, the uniqueness and typicality of the objects were varied across images.

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Participants had as much time as they needed to complete the experiment. Responses were recorded electronically and labeled for article use.¹ An example of an image used in the experiment is shown in Figure 1, where the figure of the woman with a hat would begin to flash:



Figure 1: Sample image with four silhouetted figures

As part of the instructions, participants were told that the figures appearing on their teammate's screen would not flash, thus preventing them from producing simpler, but non-target, responses of the form *Choose the flashing figure*. Participants were also told that the figures would appear in a different order than on their teammate's screen, which again ruled out simpler but irrelevant responses using directional cues, e.g. *Choose the guy on the left*.

In addition, a pilot study we conducted revealed that, without any further directions to guide them, participants tended to produce increasingly reduced nontarget responses over the course of the experiment, e.g. *the man with the cane, the man with cane, man with cane, cane man, Caneman,* etc. This finding replicates the findings of others that repeated use of referring expressions in a task-based setting results in a reduction in the form of those referring expressions (Clark & Wilkes-Gibbs 1986; Horton & Gerrig 2002; *inter alia*). To circumvent this tendency, we instructed our participants in the experiment proper to use complete sentences in their responses, thus increasing their use of articles overall as well as the likelihood of their producing an APNP.

Another finding from the pilot study was that the structure of the task itself had a powerful influence on article choice. That is, some participants understood the task to be one of merely describing the flashing figure; i.e. upon seeing a unique flashing man with a unique hat, many participants in the pilot study simply responded with "a man with a cane". Such participants tended to use the indefinite article almost to the complete exclusion of the definite, even when the objects in question were uniquely identifiable. In order to emphasize the interactive nature

¹ Since participants were typically run two at a time, all participants were verbally informed that their teammate was not participating in the experiment concurrently with them and that their responses would be stored for later use.

of the task, i.e. that they were providing instructions for someone else to use to identify the figures and not merely labeling them, we required that each response begin with the verb *choose*. Responses that did not begin with the verb *choose* were automatically rejected by means of a computer-generated script and participants were then asked to re-enter their response. Furthermore, responses were automatically checked for the presence of articles upon submission. If no articles were present, participants were prompted to "use a complete sentence". Responses were recorded electronically and labeled for article use.

Since the focus of this study was on APNPs, we only considered responses that contained two NPs, one representing the attribute possessor and the other representing the possessed attribute. The first NP (the possessor NP) was associated with the silhouetted figure (of a man, woman, boy, or girl) while the second NP (the APNP) was associated with the accompanying object (umbrella, hat, cane, etc.). Both of these NPs could appear with either a definite or indefinite article, resulting in four possible combinations of articles given a possessor NP followed by an APNP. Only the articles corresponding to the figure and object were considered for responses such as *Choose the man wearing the shorts with the cane*.

3.3 Phase 2

Recall that our hypothesis is that the typicality of the accompanying object in an APNP plays a significant role in the use of the definite and indefinite article in English. To assess the affect of typicality on article choice, we asked the participants to rate the typicality of the accompanying objects used in Phase 1. Participants rated each of the objects on a scale from 1 to 4, where 4 was 'very typical' and 1 was 'not typical at all'.² Examples of two of the objects – one rated typical and one rated atypical – are provided in Figures 2a-b, respectively:

Figure 2a: A 'Typical' Object Figure 2b: An 'Atypical' Object



² An even number of values was used to prevent participants from (over-)using the median value.

We relied on the ratings of the participants themselves rather than on our own ratings to avoid possible experimenter bias when it came to assessing the (a)typicality of a given object. That is, if a participant gave a rating of 1 or 2 to an object, regardless of our intuitions, it would nonetheless be categorized as 'atypical' for that participant, in which case we would expect that participant to produce more definite articles in referring to that object (*ceteris paribus*). To balance the presentation of objects, an equal number of (what we judged to be) typical and atypical objects were used in the study (Figure 2b was designed to serve as the atypical counterpart to the object in Figure 2a).³

3.4 Participants

Native English speakers of the Northwestern University community, who received course credit for their participation. None of the participants found the task difficult to complete and most completed the experiment in about 30 minutes.

3.5 Results

In analyzing the results of our study, we were particularly interested in the role that two factors – uniqueness and typicality – play in article choice. The 180 images that were used in Phase 1 varied in composition, by number and kind of objects, for a total of 10,439 responses (58 participants x 180 images).⁴ The crucial cross-factorial comparison of uniqueness and typicality is illustrated in Figure 3:

Figure 3



Typical, unique object

Typical, non-unique object

³ Participants' ratings of the objects used in the study largely correspond to our own: the mean ratings of only two (of 22) objects deviated from our own, and then only slightly.

⁴ One response had to be discarded in the analysis of the data.

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Atypical, non-unique object

The two images in the left column display a unique object, while those in the right do not. The two images in the top row display typical objects (based on participant ratings) and those on the bottom display atypical objects.

If uniqueness is a motivating factor in article choice, then we predict that images like those in the left column would elicit more definites than those in the right. This would accord with previous accounts of definiteness based primarily or exclusively on uniqueness. However, if typicality is also a significant factor, as we have hypothesized, then we predict that for images with non-unique objects, typicality will also play a role in article choice. That is, we predict that images with non-unique, atypical objects, like the one in the bottom-right image, will elicit more definites than ones with non-unique, typical objects (as illustrated in the top-right image).

To test these predictions, we performed a 2x2 ANOVA based on two factors: uniqueness and typicality, as illustrated in Figure 3. There was a significant main effect of uniqueness (F(1,57) = 17.21, **p < .001), i.e. there were significantly more definite APNPs used for images displaying unique objects than for those displaying non-unique ones, as shown in Figure 4.

Figure 4

Proportion of Definite APNPs for Unique vs. Non-Unique Objects (n=58)



This finding supports uniqueness as an important factor underlying the felicitous use of the definite article.

In the absence of uniqueness, on the other hand, we find that typicality plays a significant role in accounting for the distribution of the definite and indefinite articles in APNPs. Our initial 2x2 ANOVA revealed an interaction between uniqueness and typicality that trended towards significance (F(1,57) = 3.63, p = .062). This, however, includes both the unique and non-unique conditions. When we separate out the two factors, a pairwise t-test reveals that this interaction is being driven by the non-unique cases (t(57) = 2.22, *p < .04), as illustrated in Figure 5.

Figure 5

Proportion of Definite APNPs for Typical vs. Atypical (Non-Unique) Objects (n=58)



As shown in Figure 5, we see that there are significantly more definites used in referring to (non-unique) atypical objects than to (non-unique) typical ones, thus supporting our hypothesis that typicality plays a role in determining article choice for non-unique referents. Note that this effect only holds in the non-unique condition; for unique objects, typicality was not found to be significant (F(1,57) = 1.41, p = .24).

4 Discussion

Previous analyses of the use of the English definite article have relied on the notions of familiarity or uniqueness (or both). The results of our empirical study suggest that, in the case of APNPs, speakers do not rely exclusively on either and that typicality plays a significant role. In this section, we propose an alternative explanation to account for the distribution of the (in)definite article in APNPs,

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and compare it to the principles that govern article choice in other environments.

4.1 Object- vs. Property-Denoting

The results of our empirical study suggest that both uniqueness and typicality play a significant role in the use of the definite article in APNPs. When the referent of an APNP was unique within the discourse context, participants used the definite article 72% of the time to refer to it. On the other hand, when the referent was non-unique, participants used an indefinite only 34% of the time (contrary to what one would expect based on uniqueness alone). Instead, their use of the definite article for non-unique referents was dependent on the perceived typicality of those referents: the more typical the referent was judged to be, the greater the likelihood of an indefinite article being used to refer to it.⁵

The greater use of the indefinite article to refer to typical objects suggests that indefinite APNPs are being interpreted less as discourse entities in their own right than as properties associated with the possessor NP. One useful diagnostic for measuring the degree to which an NP is being interpreted as property-denoting vs. object-denoting is the extent to which subsequent anaphora is possible (Meier 2003). Compare the felicity of subsequent discourse anaphora when the entity in question is evoked by an APNP denoting a typical object versus one denoting an atypical object, as shown in (6a) and (b), respectively:

- (6) a. The man with the tie over there is my boss. ?He wears it every day.
 - b. The man <u>with the purple polka-dotted bowtie</u> over there is my boss. He wears it every day.

There is a clear contrast in felicity between reference to the typical tie evoked by the APNP in (6a) and to the atypical one evoked in (6b).⁶ When the referent of an APNP is atypical, that is, when it is noteworthy in its own right, then subsequent reference to it is relatively felicitous. To see that this difference is independent of definiteness, we find the same contrast with indefinite APNPs, as illustrated in (7):

- (7) a. The man with a tie over there is my boss. ?He wears it every day.
 - b. The man <u>with a purple polka-dotted bowtie</u> over there is my boss. He wears it every day.

⁵ The overall usage of the definite article for non-unique referents was 65%.

⁶ While not impossible, the anaphora in (6a) is clearly marked; the point is that there exists a contrast between subsequent reference to typical and atypical objects. The fact that the APNP in (6b) is also longer, heavier, and more complex than the APNP in (6a) correlates with this difference in typicality.

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From this, we can posit that APNPs denoting typical objects are associated with relatively low topicality. In this way, they are functionally akin to property-denoting prenominal modifiers, whose function is to restrict the extension of the noun to those members having the property in question. That is, a man wearing a prototypical tie can be described by means of a definite or indefinite APNP, as in (6a) or (7a), respectively, or by means of a prenominal modifer (*tie-wearing*), as in (8):

(8) The tie-wearing man over there is my boss. #He wears it every day.

In both the APNP and the prenominal case, the tie is being supplied primarily as a means to identify the man in question, and not as a full-fledged discourse entity that will, for example, be referenced in subsequent discourse. What renders (8) even less felicitous than the corresponding APNP (e.g. (7a)) is the fact that in (8), the noun *tie* occurs as part of a complex modifier in prenominal position.⁷

Of course, there are many ways in which an object can be seen as atypical. In addition to being seen as atypical in its own right (as, e.g., being a non-prototypical member of its class), an object can also be perceived as contextually atypical given the noun with which it is associated. For example, a completely ordinary-looking skirt would be perceived as extremely atypical if worn by a man as opposed to a woman. To illustrate the context-sensitive nature of typicality, we conducted an informal search on Google for *woman wearing a skirt* and *man wearing a skirt*, along with their prenominal counterparts.⁸ The string *skirt-wearing woman* received only 144,000 hits compared to *woman wearing a/the skirt* (a ratio of 1:5.49), while *skirt-wearing man* received 34,200 hits compared to 537,004 hits for *man wearing a/the skirt* (a ratio of 1:15.7). This difference is highly significant: $x^2 = 30122.35$, df = 1, p < 2.2e-16,

⁷ Contributing to the low topicality of the tie in (8) is the fact that it is being introduced within a so-called ANAPHORIC ISLAND (Ward, Sproat, and McKoon 1991), an even less preferred way of introducing an entity into the discourse than via an APNP. As Ward *et al.* note, when the referent is particularly salient, then subsequent anaphora to an object evoked within an 'island' is ameliorated; compare (i) with (ii)

⁽i) The tie-wearing man is my boss. #He bought it last week.

⁽ii) The purple-polka-dotted-bowtie-wearing man over there is my boss. ?He bought it last week.

Moreover, the fact that bowties are an atypical type of tie would lead us to predict that they would be referenced in prenominal modifier position less frequently than typical ties would be referenced in the same position. This prediction is borne out by an informal corpus search on Google: tie-wearing man (with no determiner specified) received 16,800 hits, while *man wearing a/the tie* received 1,766,000, a ratio of 1:105, whereas *bowtie-wearing man* received 5,917 hits compared to 725,240 hits for *man wearing a/the bowtie*, for a ratio of 1:122. Performing a chi-square test reveals that this difference is indeed highly significant: $x^2 = 102.3887$, df = 1, p < 2.2e-16.

⁸ We thank Larry Horn (p.c.) for suggesting this pair to us.

which we take to be further evidence that atypical objects are disfavored in prenominal position.

To account for the observed difference between typical and atypical objects, we draw on the object-denoting vs. property-denoting distinction for NPs as discussed in Partee 1987 (see also Meier 2003). We suggest that APNPs used to refer to typical objects were interpreted by our participants as *relatively* property-denoting. These NPs provide a property or attribute whose primary function is to identify the referent of the possessor NP, similar to the property-denoting function of NPs in predicate position:

- (9) a. Pat is <u>a teacher</u>.
 - b. Lee is <u>a fool</u>.
 - c. Sam is <u>a marvel</u>.

In this way, the APNPs denoting typical objects tended to be interpreted as property-denoting and were therefore realized by our participants more frequently with the indefinite article.

APNPs used to refer to atypical objects, on the other hand, tended to be interpreted as object-denoting and were therefore realized more frequently with the definite article. The atypicality of these objects rendered them more salient, and hence presumably more topical, rendering them as discourse entities available for subsequent reference. While the object-denoting vs. property-denoting distinction is a categorical one, our findings suggest that the criteria used to determine whether an NP is interpreted as one or the other may well be gradient.

4.2 Uniqueness vs. Typicality

The results of our empirical study suggest that typicality plays a significant role in the use of the definite article. However, this effect was found only in cases where uniqueness does not hold; that is, contextual uniqueness still plays a significant role in a speaker's decision to use a definite article in referring to an object with an APNP – regardless of the perceived typicality of that object. In this way, uniqueness can be seen of as a kind of 'primary' strategy and typicality as a 'secondary'. When the principle of contextual uniqueness is not satisfied, speakers rely on secondary strategies such as typicality to assist their hearer in identifying the intended referent as efficiently as possible.

Moreover, if we consider some very basic assumptions about the cognitive difficulty associated with determining uniqueness versus typicality, it may be the case that, at least for APNPs, these two strategies are ordered with respect to one another. On the assumption that it is easier to determine whether a referent is contextually unique or not than whether it is typical or not, then it might be expected that speakers would rely on the easier strategy to minimize their effort

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and maximize the likelihood that a hearer will successfully identify the intended referent. In our experimental paradigm, participants needed only to ascertain whether the object was unique within the image presented. For example, to know whether a hat was unique, participants needed only scan the other figures in the image to determine uniqueness. In contrast, in the case of a non-unique referent, the speaker must resort to alternative strategies. Presumably, computing the perceived similarity between an object and its exemplar is relatively costly and undertaken only as a 'backup' strategy when uniqueness does not obtain.

5 **Conclusion and Future Directions**

In this paper, we have argued that the (in)definiteness of an attributive-possession NP is sensitive to whether it is being interpreted as property-denoting or objectdenoting (Partee 1987). Typical instances of an object are interpreted more as property-denoting, thus favoring the indefinite, while atypical instances are interpreted more as object-denoting, thus favoring the definite. Moreover, we have shown that typicality is only relevant in the absence of uniqueness; in the case of unique objects, the perceived typicality of the object was irrelevant.

In addition, the results of our empirical study support the claim of Birner & Ward (1994) that uniqueness is at most a sufficient condition for the felicitous use of the definite article; fully two-thirds of the APNPs with non-unique objects were nonetheless produced with a definite article. This use of the definite article in conjunction with non-unique referents represents a challenge for any unified theory of definiteness based solely on the notion of uniqueness.

We do not, however, claim that typicality and uniqueness exhaust the possibilities; other factors may well play a role in guiding a speaker's choice of article for APNPs. Moreover, it is possible that typicality plays a role in guiding article choice for other types of NPs as well. Finally, it would be interesting to extend this paradigm to languages with article systems distinct from English, e.g. Polish, Arabic, Japanese. In the case of a language with only a definite article (and no indefinite one), for example, we would expect speakers of such a language to use anarthrous APNPs for typical objects and arthrous APNPs for atypical objects. In any event, what is clear is that uniqueness alone, while being a powerful explanatory principle, is only part of the story for this class of expressions.

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Gregory Ward, Christopher Ahern, Tom Hayden Department of Linguistics Northwestern University 2016 Sheridan Road Evanston, IL 60208

gw@northwestern.edu

cahern@ling.upenn.edu

thomashayden2007@u.northwestern.edu

Perception of Illegal Contrasts: Japanese Adaptations of Korean Coda Obstruents¹

JAMES D. Y. WHANG New York University

1 Introduction

A series of studies by Dupoux and colleagues (Dupoux et al. (1999), Peperkamp & Dupoux (2003), Vendelin & Peperkamp (2004), Peperkamp (2005)) have proposed that loanword adaptation, which refers to the transformation words go through when they are borrowed from a source language (L2) to a borrowing language (L1), happens entirely during perception. They claim that when an L1 speaker is given an acoustic signal that contains segments that are illegal in his native language, his native phonotactics distort how this signal is perceived, automatically mapping it to the closest well-formed sound, and that this process, called perceptual assimilation, often makes it extremely difficult to perceive nonnative sounds accurately. This paper provides evidence partially contrary to their claims, from adaptations of Korean final coda obstruents into Japanese, showing that Japanese speakers are able to perceive some phonotactically illegal contrasts.

2 Korean Loanwords in Japanese

2.1 Overview

There has been an influx of Korean loans into Japanese since the turn of the 21st century, following a cultural trend in Japan called "the Korean Wave," where all things Korean gained tremendous popularity. The majority of Korean loanwords in Japanese are in the lexical category of cuisine, and it can be assumed that these

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loans are based more on auditory perception compared to western loans, as knowledge of Korean orthography is still relatively low in Japan. Evidence of this can be seen in numerous Japanese web forums where the users discuss the "correct" way to spell and pronounce Korean loans, many bringing up the issue of their own perception (website 1). Korean loans into Japanese, therefore, provide a rare look into the actual process of how words are borrowed with minimal orthographic interference.

2.2 Data

Japanese word structure is primarily CVCV, with only one obstruent coda /Q/, written as \neg in hiragana or \neg in katakana, which normally represents the first half of a geminate (Ito & Mester 1995). Although it is not conventional orthographic practice to have a word end in /Q/, the characters representing it are actually used quite liberally in the word-final position in comic books and the like to indicate an abrupt pause in utterance, which surfaces in speech as a glottal stop.

(1)	このつ	[kono ?]	'why, you!' (literally, <i>this</i>)
	くつ	[ku ?]	'a grunt'
	何ッ	[nani ?]	'what?! (emphatic)'

The glottal stop, however, is optional and is not phonemic in its usage.² By contrast, Korean allows $[p^{\neg}, t^{\neg}, k^{\neg}]$ in coda position (Sohn 1999:165), and as will be discussed later in this section, there are cases in which the three Korean final coda obstruents are mapped to the optional glottal stop in Japanese.

Data were obtained from Japanese websites, including personal blogs and professional sites dedicated to Korean culture, katakana transliterations of Korean pop song lyrics in Japanese karaoke machines, and two native Japanese speakerconsultants from Chiba (Kanto region) and Osaka (Kansai region). According to Japanese orthographic representations, Korean loanwords in Japanese behave similarly to the more well-documented western loans, showing deletion and epenthesis to resolve illegal codas.

(2)	Deletion:			
	[pibimpa p]	>	[bibimbaØ]	'rice dish'
	[kukpa p ٦]	>	[kuppaØ]	'rice in soup'

² There are native Japanese words that end in [?] (5z) [$\mathfrak{f}e$?] 'curse word'), but they are peripheral (Ito & Mester 1995) and the necessity of the final \mathfrak{I} seems to depend on the context.

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(3) Epenthesis:

[h ^w edɔppa p]	>	[øetoppapu]	'rice mixed with raw fish'
[k'enni p]	>	[kenni pu]	'sesame leaf'
[p ^h attf̂u k]	>	[patfu ku]	'red bean porridge'
[t'ɔ k]	>	[to kku]	'rice cake'

Currently, my data show that epenthesis is the most productive repair strategy for Korean coda obstruents, but as my analysis will show in the next section, it is unclear whether this epenthetic vowel is actually the result of acoustic perception or a misrepresentation due to limitations of Japanese orthography in expressing coda segments. Further research and experiment are required before any claims can be made, and thus epenthesis will not be discussed in too much detail in this paper. A new orthographic convention was found in the transliteration of Korean pop-song lyrics in Japanese karaoke machines, which also show epenthesis, but the kana characters that represent codas are written in subscript, presumably to show that the epenthesized vowel is "weak."

(4)
$$[ap^{\neg}]$$
 > $[ap_u]$ $\mathcal{T}_{\mathcal{T}}$ 'front'
[mackimak^{\neg}] > [mackimak_u] マジマ₂ 'last'

There are no instances of epenthesis after $[t^{\neg}]$. Instead, Japanese consistently resolves Korean final coda obstruent $[t^{\neg}]$ by means of debuccalization to a glottal stop, a repair strategy that can be seen with $[p^{\neg}, k^{\neg}]$ as well.

(5)	[kimpa p]	>	[kimpa ?]	'Korean style sushi roll'
	[tig i t]	>	[tigu ?]	'Hangul letter t'
	[hot'ɔ k ٦]	>	[hotto ?]	'grilled rice cake'

The repair strategies above often apply to the same words, resulting in multiple forms of the same words.

(6)	[pibimpa p]	>	[bibimba \emptyset] 'rice mixed with vegetables'
			[pibimpa pu]
			[pibimpa ?]
	[fjejukdoppap]	>	[ffejukutoppapu]'rice mixed with pork'
			[fjejuttoppa?]
	[pindet'ok]	>	[pindetoku] 'flat rice cake'
			[pindeto?]

2.3 Analysis

Because all loanword adaptation occurs at the phonetic level during perception according to Peperkamp & Dupoux (2003), there is no mapping from source pronunciation to nativized pronunciation that is regulated by L1 phonology, meaning the source is not treated as the underlying representation (UR). Rather, L1 phonology is involved in dictating how the acoustic input from L2 will be perceived. It is not surprising then that Japanese repairs Korean coda obstruents through deletion since Korean coda obstruents are strictly unreleased and thus acoustically similar to zero. On the other hand, what is surprising is that the two examples in (2), relisted below, were the only words that showed deletion.

(7)	[pibimpa p ٦]	>	[bibimbaØ]	'rice dish'
	[kukpa p ٦]	>	[kuppaØ]	'rice in soup'

All other loans show epenthesis or debuccalization, and while vowel epenthesis is by far the most productive repair strategy in Japanese for western loans, it is rather unexpected in the case of the unreleased Korean coda obstruents since epenthesis is usually an attempt to mimic release (Jun 2002). To confirm whether perceptual epenthesis actually occurs, I conducted a pilot perceptual experiment, where I recited five Korean words out loud twice and gave my two speaker consultants the task of repeating after me, then transcribing the words into katakana by hand. The results were as shown in (8) below. Romanized forms of the katakana transcriptions have been provided in parentheses.

(8)			Kanto	Kansai	
	Stimulus		Speaker	Speaker	Definition
	[t ^h a p ٦]	>	[ta ?], [tap [¬]]	[ta ?]	'tower'
			タツ ,	タ	
			(taQ, tap_u)	(taØ)	
	[k'onni p]	>	[konni p]	[konni?]	'flower petal'
			コンニ _プ	コンニ	
			(konni p u)	(konniØ)	
	[ma t]	>	[ma ?]	[ma ?]	'flavor'
			マツ	マ	
			(maQ)	(maØ)	
	[mo k]	>	[mo ?]	[mo ?]	'neck'
			モッ	モ	
			(moQ)	(moØ)	
	[sutkara k ٦]	>	[sukkara ?]	[sukkara ?]	'spoon'
			スッカラ ッ	スッカラ	
			(sukkara Q)	(sukkaraØ)	

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While the results above reveal that perceptual epenthesis does not occur after Korean final coda obstruents, they also reveal that the relationship between Japanese speech and orthography is somewhat unreliable when it comes to coda obstruents. First, notice that both consultants' speech show debuccalization for all of the words except the second, but the Kansai speaker's transcription shows deletion rather than debuccalization. I was surprised at the consistent discrepancy between the Kansai dialect speaker's speech and transcription and inquired her regarding the matter, but she stated that her transcriptions accurately represented what she heard, meaning the final glottal stop in her speech is non-contrastive. Second, the Kanto dialect speaker's transcription uses subscript kana to represent the coda [p] for the first two examples, showing that it represents an unreleased lip closure. However, when I asked the Kansai speaker about the subscript kana, she claimed that she would read it like a full-sized kana and that the smaller size of the kana is meaningful only in that it lets her know that the sound is "weaker" in Korean. So it seems that while subscript kana is an attempt to mimic the unreleased Korean coda obstruents, there still is no consensus on what the correct way to read it is. Given the experimental results above, I will assume that epenthetic vowels in Korean coda adaptations are not the result of a misperceived extra vowel, and thus will focus on debuccalization. In fact, the epenthesized forms are usually found in websites run by Korean individuals or companies, who may be basing their transcriptions on what they expect Japanese speakers to do.

Debuccalization, a process in which the supralaryngeal articulation of a consonant is lost, satisfies the Coda-Condition constraint in Japanese, which disallows place in coda (Kager 1999:131), by neutralizing the three Korean coda obstruents $[p^{\neg}, t^{\neg}, k^{\neg}]$ to glottal stop.

(9)	[pi ip]	>	[piu ?]	'Hangul letter p (lax)'
	[o&giŋɔ&͡ɔt]	>	[o&ino&o?]	'marinated raw squid'
	[ʧuk]	>	[tju?]	'porridge'

This process of debuccalization of Korean coda obstruents in Japanese shows that native Japanese speakers are able to perceive the presence of a final stop. A similar case of debuccalization can be seen in Bahasa Indonesia loans into Selayarese (Broselow 2002). However, unlike in Selayarese, word-final glottal stop is not a phoneme but an optional variant of \emptyset in Japanese (Bloch 1950), and thus, this neutralization of $[p^{\neg}, t^{\neg}, k^{\neg}]$ to glottal stop, while it preserves the restriction against place contrast in coda, violates another restriction against a contrast between final glottal stop and final zero.

Peperkamp and Dupoux probably would not use Optimality Theory to support their arguments, but it is useful in illustrating the mechanism behind how things get perceived. Therefore, provided below are the constraints and their ranking from Furukawa (2009), which reflect how Korean coda obstruents are perceived

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in Japanese. I would like to clarify that the tableaux below do not represent the mapping from a lexical entry to a surface form, but rather a mapping from acoustic input to a perceptual representation based on Peperkamp & Dupoux's (2003) argument that all loanword adaptation occurs during perception.

- (10) Constraints
 - a. CODACOND *Place]σ. A coda may not have its own place feature (though it may share place features with a following onset)
 - b. IDENT-IO [Place]. Correspondent segments in input and output have identical values for their place of articulation
 - c. IDENT-IO [Release]. Correspondent segments in input and output have identical values for their release characteristics (i.e., whether they are audibly released or not)
 - d. MAX-IO. No deletion.
 - e. DEP-IO. No epenthesis.
- (11) Korean input: pibimpap[¬] > bibimbaØ or pibimpa?'rice mixed with vegetables'

	Ranking Variable						
Source Pronunciation		pap⁻	CODACOND *Place]σ	IDENT-IO [Release]	Max-IO	IDENT-IO [Place]	Dep-IO
Perception Candidat		a. papu		*!			*
	ł	b. pa			*	>	
	¢,	c. pa?				*	
on		d. pap [¬]	*!				

Compare (11) above to (12) below.

			Tunking Variable					
Source Pronunciation	paīp	CODACOND *Place]σ	IDENT-IO [Release]	Max-IO	IDENT-IO [Place]	Dep-IO		
Perceptior Candidate	🖙 a. paipu			 	>	*		
	b. pai			*!	>			
	c. pai?¬		*!		*			
	d. paip¬	*!	*					
S	e. paip	*!			>			

(12)	English input: parpr	′ > pai pu	'pipe'	([p~] stand	s for release)
				Re	anking Variable

Furukawa's analysis shows that epenthesis is dispreferred for Korean loans because there is no release, which is not surprising since epenthesis is usually an attempt to preserve a misperceived release (Jun 2002). However because place contrast in codas is disallowed, native Japanese speakers are left to choose either deleting the consonant completely or deleting just the place features. A jagged line was used between MAX-IO and IDENT-IO [Place] because the ranking of the two seems to be variable depending on the speaker.

3 Discussion

Tableau (11) illustrates the idea that given an acoustic signal containing unreleased coda obstruents, it is equally possible for native Japanese speakers to perceive the phonotactically illegal segment as either non-existent or as a placeless coda. However, the distribution of deletion vs. debuccalization is extremely skewed, with only the two items in (2), listed again below, showing deletion.

(13)	[pibimpa p ٦]	>	[bibimbaØ]	'rice dish'
	[kukpa p ٦]	>	[kuppaØ]	'rice in soup'

A possible explanation for this is that the two items above have been the all-timefavorite Korean dishes in Japan since before "the Korean Wave," when the knowledge of Korean phonology in Japan would have been extremely low. Early English loans into Japanese in the 19th and early 20th centuries had also undergone final coda deletion when borrowed under similar circumstances (Smith 2006).
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(14)	English		19th-20th Century Adaptation
	pocket	>	[pokkeØ]
	lemonade	>	[ramuneØ]
	jitterbug	>	[&irubaØ]

Since Japanese optionally inserts a glottal stop utterance-finally, it is quite possible that the final $[p^{\neg}]$ in the two examples in (13) completely deleted because it was perceived as a pause in utterance. All other loans were borrowed much more recently following the rise in popularity of all things Korean, and therefore, the borrowers would have had a higher level of proficiency in Korean and known that Korean allows coda obstruents word-finally. Of course, it is possible that the earlier loans in (13) were perceived with a glottal stop, but the fact that they did not explicitly note the presence of a coda segment orthographically suggests that the glottal stop was treated as non-contrastive. The more recent loans, however, do explicitly note the coda segments, meaning they are now treated as contrastive even though they are not contrastive in the native phonotactics. Evidence of this is the presence of pairs in which the final glottal stop becomes contrastive. In (15), /t'ok/ is repaired by epenthesis, creating a minimal pair (the pitch-accents were identical for the Kansai speaker, though they differed for the Kanto speaker) with debuccalized /t'okkuk/:

(15)	[ť'ɔ k ٦]	>	[to kku]	'rice cake'
	[ť`okku k ¬]	>	[tokku ?]	'rice cake soup'

The experience of my Kanto dialect speaker-consultant also seems to confirm a correlation between L2 proficiency and perceptual sensitivity toward phonotactically illegal segments, as she has been taking Korean language classes for a year and performed better than the Kansai dialect speaker in perceiving and noting the presence of the Korean coda obstruent. She claims that taking the classes has helped her to hear these segments she was once "deaf" to, although she admits that it is still difficult for her to distinguish among the three obstruents.

It is somewhat surprising that $[p^{\neg}]$ is neutralized despite its visually apparent labial feature. Both of my speaker consultants neutralized $[p^{\neg}]$ to a glottal stop, although the Kanto dialect speaker corrected herself the second time.

(16)	Stimulus		Kanto Speaker	Kansai Speaker	Definition
	[t ^h a p ٦]	>	[ta?], [tap]	[ta?]	'tower'
			(taQ, tap_u)	(taØ)	
	[k'onni p]	>	[konni p 7]	[konni ?]	'flower petal'
			コンニィ	コンニ	
			(konni p _u)	(konniØ)	

This may be due to the fact that lip closure occurs freely in the coda position in emphatic/firm speech in Japanese (/hai/ > [haip¬] 'yes', /ikimaseN/ > [ikimasem] 'not going'), and thus is not treated as contrastive.

Generally speaking, however, debuccalization of $[p^{\neg}, t^{\neg}, k^{\neg}]$ seems quite similar to how final /n/ of English and French loanwords are dealt with in Japanese. English /n/ is mapped to the moraic nasal consonant of Japanese, which assimilates in place to a following consonant, or, if word-final, surfaces as a uvular nasal or just a nasalization of the preceding vowel. French /n/, on the other hand, is unnecessarily repaired as a geminate nasal followed by an epenthetic vowel (Vendelin & Peperkamp 2004).

(17) From Vendelin & Peperkamp 2004

[skri:n]	>	[sukuri:n]	'screen'	English
[dwan]	>	[dua nnu]	'customs'	French

Vendelin and Peperkamp attribute this difference in adaptation strategies to the differences in length and intensity of final [n] in both languages and their release. Phonetically, /N/ in Japanese is placeless in the same way glottal stop is, and if it is the case that English final /n/ is being mapped to the placeless /N/ because it is perceived to be weaker than French final /n/, then this could also mean that Korean coda obstruents are resolved through debuccalization rather than through epenthesis because Japanese speakers perceive the strictly unreleased coda obstruents of Korean to be weaker than the variably released English final coda obstruents.

4 Conclusion

Dupoux and his colleagues argue that all loanword adaptations occur during perception and that any structure that is phonotactically illegal in L1 is mapped to the closest legal native counterpart. However, this paper has shown an intermediate case with Korean loanwords in Japanese, where one illegal contrast fails to get perceived (place in the coda) while another illegal contrast that results from the first failure does get perceived (presence vs. absence of final stop, realized as

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glottal stop vs. zero), the latter of which was not perceived with older loans, as the orthography suggests. This development of sensitivity towards illegal contrasts can be linked to L2 proficiency, and my pilot perceptual experiment seems to support this. However, there may be other factors involved in my speaker-consultants' different levels of sensitivity towards Korean final coda obstruents, such as high vowel devoicing between voiceless segments, which is observed in the Kanto dialect but not in the Kansai dialect. Another possible explanation for the sensitivity toward illegal contrasts is that there is more direct exposure to Korean acoustic sources through various media outlets such as pop music, television shows, and movies; debuccalization may be evidence that the optional utterance-final glottal stop is becoming phonemic through this increased exposure.

The greatest shortcoming of this research, even with my two speaker consultants, is that my analysis is based heavily on the orthographic representations of Korean loanwords in Japanese, which is very limited in its ability to express coda segments, although there are new orthographic conventions that try to remedy this. A larger-scale perceptual experiment than what was presented in (8) should provide clearer insight into how Korean final coda obstruents are perceived in Japanese. Besides looking just at how native Japanese speakers from different dialectal regions with different levels of exposure to Korean perceive acoustic stimuli, an interesting experiment could be to test whether their perception changes based on whether they are told that the acoustic stimuli are Korean, English, or an artificial language.

This research also brought up some new questions, such as the environments in which glottal stop and lip closure surface. They both occur utterance finally, but it is unclear whether they are simply two different surface forms of /Q/ or they are to be treated separately. Thus far, it seems likely that glottal stop is the default and lip closure an allophone, but further research is required.

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James Whang New York University Department of Linguistics 10 Washington Place New York, NY 10003

james.whang@nyu.edu

Diglossia versus Register: Discursive Classifications of Two Sinhala varieties

CALA ZUBAIR University of Buffalo

Introduction

Though Sinhala is the native language of the majority Sri Lankan Sinhalese population, it consists of two contrastively defined varieties commonly referred to as 'Colloquial' and 'Formal' Sinhala. In categorizing spoken Sinhala into a 'formal' and 'colloquial' variety, past research (Gair 1968; DeSilva 1974; Paolillo 1997) draws primarily on Ferguson's (1959, 1991) notion of diglossia where two related languages are lexically and grammatically distinct and prescriptively used in different social domains. Formal Sinhala includes elaborate nominal declensions and verbal paradigms and is the primary medium of bureaucratic and state-funded educational establishments. Colloquial Sinhala is the informal variety used outside of institutional settings with simplified tense, pronominal systems and a distinct lexicon. Problematizing diglossia theory's reliance on axiomatic grammatical categories and discrete formal and informal social environments as well as prestige values, I utilize Agha's (2007) recent reworking of register theory (cf. Biber & Finnegan 1994; Biber 1995; Milroy 2001) to move beyond diglossia's dichotomous, top down classification system, at the expense of more dynamic approaches to language variety classification. Agha's enregisterment model incorporates the sociohistorical contexts through which diglossic formations emerge, particularly prioritizing the role of discourse in creating, maintaining, or challenging diglossic systems.

The discourse I focus on in this study comes from interviews and ethnographic work with Sri Lankan university youth. While diglossia theory proves insufficient in depicting the way these youth mix 'formal' and 'colloquial' morphosyntactic features in the same social setting, Agha's register approach to Sinhala optimally accounts for the specific dialogic effects speakers attach to linguistic features, suggesting such interdiscursive meaning combined with sociohistorical backgrounds of the varieties explains the registers' composite recognition as divergent.

My work specifically builds on Agha (2007) in understanding diglossia maintenance and change through instances of specific discursive interactions, whereas previous enregisterment studies have relied on evidence from widely available pubic discourses. Also, I build on Sinhala language studies. While much descriptive linguistic research on these varieties exists, few studies have made use of natural speech samples and no strictly sociolinguistic study has considered the discursive construction of each variety.

1 Diglossia Revisited

Ferguson introduced the term diglossia, borrowed from the French term 'diglossie' (Marsais 1930), meaning 'bilingualism,' to describe two superposed but functionally differentiated 'high' and 'low' prestige varieties. Since Ferguson's initial 1959 study of Arabic, Greek, German, and Haitan Creole diglossia scholars in a diverse range of fields (linguistics, anthropology, sociology, and education) have adopted this concept to study language variation (Bell 1976), language planning and maintenance (Fishman and Das Gupta 1986), language standardization and dialectology (Fasold 1984; Yaeger-Dror 1988), code switching, bilingualism, and language contact (Fishman 1967).

Table (1) below shows the criteria developed in Ferguson's (1959) study to label 'High' (H) versus 'Low' (L) varieties. Notably, functional differentiation of H and L varieties is considered to be stable, reinforced through standardization of the H variety in grammars, dictionaries, and canonical texts. In addition, H varieties closely resemble older, written forms of a language as found in literary works. Because of such a resemblance, H varieties are typically more grammatically complex than L varieties (as indicated in the table below) and spoken in what Ferguson calls 'formal' settings, such as educational, state, and institutional establishments. L varieties are spoken 'informally' among family and friends and are acquired from parents. H varieties are learned in school and are collectively viewed as a more educated, prestigious, or correct way of speaking. Thus, H varieties are the prestigious variety and L varieties and usually not valued by the community, considered 'bad' or 'uneducated' language (Schiffman 1978).

	High Variety	Low Variety
Functional differentiation across social spheres	Spoken in formal set- tings: educational, state, institutional, certain types of media	Spoken informally: among friends, family, outside of institutions
Prestige	'High' prestige value	'Low' prestige value

(1) Table 1: Ferguson's Diglossia Rubric

Literary Heritage	The language of a large body of classical litera- ture including canonical religious texts, ancient poetry, public speeches	No written records or literary cannon supporting this varie- ty; much changed from written language
Acquisition	At school through education	Learned first at home from parents
Stability through Standardi- zation	Standardized through grammars, dictionaries, canonical texts	Rarely standardized
Structure (grammar, lexicon, phonology)	More complex gram- mar; different lexicon (possible overlap); shared morpho- phonemics or comprising a Superset	Less complex grammar, different lexicon (possible overlap), shared mor- phophonemics or sub- set of H variety

Now revisiting some of diglossia's classification principles, I will focus on the issues of functional differentiated language use among 'formal' versus 'informal' social settings, prestige value of H and L varieties, and the limits of morphosyntactic repertoire categorizations. First, diglossia theory's prescriptive use of dichotomous formal/informal social settings, where formal settings predict the use of an H variety (Formal Sinhala) and informal settings predict the use of an L variety (Colloquial Sinhala) cannot account for the code mixing that speakers in my study exhibited. As Wilce (2010) notes, code mixing under Fergusons' model may either be interpreted as impossible, or unlikely due to the fact that codes are designated for fixed speech environments where violations would be so negatively valued, they would never, or rarely occur.

Moreover, approaching language with this initial taxonomic view of speech setting, formal versus informal, cannot explains differences in social meaning of the varieties cross-generationally. In other words, Ferguson's prestige scale conflates prestige with functional differentiation of varieties (including use across different settings), where institutionalized language is automatically labeled as more prestigious, overlooking speaker demographics, instances of covert prestige, and counter-valorizations of varieties. For certain groups of speakers, such as the youth I interviewed in this project, speech will indicate that the L variety, or Colloquial Sinhala, is in fact prestigious, valorized by youth who denigrate the formal, 'High' variety.

As the topics of social setting and prestige scales have been defined, by Ferguson (1959) and in subsequent studies, they also reflect a narrow methodological labeling that overlooks the crucial sociohistorical narratives and ideologies surrounding 'varieties' or 'registers.' Particularly, researchers have failed to treat what Agha (2007) calls 'reflexive' semiotic processes, processes that depict how linguistic units are valued, and which create and reinforce boundaries between use of H and L varieties (cf. Silverstein 1996; Agha 2002; Irvine and Gal 2000; Haeri 2003). Within the Sinhala literature especially the formal/informal division led researchers to identify and name two varieties of Sinhala as 'Formal' and 'Colloquial.' These quantifier free names depict a stereotypical assumption that the varieties are universally used in either a formal or colloquial setting. Without giving details on what counts as formal or colloquial, who uses which variety and when, the names also assume social settings fit into neat compartmentalized categories and that these categories apply across a range of locales. The names reify a false dichotomy for researchers as well as speakers. Without substitute names, for the present, I will continue to call each variety formal and colloquial, though the names of Sinhala varieties will be something I consider for future research.

2 The Sinhala Language: Morphology, Syntax, Lexicon

In addition, past Sinhala studies (DeSilva 1974, 1979; Gair 1968, 1998; Fairbanks et al 1986; Paollilo 1992, 1997) detail in abundance how the Colloquial variety is distinct from Formal Sinhala in several morphosyntactic ways (Table 2). Colloquial Sinhala nouns have a less complex declension, fewer cases, differences in semantic and syntax of cases, lack of subject/verb agreement, and simplified tense, mood, and voice when compared with Formal Sinhala. Formal Sinhala maintains subject/verb agreement in person, number, and gender and has complex nominal declensions reminiscent of the written, literary variety. Formal Sinhala also has a different lexicon than Colloquial for prepositions, conjunctions, pronouns, and deictics (Gair 1968). Additionally, because Formal Sinhala has evolved from an older, literary tradition which is closely related to the ancient Indo-Aryan languages of Sanskrit and Pali, many of its lexical items are not used in Colloquial Sinhala or are used in a changed form.

	Colloquial Sinhala	Formal Sinhala
Nouns: Declension	SG/PL	SG/PL MASC/FEM ANIM/INANIMATE
Case	NOM, ACC, DAT, GEN, INSTR, LOC	+ ABL, VOC, AUX
Semantics of case	 1) LOC: place 2) ACC: patient subjects 	 LOC: time and place INSTR: patient subjects
Syntax of Case (Argument realization)	INSTR: object/oblique	INSTR: subject/object/oblique
Verbs: SV AGR	-	+
Tense	NPRES, PRES	+ FUT, PER, IMPER
Mood	IND, IMP, OPT	+COND
Voice	Active	Active/Passive
Word Order	SOV	unfixed

(2) Table 2: Colloquial and Formal Sinhala

While these structural differences are noteworthy, such a 'repertoire-based' perspective, a categorization of grammatical lexical, phonetic, and other structural ways the two language varieties differ (Agha 2007: 148), remains incomplete. These analyses fail to consider sociohistorical evidence, natural speech data, or the discursive construction of each variety. Without an initial sociohistorical study, they cannot explain how widespread functional differentiation contributed to the evolution of structural divergence or how such structures became associated with social practices at all. In answer to this, I give a brief introduction of the macro-social narratives identified with each variety in Section 3, followed by an analysis of natural speech samples in Section 4.

3 Sociopolitics: Cultural Preservation Versus Modernism

The story of the Formal and Colloquial varieties begins with past struggles of nationalism versus current moves for the state's upward economic mobility. Ideologically, I characterize this as cultural preservation through Formal Sinhala versus modernism as attached to Colloquial Sinhala.

Formal Sinhala became an essential part of nationalist identity in the decades surrounding the country's postcolonial independence (1930's-1940's). Sinhala

nationalists made policies targeting students as a vital demographic for cultural preservation in the face of modernism; and Formal Sinhala the vehicle of purism through which students could regain this idealized, pre-colonial way of life. Born from efforts to gain majority rule, such policies promoted discourses of ethnic nationalism, valorizing Formal Sinhala through a series of 'Sinhala -only' campaigns. These campaigns promoted Formal Sinhala as the premier language for all aspects of the newly formed, democratized and bureaucratized state. Throughout the 1940s, voices like future prime minister J.R. Javawardene called for change in the official government language rallying before the State Council for Sinhala to replace British, Colonial English as the primary medium of government and state institutions. In 1956, Congressman Bandarnaike won the presidency on the 'Sinhala-only' platform, utilizing language policy as a way to cross cut class lines and unite the people with visions of a unified Sinhalese state (DeVotta 2003). Promising Formal Sinhala language instruction would lead to recovery of a lost culture and strengthen the bonds of statehood, the 1960s parliament began to fund schools where Formal Sinhala was the primary medium of instruction (Kearney 1967; Sharma 1988). These schools, unlike pre-existing, British- founded private schools, were made publically accessible to all demographic groups, and currently comprise the majority of primary and secondary educational institutions on the island. Thus, with increased government job opportunities and education institutions backing this variety, there has been a rise in country wide proficiency in Formal Sinhala and institutional proliferation of ideological associations between this 'pure' variety and cultural preservation.

However, while Sinhalese nationalists have repeatedly valorized Formal Sinhala, proclaiming student education in this variety essential (Dharmadasa 1993; DeVotta 2003), the Colloquial Sinhala variety has continued to make up a fundamental part of everyday language including use in casual conversations, social encounters outside of institutional settings, use on the internet (facebook pages), in media (i.e. TV dramas, pop radio shows), and particularly as a fundamental part of present day youth identity. Particularly, the state has allotted funds in the last 10 years to supplement Formal Sinhala medium classrooms with English language instruction in an effort to become more competitive in the global market and lend support to the country's growing economic crisis. Thus, while more youth are gaining skills in English, this is at the expense of Formal Sinhala. In many ways the new cosmopolitan, youth student is associated not only with English, but with Colloquial Sinhala usage where a lack of Formal Sinhala education has robbed her of knowing any better.

Moreover, youth are using and engaging in Colloquial Sinhala in an increasing number of new media. With the spread of the internet, for example, and need for efficient transliterations of Sinhala text, youth have relied on the colloquial variety, adding inventive slang forms to its repertoire. Newer, youth-oriented TV and radio stations are competing with older, more established news stations and news shows, broadcasting music videos and talk shows with youth speaking Colloquial Sinhala.

Such usages of Colloquial Sinhala are a hot topic for conservative nationalists who discuss youth proficiency in Formal Sinhala on radio and televised debates, suggesting how the government can continue to uphold this endangered, 'pure' language. Additionally, cultural sections of Formal Sinhala newspapers often host commentary with Sinhala scholars commenting on the way these usages 'pollute' the Formal Sinhala language that has survived seemingly unchanged for so many centuries. The colloquial language is charged with leading to the endangerment and extinction of the true Sinhala language and the heritage it carries with it (Dharmadasa 1993).

4 Nationalist Parodies: 'Formal' Usages in 'Colloquial' Encounters

Moving on to some examples of how you use Formal and Colloquial Sinhala, the following data comes from youth speakers in informal, conversational interactions. For the present study, I am tentatively labeling use of 'formal' language in **bolded font**, where surrounding *italic segments* constitute 'colloquial' language (as per past Sinhala morphosyntactic studies discussed in Section 2).

kivanna

say.

IMP

ehe

there

kiyuwa.

say.

PST

iddi.

stay.PST

- (3) Example 1
 - (a) Jayantha Mang eyaaTə MahindaTə 'hi' 1SG. 3SG. Mahinda. hi DAT NOM DAT 'Tell him to say 'hi' to Mahinda for me.' (b) Chathura (voicing Ou eyaa kiyənəwa Kavan) 3SG.NOM say.NPT veah 'Yeah, he says there,

(c) Chathura (voicing Kavan)	" Ayubow a greetings ' "Gree	an gau hone tings hono	ruwuniya orable rable, son." '	puthrəyaa." son
(d) Jayantha (voicing the President	" Bohoma many	istuthi thanks,	<i>MAGE</i> 1SG.GEN	puthrəyaa . " son
	· "Mai	ny thanks,	MY son.	

Here Jayantha and Chathura engage in a casual conversation, constructing a dialog between their friend Kavan, newly appointed to a government post, and the president of Sri Lanka, Mahinda Rajapaske. The speakers use the realm of the state as the common component hypothetically linking the two characters. As Chathura plays the voice of Kavan, he parodies his friend's misuse of the formal variety. Meaning to greet the 'President' with a formal word equivalent to English *sir*, 'Kavan' instead calls the 'President' *puthrəyaa* 'son' in line (3c) (an unlikely mistake since the 'colloquial' word for *son* is *puthaa*, a shortened version where the final morphology is dropped). Jayantha responds in line (3d), with the voice of the 'President' who points out 'Kavan's' mistake by calling 'Kavan' *puthrəyaa* 'son.' With emphasis on the word *mage* 'my', the 'President' not only draws attention to 'Kavan's' misuse of a formal term, but uses a colloquial pronoun that contrasts with the surrounding formal speech, thus suggesting that Kavan requires a colloquial insert to understand his mistake.

Where diglossia research predicts resolute 'colloquial' speech, here youth are violating theoretical expectations by shifting into 'formal' features in an informal setting. Such code mixing seems to be directly related to how each variety is discursively constructed and representative of different ideologies. In other words, these speakers use the two varieties to achieve specific dialogic affects. They construct Formal Sinhala dialog in the midst of a Colloquial Sinhala conversation to parody the way a youth speaker uses the variety, which both detaches it from a youth character type and connects it to older, authoritative politician.

In Example 2, Priya, Sharmilla, and Buddhika discuss a friend who's father was a diplomat and knew the former Prime Minister, whom they think attended their friend's sister's wedding.

(4) Example 2

(a) Priya

<i>Oyaa</i> 2SG.	<i>eyaage</i> 3SG.	<i>thatha</i> father	<i>diplomat</i> diplomat	<i>kennek</i> person	<i>dannəwa-də?</i> know.
NOM	GEN				NPT-Q
(37	1 1	· 1 1	1. 1	(0)	

'You know his dad was a diplomat?'

(b) Priya

Eyaa Ranilwə dannəwa. 3SG.NOM Ranil.ACC know.NPT 'He knows Ranil.'

(c) Shar-							
milla	Mang	hitannə	Ranil	eyaa-	nana-	man	- aavə.
	0			ge	gige	gale	уə
	1SG.	think.	Ranil.	3SG.	sister.	wed	- come.
	NOM	NPT	NOM	GEN	GEN	ding	PST
	'I th	ink Ranil	came to	his sister	's wedd	ing.'	
(1) D 111	•1						
(d) Buddh	ilka		- J		n liter		1.:
	Uu Vac	, <i>macn</i> ah duda	o aoor door	'ð lange · near	a nildz stan	<i>zənnə</i> A NDT	niləyə. stav
	yca	in uuuc	uooi	ncai	PA1	RT	Stay. PST
	ʻYe	ah. dude v	vas stanc	ling near	the doo:	r.'	101
		,		0			
(e) Buddh	ika						
(voicing	"K	arunawei	n aat	huləTə	ennə,		sir."
Shehan)	res	pectfully	111	de.DAT	come	NPT	SIT
		Respectfu	illy come	e inside, s	S1r.		
(f) Buddh	ika						
(voicing	"B	uffet eka	эТə	mehen	g ini	nə."	
Shehan)	but	ffet DI	EF.DAT	way	co	me.NP7	Γ
,	• "C	ome this v	vay for the	he buffet.	›› ›		
			-				
(g) Buddh	ika						
(voicing	"A	h tha	runayar	n nitha	ərəmə	ba-	
			.1			laapor	oththuwa
K.W.)		you	th	conti	nue	expecta	ition
		An, th	e youth c	continuot	isiy		
(h) Buddh	ika						
(voicing		vinaashə	kərəna	wa na	ieae.		
R.W.)	des	stroy	do.NP	T N	EG		
,	0	cease to di	sappoint	· ›› ›			

In lines (4e-h), Buddhika plays the voice of both his friend <u>and</u> the former Prime Minister of Sri Lanka, Ranil Wickremasinghe (R.W.), creating a scenario where his friend welcomes Mr. Wickremasinghe to a wedding. Similar to Example 1, here a youth speaker's Formal Sinhala is being parodied where lines (4e-f) represent the voice of the friend and fellow classmate, Shehan. In line (4e), we see formal lexical items *karunawen aathulaTa* 'respectfully inside' being paired with a colloquial verb *enna* 'come.' In line (4f), Shehan switches completely to Colloquial Sinhala, the humorous crux of this line resting on the word *buffet*, which

stands out amongst formal speech both because of the English usage, and Shehan's social faux paux of openly admitting that food is the way to the wedding guest's heart. Since in lines (4g-h) 'Mr. Wickremasinghe' expresses pleasure in Shehan's welcome, however, Shehan is excused for his 'rough' colloquial language that did not offend the 'Prime Minister' as evidenced by his reassurance using the expected Formal Sinhala in lines (4g-h).

Again, youth discourse is characterizing Formal Sinhala as the language of politics, characterizing a well-known political figure as the stereotypical speaker whose proper use of Formal Sinhala indicates this variety is not the language of a younger speaker, whose usage fails in comparison.

Looking briefly at one last example, we see that Formal Sinhala is not always used as the voice of politicians but can also be more generally associated with older, authoritative speakers:

(5) Example 3

```
(a) Manjula
```

Nah, machang.		'Abey'			nithərəmə		
No dude		Mr. Abe	Mr. Abeygunawardana			a ST.	
'N	No dude. 'A	Abey' used	d to say.				
"Mehe	enda,	mehe	enda,	n	nehe	enda."	
here	come. NPT.IM	here P	come NPT.	. h IMP	ere	come. NPT.I MP	
"Co	me here, c	come here,	come h	ere." '			
"Aiyoo	oo, umi	ba	poda	sir."			
EMP	2.S	G.NOM	small	sir			
ʻ "Ooooh	, you are a	a small one	e, sir." '				
"Ои,	mai	ng	ithing	kallu.'	,		
yes	1.S	G.NOM	EMP	black			
ʻ "Yes,	I am unwo	orthy like t	hat."'				
(1	iterally 'I a	am black'))				
	Nah, m No d 'N "Mehe here "Co "Aiyoo EMP '"Ooooh "Ou, yes '"Yes, (1	Nah, machang. No dude 'No dude. 'A "Mehe enda, here come. NPT.IM "Come here, c "Aiyoooo, uma EMP 2.S '"Ooooh, you are a "Ou, maa yes 1.S '"Yes, I am unwo (literally 'I a	Nah, machang. 'Abey' No dude Mr. Abey 'No dude. 'Abey' used "Mehe enda, mehe here come. here NPT.IMP "Come here, come here, "Aiyoooo, umba EMP 2.SG.NOM '"Ooooh, you are a small ond "Ou, mang yes 1.SG.NOM '"Yes, I am unworthy like t (literally 'I am black')	 Nah, machang. 'Abey' No dude Mr. Abeygunawa 'No dude. 'Abey' used to say. "Mehe enda, mehe enda, here come. here come NPT.IMP NPT." "Come here, come here, come	 Nah, machang. 'Abey' No dude Mr. Abeygunawardana 'No dude. 'Abey' used to say "Mehe enda, mehe enda, mehere come. here come. here come. here come. here come. here come here come here come here. NPT.IMP NPT.IMP "Come here, come here, come here."' "Aiyoooo, umba poda sir." "Aiyoooo, umba poda sir." "Aiyoooo, umba poda sir." "Ou, mang ithing kallu." yes 1.SG.NOM EMP black "Yes, I am unworthy like that."' (literally 'I am black') 	Nah, machang. 'Abey' niths No dude Mr. Abeygunawardana say.P 'No dude Mr. Abeygunawardana say.P ''No dude. 'Abey' used to say PRG ''No dude. 'Abey' used to say mehe ''Mehe enda, mehe enda, mehe here come. here come. here NPT.IMP NPT.IMP here "Come here, come here, come here." ' '' "Aiyoooo, umba poda sir." EMP 2.SG.NOM small sir<''	

Diglossia Versus Register: Sinhala

(e) Kenneth (voicing Manjula)	<i>Nah</i> no 'No, duo	<i>macha</i> dude de Mr.	ang. Abey	<i>Mr. A</i> Mr. A gunaw	<i>beyguna</i> beyguna ardana,	w <i>ard</i> awarc sir	<i>lana, si</i> lana si	r r	
(f) Kenneth									
(voicing	nithəra	əmə	"Miin	ıa,	miina,		miina,	m	iina."
	ki:u:w	a,							
Manjula)	say.PS'	Τ.	here		here		here	he	ere
	PRG		come		come.		come.		me.
			NPT.	IMP	NPT.IN	ΛP	NPT.IM	P N	PT.IMP
	used 1	to say,	"Com	'ere, c	om'ere,	com'	ere."		
(g) Manjula									
	Me	ithing	u	mbage	kallı	ı a	mmi.	Mang	5-
	well	EMP	2.	.SG.	blac	k n	nommy	1.SG	.NOM
			G	ΈN					
	'Well, tl	his thir	ngyou	ır motl	her was	unwo	orthy. I-'		
(h) Kenneth									
	Dhang	'ma	ng'?	Dhar	ng 'ma	ng'.	Hella	Basa,	no?
	now	1.SC	J.	now	1.S	G.	'true'		no
		NO	М		NO	М	langua	ige	
'Now vou sa	av 'I' (inf	formal	lv)? No	ow 'I:'	(inform	allv).	Formal	Sinhal	a. no?'

(i.e. What about Formal Sinhala?)

In this example, Kenneth and Manjula are discussing an old school teacher. Manjula begins in line (5a-b) by correcting Kenneth's impersonation, introduces his voicing of the teacher with the Formal Sinhala quotative *nithərəmə kiuwa* 'used to say' (5a), then using the Formal Sinhala that the teacher would have addressed them with. Kenneth responds in lines (5c-d) by continuing his impersonation, but note he is still using mostly Colloquial Sinhala. Then in line (5e-f), Kenneth turns to mocking Manjula. Using the formal morphology on the verb 'say' in (5f), he repeats Manjula's *nithərəmə kiuwa* 'used to say' from (5a). Kenneth draws attention to the formal usages through elongated initial and medial vowels (*ki:u:wa* 'say'). Asserting that Mr. Abeygunawardana would have said *miina, miina, miina* 'com'ere, com'ere, 'Kenneth mocks Manjula's voicing of the teacher in Formal Sinhala (*mehe enda* 'come here') using an elongating vowel [i] to combine the Sinhala for 'come here' so that it becomes *mina* 'com'ere.' Manjula responds in line (5g) with an insult to Kenneth based on his

low birth not only mentioning his mother, but mirroring Kenneth's use of the pronoun *umba* 'you' in line (5c), which is a slang term used in derogatory social deixis (Tilakaratne 1988). Ignoring the insult, in line (5h), Kenneth instead highlights Manjula's use of the colloquial 1st person pronoun, *mang* 'I,' asking him why he is no longer speaking *Hella Basa*.

The use of this term specifically references nationalist language ideology. *Hella Basa* historically refers to a variety of literary Sinhala from the 13th century A.D. which was resurrected by nationalist discourses in the 1950s to refer to 'the true, heritage language' and is now largely interchangeable with Formal Sinhala (Dharmasada 1993). Kenneth's use of this term connects Manjula's Formal Sinhala to past nationalist discourses at the same time framing Formal Sinhala as the language of an older generation (with nationalist political leanings) to be mocked when used by younger speakers.

As in Example 1 and 2, Example 3 clearly shows that mixing of the two Sinhala registers occurs. Thus, the most straightforward question becomes *why*? Or, how are linguistic forms associated with readable ideologies? As suggested in Examples 1 and 2, these speakers are borrowing formal speech to parody other speakers using Formal Sinhala, more specifically their peers' shaky confidence in the variety. Distancing themselves from this variety, speakers portray authoritative figures, teachers and politicians as the voice of the formal variety, characters of the older generation who hold positions where they must comfortably use formal language and as such are stereotypically associated with the nationalist rhetoric. In Example 3, we saw that just as youth mock their peers' poor usage of Formal Sinhala, they can also denigrate their peers' proper usage, aligning themselves with the Colloquial variety. Kenneth's parody of Mr. Abeygunawardana, forcefully injecting colloquial speech into his mouth, not only rejects Manjula's correction, but also rejects Formal Sinhala.

These parodies, then, exhibit reflexive processes that indicate Formal Sinhala holds a different prestige value for different social groups. Judging from sociohistorical evidence (Section 3) where Formal Sinhala was widely esteemed in politics, the media, and educational institutions, by favoring Colloquial Sinhala, these youth are reanalyzing ideologies associated with registers of Sinhala. Such a cross-generational counter valorization, expresses the gap between older nationalists who were pushed to learn Formal Sinhala and youth who identify with the Colloquial variety. Contrary to widespread state institutional policies, these examples select Colloquial Sinhala as the prestige variety where use of 'formal' features results in parody or mocking.

5 Conclusion

What do these parodies of Formal Sinhala mean for diglossic classifications of Sinhala varieties? Straightforwardly labeling such parodies as either 'formal' or 'colloquial' based on diglossia's clear cut social settings with attributed prestige

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values fails to accurately depict how youth operationalize 'formal' grammatical features as a speech type to charaterize oppositonal personas.

With the loss of social setting as a definitive classifier of H and L variety, diglossia's top down categorization of linguistic features is also questionable. Indeed, while labeling features 'formal' and 'colloquial,' I have maintained labeling based on past morphosyntactic studies, but come across speech which is not easily identifiable as formal and colloquial (see also Paolillo 1997). Documenting shared features between the varieties, then, is an important topic for further study which may additionally update diglossia theory. Expecting that some linguistic features are present in both varieties, speakers repeated use of 'formal' phrases in 'colloquial' settings can bi-directionally signal and cause the insertion of Formal Sinhala grammar into the colloquial variety. Such usage reclassifies and blurs the lines of grammatical classification for each variety, even if mixing begins only as limited register representation of certain stereotypical speakers.

By extension, researchers may be more accurate in considering that Formal and Colloquial Sinhala exist along a continuum. Clearly, the way speakers and listeners recognize and discursively assign value to linguistic features indicates the need for a less dichotomous, more dynamic model of classification than diglossia theory presently provides. Attention to sociohistorical ideologies and interactional reflexive language behavior reveals dynamic, emergent meanings which are as equally important as considering social setting and morphosyntactic categorization. Beginning with such a bottom up discursive approach recognizes language ideology as a motivating factor for variety classification where language can be reanalyzed and regrouped cross-generationally and in the name of ethnic or political identity, as is the case when this Formal Sinhala register is employed by this specific set of youth (Agha 2007). Thus, reframing methods of language classification to include discursive interactions speaks to central issues in the study of language variety, especially the traditional 'diglossic' classification of older, written linguistic forms versus newer, colloquialisms (c.f. Egyptian/ Modern Standard Arabic: Haeri 2003; Spanish/ Catalan: Pujolar 2001; Javanese/ Indonesian: Errington 1998).

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Cala Zubair Department of Linguistics 605 Baldy Hall University at Buffalo Buffalo, NY 14260-7022

calazuba@buffalo.edu